

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

**SAMSUNG ELECTRONICS CO., LTD. AND
SAMSUNG ELECTRONICS AMERICA, INC.,**
Petitioners

v.

MAXELL, LTD.,
Patent Owner

Inter Partes Review No.: IPR2025-01307

**DECLARATION OF JOSEPH A. PARADISO IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,026,088**

I hereby declare under penalty of perjury under the laws of the United States of America that the following is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code.

Date: 25-5-17-2025



JOSEPH A. PARADISO

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. BACKGROUND AND QUALIFICATIONS	1
A. Qualifications	1
B. Technology Background	6
III. THE ‘088 PATENT	7
A. Summary of the ‘088 Patent.....	7
B. File History of the ‘088 Patent	12
C. Priority Date of the ‘088 Patent.....	16
IV. OVERVIEW OF CHALLENGES	17
A. Summary of Iwami (EX1004/EX1005)	17
B. Summary of Kim (EX1006).....	17
C. Summary of Weiser (EX1008).....	18
D. Summary of Kato (EX1009)	18
E. Summary of Liansky (EX1012)	18
F. Summary of Dowling (EX1021).....	19
G. Legal Standards	19
H. Other Materials Relied Upon	23
V. CLAIM CONSTRUCTION	23
A. Claim Construction Overview.....	23
1. “access point device” (claims 1, 14, 15).....	23
2. Limitation [6b]	24
B. Person of Ordinary Skill in the Art	24
VI. GROUND 1: CLAIMS 1, 5, AND 13-15 ARE OBVIOUS OVER IWAMI IN VIEW OF KIM.....	25
A. Motivation to Combine	25
B. Claim 1	28
1. [1pre] A communication system comprising:.....	28

2.	[1a] a communication device;.....	28
3.	[1b] an access point device;.....	30
4.	[1c] a first communication terminal configured to connect to the communication device via the access point device and transmit a command to remotely control a display operation on the communication device connected with the first communication terminal; and.....	31
5.	[1d] a second communication terminal configured to, if having permission from the first communication terminal, establish a connection with the communication device to use the communication device;	37
6.	[1e] wherein, while the communication device outputs data received from the second communication terminal that has established the connection with the communication device and upon receiving, by the communication device, the command from the first communication terminal, the communication device is configured to control how to display the data received from the second communication terminal while maintaining the connection with the second communication terminal, and.....	43
7.	[1f] wherein, when the communication device receives information to terminate the permission from the first communication terminal, the communication device is configured to terminate the connection with the second communication terminal in accordance with the information to terminate permission received from the first communication terminal.....	47
C.	Claim 5	50
1.	[5a] The communication system according to claim 1, wherein, the first communication terminal displays information whether to terminate the permission on a display screen,.....	50

2.	[5b] receives an input operation for terminating the permission, and transmits the information to terminate the permission to the communication device in accordance with the input operation for terminating the permission.	52
D.	Claim 13	54
1.	[13a] The communication system according to claim 1, wherein, the second communication terminal controls the communication device while maintaining the connection with the communication device, and	54
2.	[13b] the first communication terminal controls the communication device while maintaining the connection with the communication device via the access point.....	56
E.	Claim 14	57
1.	[14pre] A communication terminal comprising:	57
2.	[14a] a wireless connection interface configured to connect to a communication device via an access point device; and	57
3.	[14b] a controller configured to control the wireless connection interface and to transmit a command to remotely control a display operation on the communication device connected with the communication terminal, ...	57
4.	[14c] wherein the controller is configured to transmit permission to establish a connection for the communication device and another communication terminal, ...	58
5.	[14d] wherein, while the communication device outputs data received from the another communication terminal that has established the connection with the communication device, the controller is configured to transmit the command to control how to display the data while the communication device and the another communication terminal are connected, and	59

6.	[14e] wherein, when the controller transmits information to terminate the permission from the communication terminal, the controller is configured to transmit the information to terminate the connection with the another communication terminal to the communication device.....	59
F.	Claim 15	60
1.	[15pre] A communication device comprising:	60
2.	[15a] a wireless connection interface configured to connect to a communication terminal and another communication terminal; and	60
3.	[15b] a controller configured to control the wireless connection interface, ...	61
4.	[15c] wherein the wireless connection interface is configured to connect to the communication terminal via an access point device, ...	61
5.	[15d] wherein the controller is configured to control to establish a connection with the another communication terminal, if having permission from the communication terminal, and control data received from the another communication terminal, ...	61
6.	[15e] wherein, while the controller controls the data received from the another communication terminal and upon receiving at the wireless communication interface, from the communication terminal, a command to remotely control how the data received from the another communication terminal is displayed, the controller is configured to control the data received from the another communication terminal in accordance with the command from the communication terminal while maintaining the connection with the another communication terminal, and.....	62
7.	[15f] wherein, when the wireless communication interface receives information to terminate the permission from the communication terminal, the controller is configured to terminate the connection with the another communication terminal.	63

VII.	GROUND 2: CLAIMS 2 AND 12 ARE OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF LIANSKY	64
A.	Motivation to Combine	64
B.	Claim 2	66
1.	The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and the second communication terminal connects to the communication device by using the connection information.	66
C.	Claim 12	69
1.	[12a] The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, ...	69
2.	[12b] the second communication terminal connects to the communication device by using the connection information, and	70
3.	[12c] in the short range communication, the first communication terminal displays a bar code representing the connection information on a display screen thereof and the second communication terminal captures an image of the bar code with a camera to read the connection information.	71
VIII.	GROUND 3: CLAIMS 7, 8, AND 10 ARE OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF LIANSKY AND WEISER.....	73
A.	Motivation to Combine	73
B.	Claim 7	75

1. [7a] The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and 75
 2. [7b] the second communication terminal transmits address information on the second communication terminal to the first communication terminal, ...76
 3. [7c] the first communication terminal transmits the address information on the second communication terminal to the communication device,.....78
 4. [7d] the communication device registers the address information on the second communication terminal into a permission list, ...79
 5. [7e] the second communication terminal connects to the communication device by using the connection information,.....79
 6. [7f] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list of the communication device, and,.....80
 7. [7g] upon the address information on the second communication terminal being not registered in the permission list, the communication device terminates the connection with the second communication terminal. 80
- C. Claim 8 81
1. [8a] The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and 81

2. [8b] the second communication terminal transmits address information on the second communication terminal to the first communication terminal, ...83
 3. [8c] the first communication terminal registers the address information on the second communication terminal into a permission list,.....83
 4. [8d] the second communication terminal connects to the communication device by using the connection information,.....84
 5. [8e] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list, and 85
 6. [8f] the communication device performs communication for confirmation with the first communication terminal and, ...85
 7. [8g] upon the address information on the second communication terminal being not registered in the permission list of the communication device, terminates the connection with the second communication terminal.....86
- D. Claim 10 87
1. [10a] The communication system according to claim 1, wherein, for the permission, the second communication terminal performs short range communication with the communication device, ...87
 2. [10b] the communication device transmits, to the second communication terminal, connection information necessary for a connection, and 87
 3. [10c] the second communication terminal transmits address information on the second communication terminal to the communication device,.....88
 4. [10d] the communication device registers the address information on the second communication terminal into a permission list, ...89

5.	[10e] the second communication terminal connects to the communication device by using the connection information,.....	89
6.	[10f] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to deletes the address information on the second communication terminal from the permission list of the communication device, and,.....	90
7.	[10g] upon the address information on the second communication terminal being not registered in the permission list, the communication device terminates the connection with the second communication terminal.	90
IX.	GROUND 4: CLAIMS 9 AND 11 ARE OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF LIANSKY AND KATO	92
A.	Motivation to Combine	92
B.	Claim 9	94
1.	[9a] The communication system according to claim 1, wherein, for the permission, the first communication terminal requests a one-time password from the communication device, and the communication device responds with the one-time password,.....	94
2.	[9b] the first communication terminal transmits, to the second communication terminal, connection information including the one-time password necessary for a connection through short range communication with the second communication terminal, and	96
3.	[9c] the second communication terminal connects to the communication device by using the connection information including the one-time password.	97
C.	Claim 11	99
1.	[11a] The communication system according to claim 1, wherein, for the permission, the second communication terminal requests a one-time password from the communication device through short range communication with the communication device, and	99

2.	[11b] the communication device transmits connection information including the one-time password necessary for a connection to the second communication terminal, and.....	100
3.	[11c] the second communication terminal connects to the communication device by using the connection information including the one-time password.	101
X.	GROUND 5: CLAIM 6 IS OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF DOWLING	102
A.	Motivation to Combine	102
B.	Claim 6	105
1.	[6a] The communication system according to claim 1, wherein, in a case that the communication device is able to receive information from the first communication terminal, the communication device controls the communication device in accordance with information from the first communication terminal, ...	105
2.	[6b] wherein, in a case that the communication device is unable to receive information from the first communication terminal, the communication device terminates the connection with the second communication terminal.	107
XI.	CONCLUSION.....	110

EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 11,026,088
1002	File History of U.S. Patent No. 11,026,088
1003	Declaration of Joseph A. Paradiso in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 11,026,088
1004	U.S. Patent Publication No. 2019/0053149 (“Iwami”)
1005	Certified Translation of Japanese Application No. 2014-024016
1006	U.S. Patent Publication No. 2007/0005788 (“Kim”)
1007	Certified Translation of Korean Application No. 10-2003-0065676
1008	U.S. Patent Publication No. 2013/0147900 (“Weiser”)
1009	U.S. Patent Publication No. 2015/0007302 (“Kato”)
1010	Certified Translation of Japanese Application No. 2013-134145
1011	Certified Translation of Japanese Application No. 2014-006624
1012	U.S. Patent No. 9,323,713 (“Liansky”)
1013	U.S. Patent Publication No. 2005/0036509 (“Acharya”)
1014	U.S. Patent Publication No. 2014/0233443 (“Kumar”)
1015	U.S. Patent Publication No. 2004/0267981 (“Kakemura”)
1016	U.S. Patent Publication No. 2015/0327310 (“Miura”)
1017	U.S. Patent Publication No. 2010/0323682 (“Hatayama”)
1018	U.S. Patent Publication No. 2013/0221084 (“Doss”)
1019	Microsoft Computer Dictionary (5th ed. 2002)
1020	Newton’s Telecom Dictionary (30th ed. 2016)
1021	U.S. Patent No. 6,636,499 (“Dowling”)

TABLE OF CLAIMS

[1pre] A communication system comprising:
[1a] a communication device;
[1b] an access point device;
[1c] a first communication terminal configured to connect to the communication device via the access point device and transmit a command to remotely control a display operation on the communication device connected with the first communication terminal; and
[1d] a second communication terminal configured to, if having permission from the first communication terminal, establish a connection with the communication device to use the communication device;
[1e] wherein, while the communication device outputs data received from the second communication terminal that has established the connection with the communication device and upon receiving, by the communication device, the command from the first communication terminal, the communication device is configured to control how to display the data received from the second communication terminal while maintaining the connection with the second communication terminal, and
[1f] wherein, when the communication device receives information to terminate the permission from the first communication terminal, the communication device is configured to terminate the connection with the second communication terminal in accordance with the information to terminate permission received from the first communication terminal.
[2pre] The communication system according to claim 1, wherein,
[2a] for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and the second communication terminal connects to the communication device by using the connection information.
[3pre] The communication system according to claim 1, wherein,
[3a] the communication device performing communication with the first communication terminal at predetermined time intervals for confirming whether to continue or terminate the permission for the second communication terminal to connect to the communication device, after the connection to the second communication terminal, and continuing the connection with the second communication terminal upon confirming the permission is to be continued, while terminating the connection with the second communication terminal upon confirming the permission is to be terminated.

[4pre] The communication system according to claim 1, wherein,
[4a] the first communication terminal confirming, with a user at the predetermined time intervals, whether to continue or terminate the permission for the second communication terminal to connect to the communication device, after the connection to the second communication terminal, and transmits information indicating termination of the permission to the communication device upon confirming the permission is to be terminated, and upon receiving the information indicating termination of the permission, the communication device terminating the connection with the second communication terminal.
[5pre] The communication system according to claim 1, wherein,
[5a] the first communication terminal displays information whether to terminate the permission on a display screen,
[5b] receives an input operation for terminating the permission, and transmits the information to terminate the permission to the communication device in accordance with the input operation for terminating the permission.
[6pre] The communication system according to claim 1, wherein,
[6a] in a case that the communication device is able to receive information from the first communication terminal, the communication device controls the communication device in accordance with information from the first communication terminal,
[6b] wherein, in a case that the communication device is unable to receive information from the first communication terminal, the communication device terminates the connection with the second communication terminal.
[7pre] The communication system according to claim 1, wherein,
[7a] for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and
[7b] the second communication terminal transmits address information on the second communication terminal to the first communication terminal,
[7c] the first communication terminal transmits the address information on the second communication terminal to the communication device,
[7d] the communication device registers the address information on the second communication terminal into a permission list,
[7e] the second communication terminal connects to the communication device by using the connection information,
[7f] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on

the second communication terminal from the permission list of the communication device, and,
[7g] upon the address information on the second communication terminal being not registered in the permission list, the communication device terminates the connection with the second communication terminal.
[8pre] The communication system according to claim 1, wherein,
[8a] for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and
[8b] the second communication terminal transmits address information on the second communication terminal to the first communication terminal,
[8c] the first communication terminal registers the address information on the second communication terminal into a permission list,
[8d] the second communication terminal connects to the communication device by using the connection information,
[8e] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list, and
[8f] the communication device performs communication for confirmation with the first communication terminal and,
[8g] upon the address information on the second communication terminal being not registered in the permission list of the communication device, terminates the connection with the second communication terminal.
[9pre] The communication system according to claim 1, wherein,
[9a] for the permission, the first communication terminal requests a one-time password from the communication device, and the communication device responds with the one-time password,
[9b] the first communication terminal transmits, to the second communication terminal, connection information including the one-time password necessary for a connection through short range communication with the second communication terminal, and
[9c] the second communication terminal connects to the communication device by using the connection information including the one-time password.
[10pre] The communication system according to claim 1, wherein,
[10a] for the permission, the second communication terminal performs short range communication with the communication device,
[10b] the communication device transmits, to the second communication terminal, connection information necessary for a connection, and

[10c] the second communication terminal transmits address information on the second communication terminal to the communication device,
[10d] the communication device registers the address information on the second communication terminal into a permission list,
[10e] the second communication terminal connects to the communication device by using the connection information,
[10f] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list of the communication device, and,
[10g] upon the address information on the second communication terminal being not registered in the permission list, the communication device terminates the connection with the second communication terminal.
[11pre] The communication system according to claim 1, wherein,
[11a] for the permission, the second communication terminal requests a one-time password from the communication device through short range communication with the communication device, and
[11b] the communication device transmits connection information including the one-time password necessary for a connection to the second communication terminal, and
[11c] the second communication terminal connects to the communication device by using the connection information including the one-time password.
[12pre] The communication system according to claim 1, wherein,
[12a] for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal,
[12b] the second communication terminal connects to the communication device by using the connection information, and
[12c] in the short range communication, the first communication terminal displays a bar code representing the connection information on a display screen thereof and the second communication terminal captures an image of the bar code with a camera to read the connection information.
[13pre] The communication system according to claim 1, wherein,
[13a] the second communication terminal controls the communication device while maintaining the connection with the communication device, and
[13b] the first communication terminal controls the communication device while maintaining the connection with the communication device via the access point.
[14pre] A communication terminal comprising:

[14a] a wireless connection interface configured to connect to a communication device via an access point device; and
[14b] a controller configured to control the wireless connection interface and to transmit a command to remotely control a display operation on the communication device connected with the communication terminal,
[14c] wherein the controller is configured to transmit permission to establish a connection for the communication device and another communication terminal,
[14d] wherein, while the communication device outputs data received from the another communication terminal that has established the connection with the communication device, the controller is configured to transmit the command to control how to display the data while the communication device and the another communication terminal are connected, and
[14e] wherein, when the controller transmits information to terminate the permission from the communication terminal, the controller is configured to transmit the information to terminate the connection with the another communication terminal to the communication device.
[15pre] A communication device comprising:
[15a] a wireless connection interface configured to connect to a communication terminal and another communication terminal; and
[15b] a controller configured to control the wireless connection interface,
[15c] wherein the wireless connection interface is configured to connect to the communication terminal via an access point device,
[15d] wherein the controller is configured to control to establish a connection with the another communication terminal, if having permission from the communication terminal, and control data received from the another communication terminal,
[15e] wherein, while the controller controls the data received from the another communication terminal and upon receiving at the wireless communication interface, from the communication terminal, a command to remotely control how the data received from the another communication terminal is displayed, the controller is configured to control the data received from the another communication terminal in accordance with the command from the communication terminal while maintaining the connection with the another communication terminal, and
[15f] wherein, when the wireless communication interface receives information to terminate the permission from the communication terminal, the controller is configured to terminate the connection with the another communication terminal.

I. INTRODUCTION

1. My name is Joseph Paradiso. I have been asked by Petitioners Samsung Electronics Co. Ltd. and Samsung Electronics America, Inc. to provide my expert opinions in support of the above-identified petition for inter partes review of U.S. Patent No. 11,026,088 ('088 patent," EX1001), challenging the validity of claims 1-15 (the "Challenged Claims").

2. In summary, it is my opinion that the references cited below anticipate render obvious the Challenged Claims. My detailed opinions on the claims are set forth below and summarized in the following chart"

Ground	Claims	Basis	Reference(s)
1	1, 5, 13-15	§103	Iwami and Kim
2	2, 12	§103	Iwami, Kim and Liansky
3	7, 8, 10	§103	Iwami, Kim, Liansky and Weiser
4	9, 11	§103	Iwami, Kim, Liansky and Kato
5	6	§103	Iwami, Kim and Dowling

3. I am being compensated for my time at the rate of \$700 per hour. This compensation is not contingent upon my performance, the outcome of this matter, or any issues involved in or related to this matter.

II. BACKGROUND AND QUALIFICATIONS

A. Qualifications

4. All of my opinions stated herein are based on my own personal knowledge, professional judgment, and analysis of the materials and information I considered in preparing this Declaration. In forming my opinions, I have relied on

my knowledge and experience in designing, developing, researching, and teaching the technology referenced in this Declaration.

5. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein. I have been informed that a copy of my current curriculum vitae, which details my education and professional and academic experience, is being submitted as Exhibit A. The following provides a brief overview of some of my experience that is relevant to the matters set forth in this Declaration.

6. I have devoted my career to various fields of physical, electrical, and computer science with more than two decades focused on embedded sensing, including wired and wireless sensors, as human-computer interaction evolved with the Internet of Things.

7. I am the Alexander W. Dreyfoos Professor in Media Arts and Sciences at the Massachusetts Institute of Technology (MIT), where I direct the Responsive Environments Group, which explores how sensor networks and embedded computation augment and mediate human experience, interaction and perception. I also have served as a co-director of the Things That Think Consortium—a group of MIT Media Lab researchers and industrial partners focused on the future of embedded computation and sensing. I now serve as our Academic Head.

8. I received my B.S. in electrical engineering and physics *summa cum laude* from Tufts University in 1977. I received my Ph.D. in physics from MIT in 1981. From 1981 to 1984, I conducted post-doctoral research at the Swiss Federal Institute of Technology (ETH) in Zurich, working on sensor technology for high-energy particle physics. From 1984–1994, I was a physicist at the Draper Laboratory in Cambridge, Massachusetts, where, as a member of the NASA Systems and Advanced Sensors and Signal Processing Directorates, my research included spacecraft control systems and sensor technology for both sonar systems and high-energy physics.

9. I joined the MIT Media Lab in 1994. The MIT Media Lab was founded in 1985 to actively promote a unique, multi-disciplinary culture that focuses on research projects joining different technological and academic fields. Initially based around the vision of “Digital Convergence,” a term coined by its founding director Nicholas Negroponte to describe how different kinds of media forms (e.g., publishing, film, broadcast, music, photography, etc.) would converge in common computing platforms, the Media Lab is recognized as a pioneering institution that explored the future of media as it moved from different industries into universal interactive and distributed networked platforms. As technology evolved, researchers at the MIT Media Lab have pioneered areas of application such as wearable computing, tangible interfaces, and affective computing, along

with early development of standards and technologies used in digital television.

Examples of products or platforms spun off from the Media Lab research include electronic ink readers such as the Amazon Kindle and Barnes & Noble Nook, the popular video game Guitar Hero, the MPEG-4 structured audio format, the first bionic lower-leg system for amputees, wireless mesh networks developed by Nortel, 3D printers manufactured by Formlabs, wearable motion trackers for physical therapy by Figur8, stress and health monitoring systems by Affectiva and Empatica, and the Mercury RFID Reader, commercialized by spin-off ThingMagic.

10. Hundreds of companies, foundations, and organizations have supported the Media Lab's research, including some of the world's leading corporations representing the fields of electronics, entertainment, computer networks, fashion, health care, cloud and mobile computing, smart homes, social media, e-government, greeting cards, toys, and telecommunications, among others. Currently, faculty members, research staff, and students work in circa 25 research groups and initiatives on several hundred projects relating to a broad range of technologies and applications including digital approaches for treating neurological disorders, new approaches to optimizing sustainable cities, self-assembling spacecraft, powering implanted electronics via radio, advancing imaging

technologies that can “see around a corner,” Human interaction with AI, and the world’s first “smart” powered ankle-foot prosthesis.

11. When I joined the Media Lab in 1994, I focused on developing new sensing modalities for human-computer interaction. By 1997, these modalities evolved into wearable and non-wearable wireless sensing and distributed platforms that could monitor, infer, and represent human activity in different ways, evolving into systems that could create, curate, and share digital content across networked displays of various sorts. For example, around the time of the '088 patent we developed and deployed a networked array of circa 50 video monitors with embedded sensors that communicated also to wireless devices and controllers (we implemented most as badges or watch form factors). Called “Ubiquitous Awareness Portals” we implemented a variety of applications on them that let users selectively share video and images between them and to interact with different kinds of video content, including controlling playback of a video with controllers on the mobile node, and automatically continuing it on other nearby displays as the user walked around the building (they were tracked by a wearable sensor in communication with the portals). One of our mobile devices featured a push button that sent a wireless signal to nearby portals when it was pressed, thereby halting video transmission from the cameras on these portals for a preset length of time, preventing it from being streamed to other portals or to users

browsing the portal data in virtual worlds. Our work on controlling and generating content on networked displays evolved into systems that allowed a user to produce query-driven video streams from sensor-labeled video coming from the portals, as well as systems that display information pertinent to a particular user when they approach, automatically migrating across proximate displays as they navigate through a building or environment.

12. My qualifications, publications, professional experience and expertise are set forth more fully in my curriculum vitae, attached as Exhibit A.

B. Technology Background

13. The basic concepts in the '088 patent relating to an approved or privileged user giving network or media stream access to other users have been in practice for a long time now. Beyond the plethora of patents that read on this patent, such as those introduced in this declaration, there are many standards and products that illustrate these ideas in different ways going back well before the patent's August 2014 priority date. Some of this emerges from the broadcast industry, where for example, management of air-chain access needed to be secured by things like request/grant protocols. An example comes from my own work in a hardware studio switcher I designed, built, and deployed for radio applications in the mid-1980s when only a studio having on-air privilege would enable another

studio to connect to the air chain or disconnect a studio from the air chain (Exhibit A, pgs. 134-155).

14. By the time internet streaming appeared, digital protocols were concocted to manage, control, and provide access to streams, for example the Session Initiation Protocol (SIP) that evolved from in the mid-1990s to handle multicast multimedia sessions on the Mbone, the H.323 standard also from the mid-1990s that managed access and control of media conferencing, and the Media Server Control Markup Language (MSCML) and Protocol that was developed a decade later. Video conferencing/sharing systems likewise developed various techniques to handle gatekeeping, some of which leveraged these protocols.

15. Similarly, internet routers and gateways also employed different protocols to enable an administrator to enable/disable/restrict the connections of different devices to a network, as well as introduce various means for allowing guest devices to have limited network access well before August 2014.

III. THE '088 PATENT

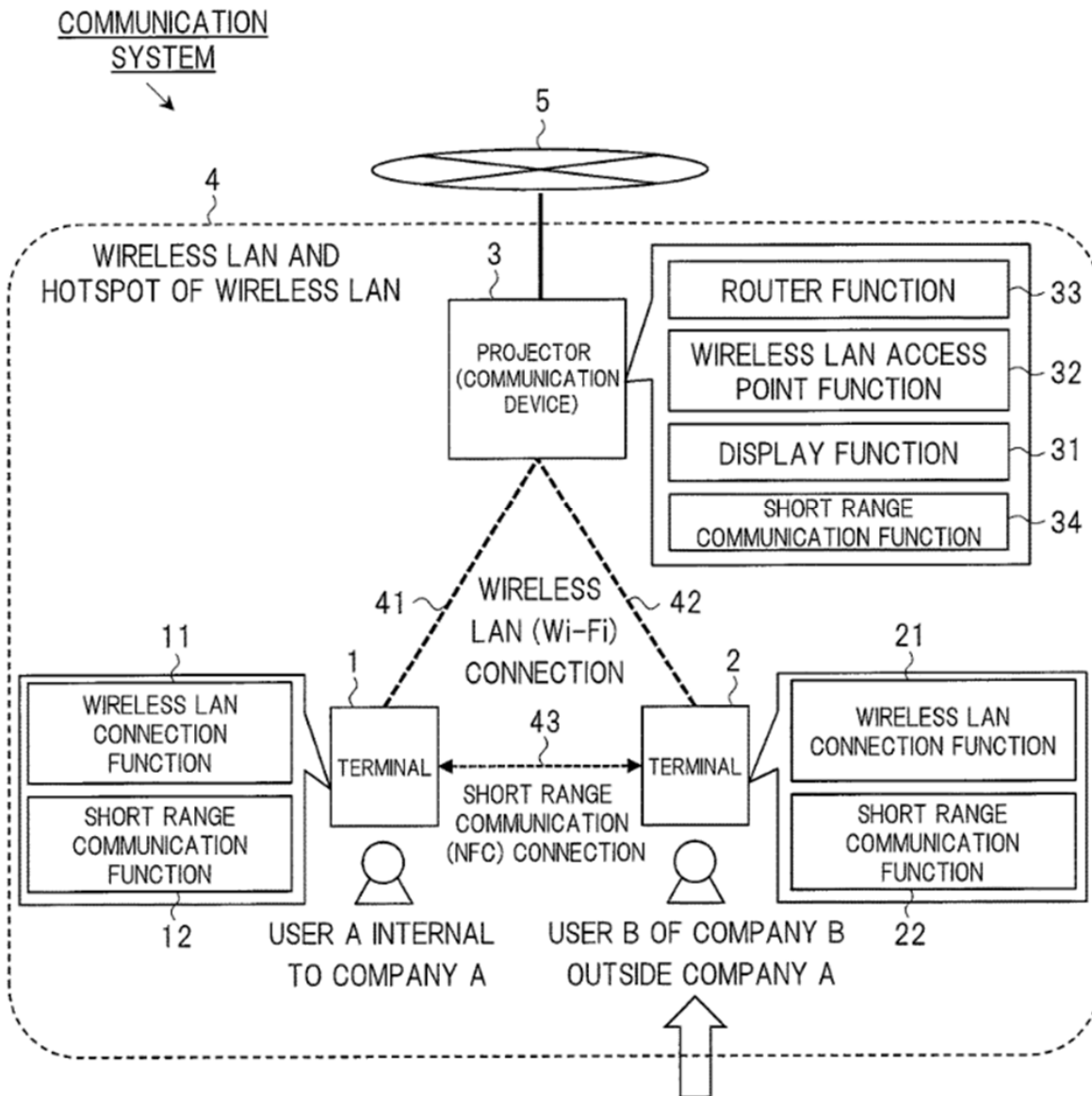
A. Summary of the '088 Patent

16. The '088 patent is directed to a “wireless LAN communication system which achieves convenience where a terminal of a user who is external to an organization can temporarily use the system while ensuring security.” EX1001, Abstract. The '088 patent explains that an organization, such as a company, has a

wireless LAN communication system. Users within the organization may connect their terminals to the wireless LAN communication system. EX1001, 1:14-23.

17. The '088 patent also explains that sometimes a user external to the organization may be invited to connect their terminal to the wireless LAN communication system. For example, a user within the organization can grant temporary access to a user outside the organization. The '088 patent notes that this creates a possible security problem where the external user is able to access the wireless LAN communication system later, after the temporary access was granted. The '088 patent aims to provide a solution where an external user terminal can conveniently connect to the wireless LAN communication system while ensuring security. EX1001, 1:47-2:10.

FIG. 1



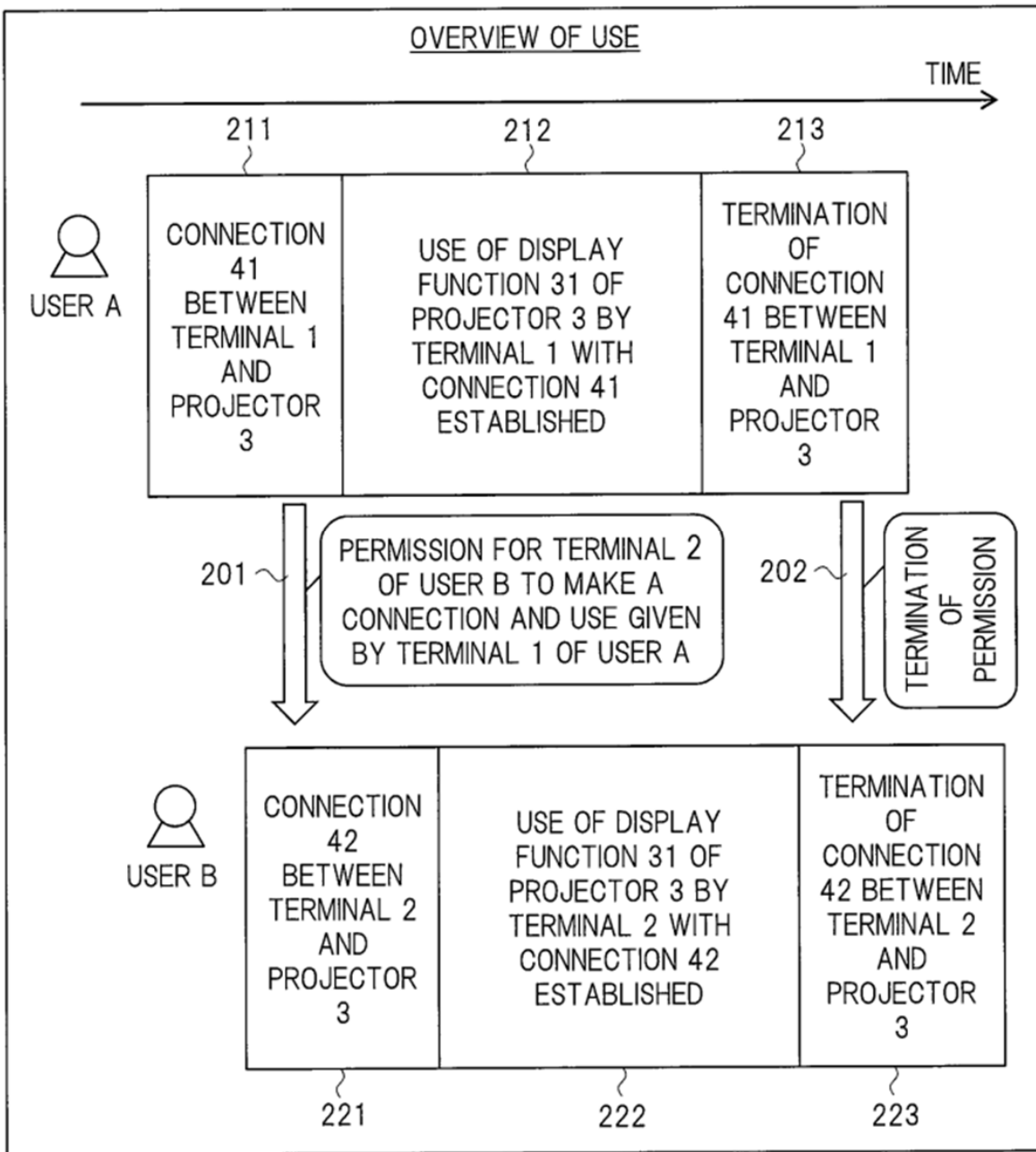
18. FIG. 1 of the '088 patent shows the basic configuration of the purported solution. FIG. 1 shows a communication system that includes a terminal 1, also referred to as a “first communication device,” a terminal 2, also referred to as a “second communication device,” and a projector 3, also referred to as a “communication device.” Terminal 1 is a terminal of user A, a user internal to

company A, while terminal 2 is a terminal of user B, a user outside company A.

Projector 3, serving “both as a projection type display device and a communication device serving as an access point of the wireless LAN 4,” communicates with terminal 1 and terminal 2 by connections 41 and 42 established by wireless LAN 4. Terminal 1 and terminal 2 can also communicate with one another by near field communication (NFC) connection 43. EX1001, 3:44-5:8.

19. Being internal to company A, terminal 1 can connect to projector 3 by the connection 41 and transmit data to projector 3, causing the display function 31 of projector 3 to display the data on a screen. Terminal 2 can connect to projector 3 by the connection 42 and similarly transmit data to projector 3, causing the display function 31 of projector 3 to display the data on the screen. However, because it is external to company A, terminal 2 connects and sends data to projector 3 under permission from terminal 1. EX1001, 5:9-22.

FIG. 2



20. FIG. 2 shows an overview of the process. At 211, terminal 1, the internal terminal, connects to projector 3 through connection 41. Over time,

terminal 1 uses display function 31 of projector 3 through connection 41 at 212

and, eventually, terminates connection 41 at 213. EX1001, 6:21-33.

21. While terminal 1 is connected to projector 3, at 201, user A of terminal 1 gives permission to user B of terminal 2 (the external terminal) to connect to projector 3. At 221, under the permission granted by user A, terminal 2 connects to projector 3 through connection 42. Terminal 2 uses display function 31 of projector 3 through connection 42 at 222. At 202, terminal 1 terminates permission of terminal 2, thereby terminating connection 42 between terminal 2 and projector 3 at 223. EX1001, 6:34-67.

22. The '088 patent also discusses that terminal 1 can also be used as a “remote controller” of projector 3, for example controlling the display operation of the display function 31 to start or stop a video. EX1001, 9:41-53. However, contrary to the requirements of claim 1, there is no disclosure in this passage that terminal 1 can cause a video being supplied to the projector 3 by *another* terminal (such as terminal 2) to start or stop.

B. File History of the '088 Patent

23. The '668 application was filed with fifteen claims. After an unsuccessful attempt to gain allowance by amending the original claims in response to the first non-final rejection, the applicant canceled the original claims and replaced them with fourteen new claims in response to the first final rejection.

These claims were twice amended further, in response to a second non-final rejection and second final rejection. The amendments entered after the second final rejection were allowed, and after a final amendment after notice of allowance to correct a typographical error, issued on June 1, 2021. EX1002, 1-26, 52-101, 109-135, 140-152, 165-208, 217-313.

24. The amendments made during prosecution were required to overcome rejections based on prior art. The primary reference cited by the Examiner throughout prosecution was U.S. Publication No. 2005/0036509 (“Acharya,” EX1013). In the second final rejection, the Examiner rejected claims 16, 20, 21, and 28-30 as unpatentable over Acharya in view of U.S. Publication No. 2004/0267981 (“Kakemura,” EX1015). Claims 17, 24, and 26 were rejected as unpatentable over Acharya in view of Kakemura and U.S. Publication No. 2015/0327310 (“Miura,” EX1016); claims 18 and 19 were rejected as unpatentable over Acharya in view of Kakemura and U.S. Publication No. 2014/0233443 (“Kumar,” EX1014); claims 22, 23, and 26 were rejected as unpatentable over Acharya in view of Kakemura and U.S. Publication No. 2010/0323682 (“Hatayama,” EX1017); and claim 27 was rejected as unpatentable over Acharya in view of Kakemura and U.S. Publication No. 2013/0221084 (“Doss,” EX1018). EX1002, 245-270.

25. Specifically, among other amendments, the applicant amended claim 16 (issued as claim 1) to require “wherein, while the communication device outputs data received from the second communication terminal that has established the connection with the communication device and upon receiving, by the communication device, the command from the first communication terminal, the communication device is configured to control how to display the data received from the second communication terminal while maintaining the connection with the second communication terminal” (emphasis added to show newly introduced elements). Claims 28 and 29 (issued as claims 14 and 15) were amended similarly. EX1002, 273-283.

26. In the accompanying remarks, the applicant emphasized the concurrent actions, communications, and connections between the first communication terminal and the communication device and between the second communication terminal and the communication device. For example, the applicant specifically noted that the claimed invention includes features such as “[i]n a case that the communication device receives the command (remote control command) from the first communication terminal, the communication device that is displaying the data received from the second communication terminal controls how to display the data in accordance with the command (remote control command) received from the first communication terminal while maintaining the

connection with the second communication terminal,” further emphasizing “[i]n the control of the display of the data by the command, the connection between the communication device and the second communication terminal is maintained.”

EX1002, 284-290.

27. The applicant also noted that the command is different from the information to terminate permission. For example, the applicant noted that “[t]he first communication terminal transmits, to the communication device, information to terminate the permission of connection of the second communication terminal with the communication device,” “[t]he information to terminate, terminates the permission of connection between the communication device and the second communication terminal,” and “[t]he command is different from the information to terminate in that the command does not include the information to terminate the permission of connection between the communication device and the second communication terminal.” EX1002, *Id.*

28. With these claim features emphasized and defined, the applicant went on to reference Fig. 2 of the specification and note, in particular, “with respect to the timeline at the top of Fig. 2, (212) and (222) overlap,” where (212) indicates terminal 1 using display function 31 of projector 3 with connection 41 established, and (222) indicates terminal 2 using display function 31 of projector 3 with connection 42 established. EX1002, *Id.*

29. The Examiner found these arguments persuasive, and determined that in view of the arguments filed 30 November 2020, he concluded the prior art does not disclose, teach, or suggest “wherein, while the communication device outputs data received from the second communication terminal that has established the connection with the communication device and upon receiving, by the communication device, the command from the first communication terminal, the communication device is configured to control how to display the data received from the second communication terminal while maintaining the connection with the second communication terminal.” EX1002, 295-298.

30. The Examiner concluded that the prior art did not teach these elements because he failed to find readily available prior art such as that cited in this document that does, in fact, teach these elements. Indeed, as shown in Sections X-XI below, there was nothing novel or inventive about the claim elements deemed to establish allowability of the Challenged Claims. These features, and all other claim features, were well known in the art well before the priority date of the '088 patent.

C. Priority Date of the '088 Patent

31. U.S. Application No. 15/504,668 (“the '668 application”) was filed on February 17, 2017 as a national stage entry of PCT/JP2014/072783, filed August

29, 2014. EX1001, (21), (22), (86). I have been advised that the earliest possible priority date for the '088 Patent is August 29, 2014.

IV. OVERVIEW OF CHALLENGES

32. In forming my opinions as discussed herein, I have relied on the following prior art, legal standards, documents and other materials.

A. Summary of Iwami (EX1004/EX1005)

33. Iwami was filed as U.S. Application No. 16/164,839 on October 19, 2018 and published as U.S. Patent Publication No. 2019/0053149 on February 14, 2019. EX1004, (21), (22), (43). U.S. Application No. 16/164,839 claims priority to Japanese Application No. 2014-024016, filed February 12, 2014. EX1004, (30). I have reviewed a certified translation of Japanese Application No. 2014-024016, available as EX1005, and have confirmed that all of the portions of Iwami EX1004 are present in EX1005. I am informed and understand that, as a result, Iwami is prior art under AIA sections 102 and 103.

B. Summary of Kim (EX1006)

34. Kim was filed as U.S. Application No. 10/573,396 on March 22, 2006 and published as U.S. Patent Publication No. 2007/0005788 on January 4, 2007. EX1006, (21), (43), (86). U.S. Application No. 10/573,396 claims priority to PCT/KR04/02422, filed September 21, 2004 and Korean Application No. 10-2003-0065676, filed September 22, 2003. EX1006, (22), (30), (86). I have reviewed a certified translation of Korean Application No. 10-2003-0065676, available as

EX1007, and have confirmed that all of the portions of Kim EX1006 are present in EX1007. I am informed and understand that Kim is prior art under AIA sections 102 and 103.

C. Summary of Weiser (EX1008)

35. Weiser was filed as U.S. Application No. 13/313,940 on December 7, 2011 and published as U.S. Patent Publication No. 2013/0147900 on June 13, 2013. EX1008, (21), (22), (43). I am informed and understand that Weiser is prior art under AIA sections 102 and 103.

D. Summary of Kato (EX1009)

36. Kato was filed as U.S. Application No. 14/306,653 on June 17, 2014 and published as U.S. Patent Publication No. 2015/0007302 on January 1, 2015. EX1009, (21), (22), (43). U.S. Application No. 14/306,653 claims priority to Japanese Application No. 2013-134146, filed June 26, 2013, and Japanese Application No. 2014-006624. EX1009, (30). I have reviewed certified translations of Japanese Application No. 2013-134145, available as EX1010, and Japanese Application No. 2014-006624, available as EX1011, and have confirmed that all of the portions of Kim EX1009 are present in EX1011 and/or EX1011. I am informed and understand that Kato is prior art under AIA sections 102 and 103.

E. Summary of Liansky (EX1012)

37. Liansky was filed as U.S. Application No. 13/676,252 on November 14, 2012 and issued as U.S. Patent No. 9,323,713 on April 26, 2016. EX1012, (21),

(22), (45). I am informed and understand that Liansky is prior art under AIA sections 102 and 103.

F. Summary of Dowling (EX1021)

38. Dowling was filed as U.S. Application No. 09/453,163 on December 2, 1999 and issued as U.S. Patent No. 6,636,499 on October 21, 2003. EX2021, (21), (22), (45). I am informed and understand that Dowling is prior art under AIA sections 102 and 103.

G. Legal Standards

39. I have been asked to use the date of the filing of the earliest application to which priority is claimed as the date of invention for purposes of my analysis.

40. I have been informed by counsel for petitioner of the following legal standards, and I have applied these standards in forming my opinion.

41. I am informed and understand that a patent claim is invalid under 35 U.S.C. §102 if a prior art disclosure teaches every element required by the claim, either expressly or inherently. The identical invention must be shown in as complete detail as is contained in the claim. When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.

42. I am informed and understand that a patent claim is invalid under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person having ordinary skill in the art to which the subject matter pertains. Obviousness, as has been explained to me, is based on (i) the scope and content of the prior art, (ii) the differences between the prior art and the claim, (iii) the level of ordinary skill in the art, and (iv) any secondary indicia of non-obviousness (e.g., “secondary considerations” such as commercial success in the market place of the claimed invention), to the extent that they exist.

43. I further understand that obviousness may be demonstrated by showing that it would have been obvious to combine the teachings of more than one item of prior art. In determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of a person having ordinary skill in the art, the following are examples of approaches and rationales that may be considered:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;

- Use of a known technique to improve similar devices (methods, or products) in the same way;
- Applying a known technique to a known device (method or product) ready for improvement to yield predictable results;
- Applying a technique or approach that would have been obvious to try (choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success);
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to a person having ordinary skill in the art; and
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

44. I further understand that an invention may be obvious if one of ordinary skill in the art, facing a wide range of needs created by developments in the field, would have seen an obvious benefit to the solutions tried by the applicant. When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, it may be obvious to a person of ordinary skill to try the known options. If a technique has been used to

improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique would have been obvious.

45. I further understand that a person of ordinary skill in the art is a hypothetical person who is presumed to be aware of the relevant art at the time of the invention. The person of ordinary skill may be able to fit together the teachings of multiple patents and/or printed publications employing ordinary creativity and the common sense that familiar items may have uses in another context or beyond their primary purposes.

46. I also understand that when considering the obviousness of a patent claim, one should consider whether a teaching, suggestion, or motivation to combine the references exists, so as to avoid impermissibly applying hindsight when combining or modifying the prior art. I understand this test should not be applied rigidly, but that the test can be important to avoid such hindsight.

47. I also understand that one of ordinary skill in the art must have a reasonable expectation of success in combining or modifying prior art references.

48. I also understand that all elements of a claim must be considered in an obviousness analysis.

49. I understand that the standard to prove unpatentability in an inter partes review proceeding is by a preponderance of the evidence, which means more likely than not.

H. Other Materials Relied Upon

50. In forming the opinions set forth in this declaration, I have utilized my own experience and expertise, including regarding the knowledge and capabilities of a person of ordinary skill in the relevant art in the timeframe of the claimed priority date of the '088 patent.

V. CLAIM CONSTRUCTION

A. Claim Construction Overview

51. In this section I list terms that require construction and I have applied those constructions in my subsequent analysis. For all other terms, I applied the plain and ordinary meaning that a POSITA would have for the terms.

1. “access point device” (claims 1, 14, 15)

52. This term means “in a wireless LAN (local area network), a transceiver that connects the LAN to a wired network.” EX1019 (Microsoft Computer Dictionary, 5th ed, 2002) (definition of “access point”); see also EX1020 (Newton’s Telecom Dictionary, 30 ed. 2016) at 112))(defining “access point” as “Network device that connects a wireless radio network to a wired LAN (local area network).”). This is the plain meaning to a POSITA in view of the specification of the '088 patent.

2. Limitation [6b]

53. Limitation [6b] does not include any requirement for the communication device to terminate the connection with the second communication terminal *in response to* the communication device being unable to receive information from the first communication terminal. Moreover, [6b] does not limit what type of information the communication device must be unable to receive in the “case.” Thus, [6b] is satisfied if the communication device terminates a connection with the second communication terminal during a time period when the communication device is unable to receive any kind of information from the first communication terminal regardless of what type of information cannot be received.

B. Person of Ordinary Skill in the Art

54. A person of ordinary skill in the art at the time of the alleged invention of the ‘088 patent (Oct. 1, 2024) (“POSITA”) would have had a Bachelors’ degree in Electrical or Computer Engineering or a comparable field of study, plus approximately two to three years of professional experience with wireless LAN communications systems and distribution of information over the same, or other relevant industry experience. Additional graduate education could substitute for professional experience, and significant experience in the field could substitute for formal education.

VI. GROUND 1: CLAIMS 1, 5, AND 13-15 ARE OBVIOUS OVER IWAMI IN VIEW OF KIM**A. Motivation to Combine**

55. A POSITA would have found it obvious, and would have been capable of modifying and motivated to modify, Iwami's communication system 700, and individual elements thereof and/or actions performed by those elements, by the teachings of Kim and/or the knowledge of a POSITA. In particular, a POSITA would have found it obvious and been motivated to configure Iwami's control device 740 to transmit message-based commands of the type taught by Kim to Iwami's information processing device 730/display device 731 and to Iwami's information processing devices 710, 720 for controlling connections to, and controlling display operations on, Iwami's information processing device 730/display device 731 (as discussed in further detail below) for several reasons. For example, both references are analogous art from the same field of endeavor and are reasonably pertinent to some of the particular problems to which Iwami and Kim are directed, including problems relating to media transmission and display in a network environment. EX1004, (57), [0002], [0009]; EX1005, [Abstract], [0001], [0008]; EX1006 (57), [0001], [0018]; EX1007, [0007], [0020]-[0028]. More specifically, the second embodiment of Iwami is a communication system 700 where information processing devices 703, 704, 710, and/or 720 can send image data to an information processing device 730 connected to a display

device 731 that displays the image data. A control device 740 manages connections between information processing devices 703, 704, 710, and/or 720 and information processing device 730. EX1004, [0235]-[0256]; EX1005, [0186]-[0207]. The control device 740 can send information to information processing device 730 that causes information processing device 730 to change the size and/or position of images from information processing devices 703, 704, 710, and/or 720. EX1004, [0296]-[0308]; EX1005, [0247]-[0356]. Similarly, Kim describes a multicast streaming service where a media server 120 sends media data to one or more media renderers 131-136 that display the media data. A control point 110 manages connections between the media server 120 and media renderers 131-136 that display the media data, including sending commands to start and/or stop video play and/or transmission. EX1006, [0035]-[0047]; EX1007, [0041]-[0054].

56. Iwami generally teaches that the connections between information processing devices 703, 704, 710, and/or 720 and information processing device 730 are formed, maintained, and/or terminated according to permission from the control device 740, as discussed in detail below. EX1004, [0406]-[0407], [0448]-[0455]; EX1005, [0330]-[0331], [0372]-[0377]. Kim describes specific systems, messages, and signal sequences by which the control point 110 can grant and/or revoke permission for connections between the media server 120 sends media data

to one or more media renderers 131-136. EX1006, [0037]-[0045]; EX1007, [0043]-[0052].

57. Iwami demonstrates the desirability of permission for connection control, but arguably does not clearly describe a technical process for permissions-based connection management. A POSITA would have been motivated to implement elements of the Kim permission technique as one mechanism by which the control device 740 of Iwami can manage connections between information processing devices 703, 704, 710, and/or 720 and information processing device 730 and/or to implement commands and/or messaging of the type discussed by Kim as one mechanism by which the control device 740 of Iwami can control display operations of information processing device 730. The decision to do so would have simply involved combining known prior art elements (i.e., the communication system 700 elements of Iwami) according to known methods (i.e., the messaging described by Kim) to yield predictable results (i.e., a communication system 700 whose elements can communicate with one another, or not, based on permission or lack thereof and exchange command messages with one another). A POSITA would have understood that there would have been a reasonable expectation of success in doing so, because Kim supplies a complete description of a technique for granting and revoking connection permission and display operation control that is compatible with the communication system 700 of

Iwami, and because implementing Kim's message-based techniques in Iwami's system would involve no more than ordinary skill. It is my understanding from Counsel that these are proper rationales to support an obviousness analysis.

B. Claim 1

1. [1pre] A communication system comprising:

58. To the extent the preamble is a limitation, Iwami and Kim each disclose a communication system.

59. For example, Iwami describes a communication system 700 in a second embodiment that includes an access point 701, a network 702, information processing devices 703, 704, 710, 720, 730, a display device 731, and a control device 740. EX1004, FIG. 17, [0235]-[0236]; EX1005, FIG. 17, [0186]-[0187].

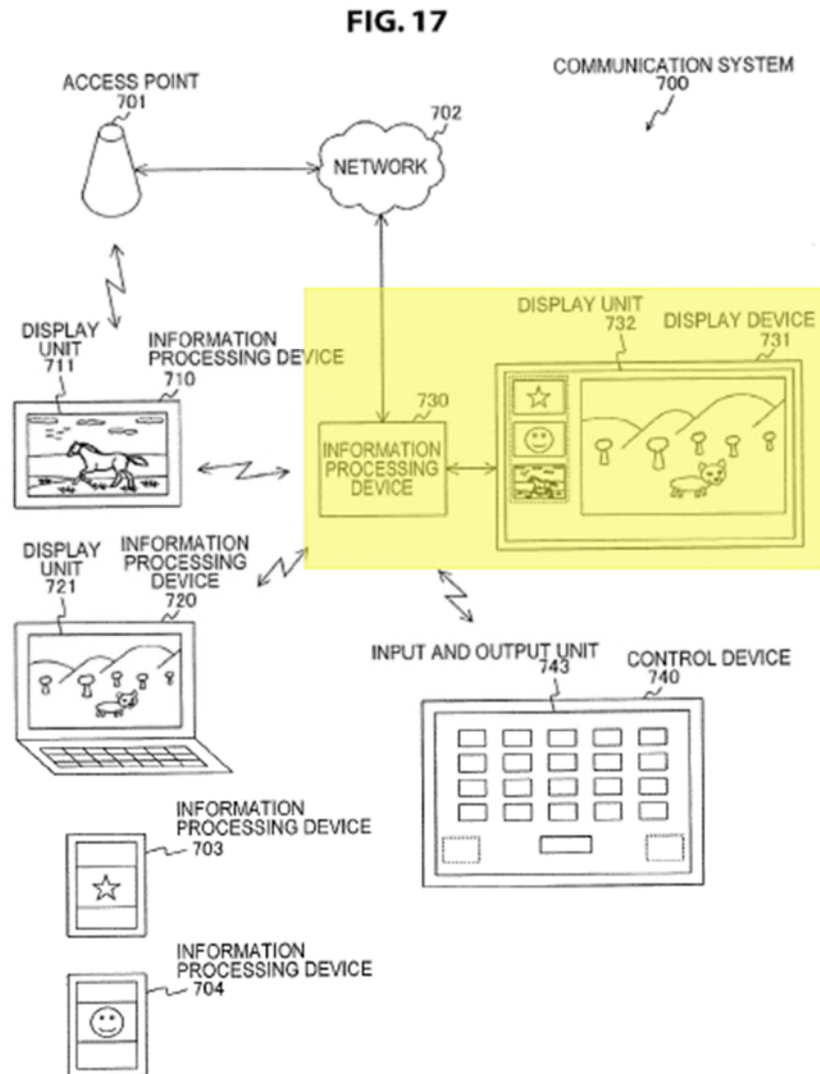
60. Kim discloses a multicast streaming service method and system wherein a control point 110, media server 120, and media renderers 131-136 communicate with one another. EX1006, FIG. 1, [0018], [0032]-[0036]; EX1007, FIG. 1, [0021]-[0028], [0038]-[0041].

2. [1a] a communication device;

61. Iwami and Kim each disclose a communication device.

62. In the communication system 700 of Iwami, the combination of the information processing device 730 and display device 731 (which includes a display unit 732 and which can be included in or coupled via a wired or wireless connection to the information processing device 730), is a claimed communication

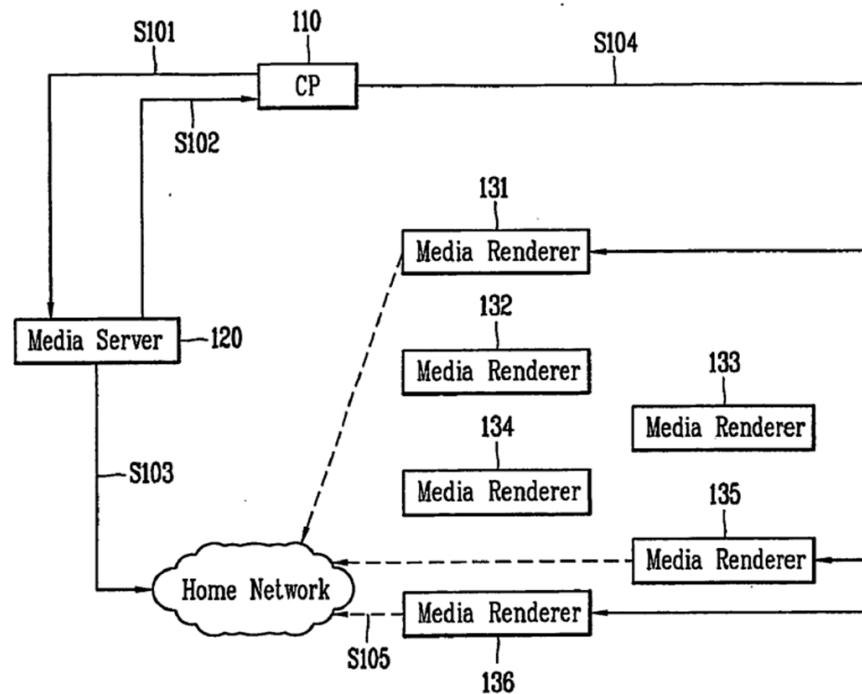
device. The information processing device 730 has a display function for displaying information on a screen of a television or projector. The information processing device 730 displays an image on display device 731. EX1004, FIG. 17, [0248]-[0249]; EX1005, FIG. 17, [0199]-[0200].



63. In the system of Kim, media renderers 131-136 are communication devices. For example, Kim discloses that one of the media renderers 131-136

requests to join a multicast group and, once joined, plays contents being sent from media server 120, thereby allowing a user to watch the contents. EX1006, [0042]-[0044]; EX1007, [0046]-[0051].

FIG. 1

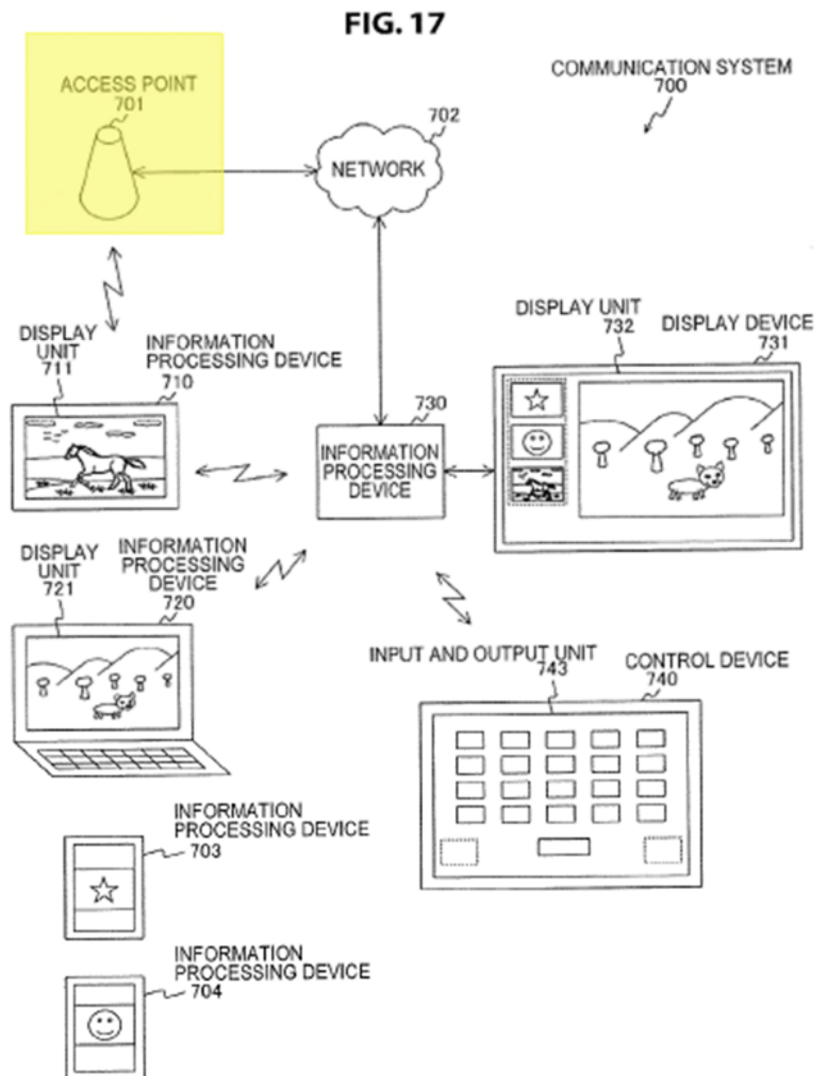


3. [1b] an access point device;

64. Iwami discloses an access point device.

65. For example, the communication system 700 of Iwami includes access point 701, which is a wireless LAN (e.g., WiFi) access point. Access point 701 can be connected to the information processing device 730 by a wired or wireless connection. EX1004, [0238]; EX1005, [0189]. Information processing devices 703, 704, 710, and 720 also connect to access point 701. Control device 740 also

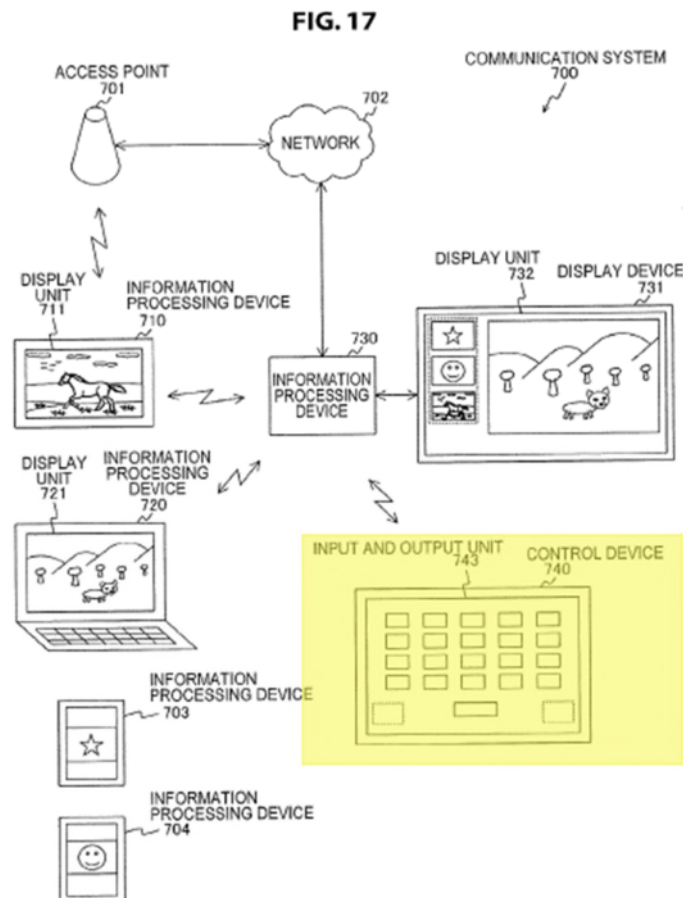
can connect to the access point 701 and thereby communicate with other devices via the access point 701. EX1004, FIG. 17, [0237]-[0239], [0250]; EX1005, FIG. 17, [0188]-[0190], [0201].



4. **[1c] a first communication terminal configured to connect to the communication device via the access point device and transmit a command to remotely control a display operation on the communication device connected with the first communication terminal; and**

66. Iwami and Kim disclose a first communication terminal configured to connect to the communication device via the access point device and transmit a command to remotely control a display operation on the communication device connected with the first communication terminal.

67. In the communication system 700 of Iwami, the control device 740 operates as the claimed first communication terminal. In one embodiment, the control device 740 connects to the information processing device 730/display device 731 via the access point 701 (not shown in Fig. 17). EX1004, [0250]; EX1005, [0201].

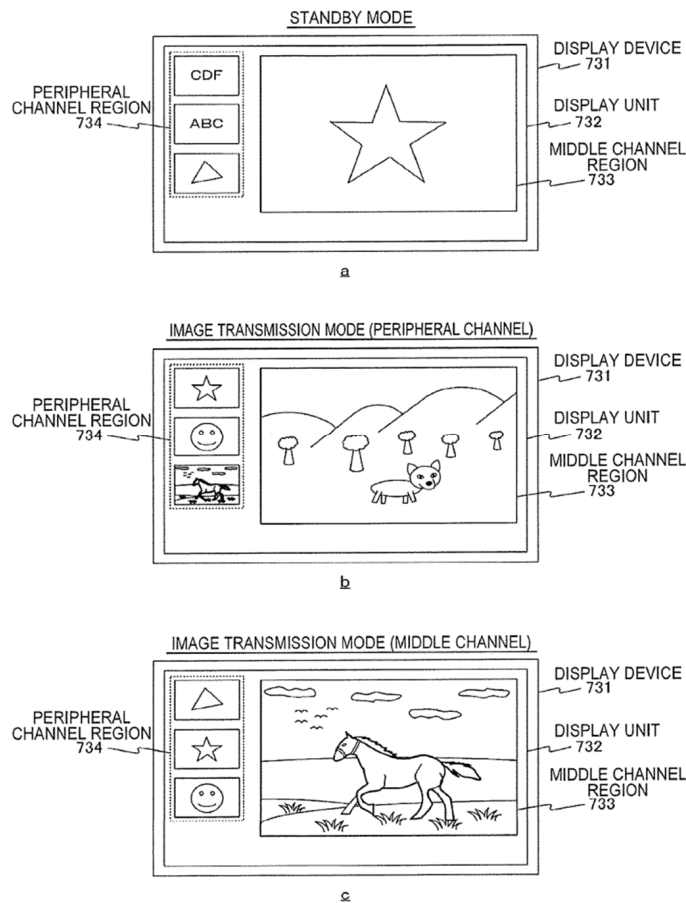


68. The control device 740 transmits commands to remotely control display of information on the information processing device 730/display device 731 (the claimed “communication device”). Specifically, Iwami describes an example in which students give presentations in a classroom using information processing devices 703-705 and 720 (each a “second communication terminal” as discussed below). A student can give presentation while causing an image related to the presentation to be displayed on the display device 731. By manipulating the control device 740, a teacher can sequentially select the source information processing devices (e.g., 710, 720) of the students and thereby cause, via a command sent to the sink information processing device 730 as discussed in EX1004, [0304]; EX1005, [0255], the image of the selected information processing device to be displayed on a display unit 732 of the display device 731 in a peripheral channel region 734 and subsequently (e.g., via selection of other students’ source image processing devices) cause the image of that information processing device to be moved to the middle channel region 733. EX1004, [0252]-[0255], [0291], [0304] and Figs. 17, 18 and 21; EX1005, [0203]-[0206], [0242], [0255] and Figs. 17, 18 and 21.

69. For example, with reference to Fig. 22b below, three student source devices are transmitting video corresponding to a star, smiley face and running horse to the sink information processing device 730 in a low frequency band, and

those video images are displayed in the upper, center and lower part of the peripheral channel region 734. At the same time, a fourth student source device is transmitting video information corresponding to a small animal which is displayed in the middle channel region 733. In response to a teacher at control device 740 selecting a new student source device, the control device sends a command to the sink information processing device 730 that results in the new student device being commanded by the sink information processing device 730 to transition from a standby mode and start transmitting triangle video information in a low frequency band, which is then displayed in the upper part of peripheral channel region 733 as shown in Fig. 22c. The star and smiley face videos, which continue to be transmitted in the low frequency band, are then moved to the center and lower parts of the peripheral channel region, and source student device transmitting the running horse video is instructed by sink information processing device 730 to transmit that running horse video in the high frequency band and the running horse video is moved to the middle channel region 733 as shown in Fig. 22c. EX1004, [0284]-[0308]; EX1005, [0235]-[0256].

FIG. 22



70. Controlling by the control device 740 the display device 731/display unit 732 to move a video display from peripheral channel region 734 to the middle channel region 733 is remotely controlling a display operation as recited in claim 1. As discussed in detail below, to the extent that Iwami does not expressly disclose sending a command from control device 740 to sink information processing device 731, selection of an information processing device to be displayed on a display unit 732 of the display device 731 using the interface of the control device 740 triggers the control device 740 to send a command to the

information processing device 730/display device 731 in Iwami's system as modified by the teachings of Kim.

71. In Kim's system, the control point 110 is a first communication terminal. For example, Kim discloses that the control point 110 controls a media server and media renderer. This control includes invoking a MulticastStart() action that triggers one or more of media renderers 131-136 to play the contents of data sent by the media server 120. Invoking the MulticastStart() action causes the media server 120 to respond with connection parameters and begin streaming, meaning that the MulticastStart() action functions as a command message sent by the control point 110. EX1006, [0040]-[0044]; EX1007, [0046]-[0051].

72. To the extent Iwami does not explicitly state that the control device 740 sends a command in response to the teacher manipulating the control device 740 to select an information processing device that will display images on the display unit 732 of the display device 731, Kim provides an example of how to send a command. A POSITA would have understood that the user input into the control device 740 has to configure connections between information processing devices and/or display operation control on the display device 731. A POSITA would have found it obvious to modify the communication system 700 of Iwami to transmit a command from a first communication terminal to remotely control a display operation on the communication device connected with the first

communication terminal. In other words, a POSITA would have found it obvious to configure the control device 740 to send a command to either the information processing device 710, the information processing device 730, or both, as taught by Kim when Kim describes sending a MulticastStart() action message. A POSITA would not need to use the specific MulticastStart() action message of Kim, but rather would understand that a message including a command can be transmitted. As discussed above, a POSITA would have been motivated to combine Iwami and Kim because they are in a same field of art, Iwami teaches that providing remote control of display operations is desirable, and Kim describes a known technique for sending control commands that a POSITA would reasonably expect to be successful.

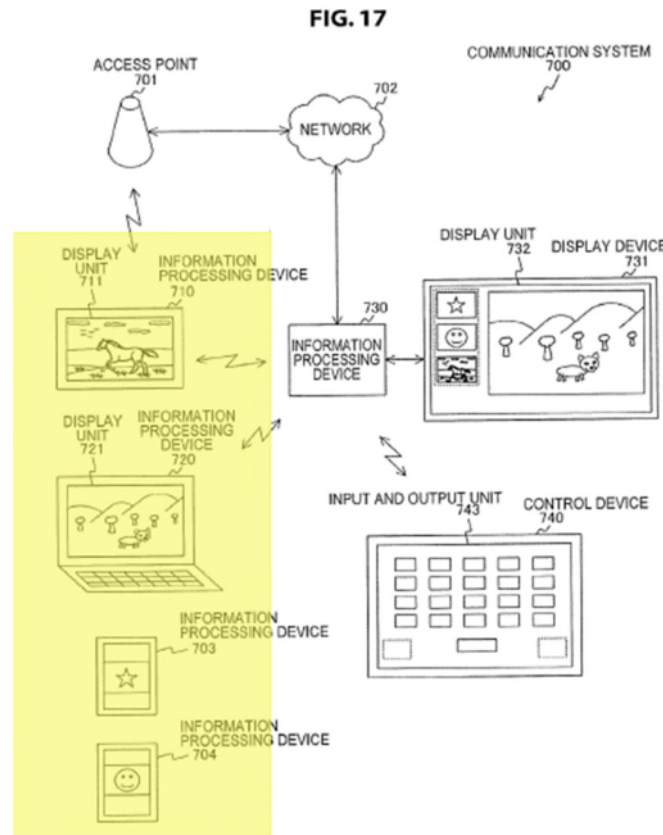
5. **[1d] a second communication terminal configured to, if having permission from the first communication terminal, establish a connection with the communication device to use the communication device;**

73. Iwami discloses a second communication terminal configured to establish a connection with the communication device to use the communication device if the second communication terminal has permission from the first communication terminal.

74. In the communication system 700 of Iwami, the information processing devices 703, 704, 710, and 720 are second communication terminals

configured to establish a connection with the information processing device

730/display device 731. EX1004, [0240], [0246]; EX1005, [0191], [0197].



75. Additionally, Iwami teaches that by manipulating the control device 740 (i.e., the first communication terminal), a teacher can sequentially select the information processing devices of the students (e.g., information processing devices 703, 704, 710, and 720) and thereby cause the image of the selected information processing device to be displayed on a display unit 732 of the display device 731 (initially in the peripheral channel region 734 and then in the middle channel region 733 as discussed at [0291]-[0295]). As such, the first

communication terminal enables the second communication terminal (i.e., the student's information processing device) to use the information processing device 730/display device 731 (i.e., communication device). When the user of the control unit 740 selects an information processing device 703, 704, 710, or 720, the control unit "performs control such that the communication mode is set in the source device (selected information processing device 703, 704, 710, or 720) based on the manipulation input." EX1004, [0252]-[0255], [0264]; EX1005, [0203]-[0206], [0215].

76. Iwami also teaches that connections between information processing devices functioning as second communication terminals (e.g., information processing device 710) and the communication device (i.e., information processing device 730) rely on permissions. When the information processing device 710 is connecting to the information processing device 730 so it can send image information to the information processing device 730, the information processing device 710 determines whether or not connection permission information has been received from the information processing device 730 (as discussed below, the connection permission information originates with control device 740). When connection permission information has been received, the information processing device 710 and the information processing device 730 complete remaining steps to establish a connection with one another. Iwami teaches that connection information

permission or non-permission can be set each time there is a connection request from the source device (i.e., each time the control unit 740 sets the communication mode of the source device as discussed above). EX1004, [0409], [0413], [0448]-[0455]; EX1005, [0333], [0337], [0372]-[0377].

77. Iwami also teaches that the permission can originate with the first communication terminal (i.e., the control device 740), and is therefore “from” the first communication terminal. For example, Iwami describes a situation where the information processing device 710 is trying to connect with the information processing device 730 by a connection other than that provided by the access point 701, referred to as “outdoor use” in Iwami. In this example, the control device 740 supplies “outdoor use” permission to the information processing device 730. When the information processing device 710 sends a connection request to the information processing device 730, the information processing device 730 responds with connection permission information that includes the outdoor use permission received from the control device 740. Specifically, Iwami states that “when the information processing device 730 transmits the connection permission information in response to the connection request received via the access point 701 (AP), the information processing device acquires the outdoor use information (permission or non-permission) from the control device 740, includes the acquired outdoor use information (permission or non-permission) in the connection

permission information, and transmits the resulting connection permission information.” EX1004, [0407]; *see also* [0405]-[0407]; EX1005, [0331]; *see also* [0329]-[0331].

78. Because the outdoor use permission is included in the connection permission information used by the information processing device 710 (second communication terminal) to connect to the information processing device 730 (communication device), the outdoor use permission is at least a part of the permission to establish a connection with the communication device to use the communication device. Because the outdoor use permission comes from the control device 740 (first communication terminal) and is included in the connection permission information sent from the information processing device 730 to the information processing device 710, the second communication terminal has received permission from the first communication terminal 740 when the second communication terminal receives the connection permission information, notwithstanding that the connection permission information passes through the information processing device 730.

79. To the extent the outdoor use permission of Iwami is not unambiguously permission from the first communication terminal such that if the second communication terminal has the permission, it establishes a connection with the communication device to use the communication device, a POSITA

would have found it obvious to send all connection permission information (not only outdoor use permission) from the control device 740 to the information processing device 730. Iwami teaches that a user of the control device 740 uses the touch screen to select the outdoor use permission that is sent from the control device 740 to the information processing device 730. EX1004, [0410], EX1005, [0334]. To the extent this feature is not explicit in Iwami, a POSITA would have found it obvious to modify the control device 740 to also accept user input of connection permission generally, meaning that any and all connection permission information would originate with the control device 740 and be passed to the information processing device 710 via the information processing device 730. A POSITA would have been motivated to include this feature both as a natural extension of the outdoor use permission already described explicitly and as a consequence of the fact that Iwami explicitly teaches that the control device 740 performs group management generally, and membership in a group specified by the control device 740 is used as a basis for granting permission to connect to information processing device 730. See EX1004, [0266]-[0273], [0357]-[0362]; EX1005, [0217]-[0224], [0281]-[0286]. In other words, a POSITA would have found it obvious to configure the control device 740 to send permission information stored by the control device 740 (e.g., group membership and/or outdoor use permission) to the information processing device 730, and in turn, to

configure the information processing device 730 to send this permission

information to the information processing device 710 as already taught by Iwami.

6. **[1e] wherein, while the communication device outputs data received from the second communication terminal that has established the connection with the communication device and upon receiving, by the communication device, the command from the first communication terminal, the communication device is configured to control how to display the data received from the second communication terminal while maintaining the connection with the second communication terminal, and**

80. Iwami and Kim disclose a communication device that receives a command from a first communication terminal while outputting data received from a second communication terminal and that is configured to control how data received from a second communication terminal is displayed while the communication device outputs data received from the second communication terminal.

81. In the communication system 700 of Iwami, the control device 740 operates as a first communication terminal, connecting to the information processing device 730/display device 731 via the access point 701 and transmitting commands to control display of information on the information processing device 730/display device 731. As noted above, Iwami describes an example in which students give presentations in a classroom using information processing devices 703-705, 710 and 720, causing an image related to the presentation to be displayed

on the display device 731. By manipulating the control device 740, a teacher can sequentially select the information processing devices of the students (e.g., 710, 720) and thereby cause the image of the selected information processing device to be displayed on a display unit 732 of the display device 731 and subsequently (via selection of other students' image processing devices) cause the image of the selected information processing device to be removed from (stop being displayed on) the display unit 732 of the display device 731. EX1004, [0250]-[0255], [0291]-[0295], and Figs. 17-22; EX1005, [0201]-[0206], [0242]-[0246] and Figs. 17-22. At least causing the image from the selected information processing device to be moved from the peripheral channel region 734 to the middle channel region 733 constitutes controlling how to display the data received from the second communication terminal by the communication device in accordance with a command received from the first communication device while the communication device outputs data received from the second communication terminal while maintaining the connection with the second communication terminal as required by limitation [1e].

82. Additionally, Iwami teaches the control device 740 switching a communication mode used by the information processing device 730/display device 731 by which the information processing device 730/display device 731 receives transmitted data from a source (e.g., information processing devices 703-

705 and 720). In an example operation, control device 740 switches communication modes. Iwami first refers to this as (B2) (see EX1004, [0299]; EX1005, [0248]), but later refers to it as (B3) (see EX1004, [0304]; EX1005, [0252]). Despite this inconsistency, it is clear that the control device 740 transmits information (the “command” of limitation [1e]) to the information processing device 730 that causes the band of the source device to be increased or decreased. EX1004, [0296]-[0308]; EX1005, [0247]-[0356].

83. Switching the communication mode between a low frequency band and a high frequency band changes how the data from the source is displayed on the display device 731, or in other words how the communication device displays data received from a second communication terminal while the communication device outputs data received from the second communication terminal. For example, data sent in high frequency mode is shown in a middle channel region 733 of an example display screen shown in FIG. 22, and data sent in low frequency mode is shown in a peripheral channel region 734 of the display screen.

Controlling the communication mode controls the display operation of where and how the data is displayed on the screen. In cases such as FIG. 22a, data is not transmitted from the source information processing device 710 when it is in standby mode (i.e., the connection is not maintained as discussed at EX1004, [0374]; EX1005, [0325]). However, in other cases such as FIG. 22b and 22c, the

connection between the source information processing device 710 and the information processing device 730 is maintained as the image transmission mode changes from the low frequency band in FIG. 22b to the high frequency band in FIG. 22c. That is, the image including a running horse as shown in FIGs. 22b and 22c is being transmitted from the information processing device 710 to the information processing device 730 in the low frequency band and displayed in the peripheral channel region 734 in FIG. 22b and, when a command comes to switch to the high frequency band as described above, the image continues to be transmitted from the information processing device 710 to the information processing device 730 but is now transmitted in the high frequency band and is displayed in the middle channel region 733 in FIG. 22c . EX1004, [0274]-[0295] and Figs. 21, 22a-c; EX1005, [0225]-[0246]. As discussed above, this switching of bands and change of location from the peripheral channel region to the middle channel region is performed in response to a command transmitted from the control device 740 to the information processing device 730. EX1004, [0304]; EX1005, [0252].

84. In the system of Kim, the control point 110 is a first communication terminal. As discussed above, Kim discloses that the control point 110 controls a media server and media renderer by invoking a MulticastStart() action that triggers one or more of media renderers 131-136 to play the contents of data sent

by the media server 120. EX1006, [0040]-[0044]; EX1007, [0046]-[0051]. A

POSITA would have found it obvious to implement the commands from Iwami's control device 740 discussed above using a message like the MulticastStart() action message disclosed by Kim for the reasons discussed above.

7. **[1f] wherein, when the communication device receives information to terminate the permission from the first communication terminal, the communication device is configured to terminate the connection with the second communication terminal in accordance with the information to terminate permission received from the first communication terminal.**

85. Iwami discloses that when a student information processing device enters the standby mode (e.g., when a student's video is removed from the middle channel region 733 in response to a command from control device 740 to the display device as discussed above), a connection between an information processing device 710 and the information processing device 730 is terminated. EX1004, [0374]; EX1005, [0325]. This command from control device 740 to the information processing device 730 constitutes information to terminate the permission of the second communication device to directly connect to the information processing device 730. Iwami further discloses that the control device 740 manages the information processing device 710. EX1004, [0283]; EX1005, [0234].

86. Iwami also teaches that there can be conditions wherein permission is not granted to a user, such as “in a time zone in which a presentation or a conference that is highly confidential, a presentation or a conference that has a high degree of importance, a meeting that has not to be exposed, or the like is performed.” EX1004, [0273]; EX1005, [0224].

87. However, Iwami does not disclose a mechanism by which the control device 740 terminates the permission of the information processing device 710 to connect to the information processing device 730. Given the teaching in Iwami that it may be necessary or desirable to withhold permissions from certain users during certain times, a POSITA would have found it obvious to provide the capability to terminate previously granted permission in a case where it later becomes necessary or desirable to do so. A POSITA would have looked to other prior art in order to implement this functionality.

88. Kim discloses a communication device receiving information to terminate permission from a first communication terminal and the communication device terminating the connection in accordance with the information to terminate permission received from the first communication terminal.

89. In Kim, after the MulticastStart() action is invoked and the media server 120 (second communication terminal) is sending content to at least one of the media renderers 131-136 (communication device), the control point 110 (first

communication terminal) can invoke a Leave() action to at least one of the media renderers 131-136. The Leave() action is information to terminate the permission, sent from the first communication terminal to the communication device, that configures the communication device to terminate the connection with the second communication terminal in accordance with the Leave() command. That is, upon receiving a Leave() command, a media renderer 131-136 will stop receiving data from the media server 120. Indeed, Kim teaches that the media renderer 131-136 will “stop the data reception,” indicating that the connection is terminated.

EX1006, [0037], [0045]-[0046]; EX1007, [0043], [0052]-[0053].

90. Based on the teachings of Kim, a POSITA would have found it obvious to modify the communication system 700 of Iwami to send an explicit message from a first communication terminal 740 to the information processing device 730 to terminate permission for a second communication terminal 710 to connect with the information processing device 730. In other words, a POSITA would have found it obvious for the reasons discussed above to configure the control device 740 to send a message as taught by Kim to the information processing device 730 indicating that permission for the information processing device 710 to connect to the information processing device 730 has been revoked. A POSITA would have understood that it was not necessary to use the specific Leave() action message of Kim, but rather would have understood that any suitable

message could be used to terminate the permission. As discussed above, a POSITA would have been motivated to combine Iwami and Kim because they are in a same field of art, Iwami teaches that terminating permission is desirable, and Kim describes a known technique for terminating such permission that a POSITA would reasonably expect to be successful.

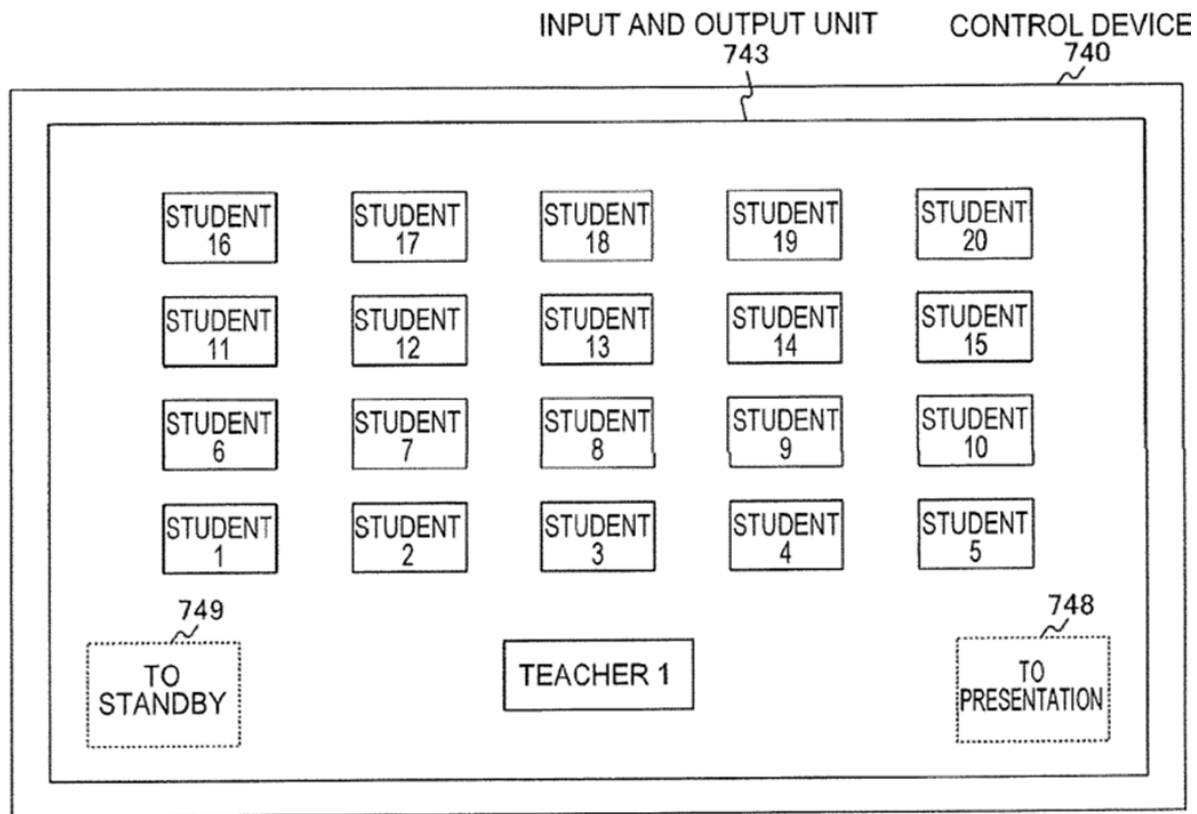
C. Claim 5

- 1. [5a] The communication system according to claim 1, wherein, the first communication terminal displays information whether to terminate the permission on a display screen,**

91. Iwami teaches displaying information whether to terminate the permission on a display screen of the first communication terminal. For example, Iwami teaches that a teacher can select student information processing devices (second communication terminals) to send information to information processing device 730/display device 731 (communication device) by manipulating the control device 740 (first communication terminal). The control device 740 includes a touch screen that shows information and accepts user inputs. The touch screen shows students 1-20, a presentation region 748, and a standby region 749. The presentation region 748 is used to switch from standby mode to image transmission mode (i.e., putting a student 1-20 in the presentation region connects their device with the communication device) and, as discussed above, will cause a student currently in the middle channel image transmission mode to be placed into

standby. The standby region 749 is used to switch from image transmission mode to standby mode. In standby mode, the direct connection between the student device and the information processing device 730 is disconnected, which terminates the student device's ability to send images to the display device 731 (i.e., moving a student 1-20 from the presentation region to the standby region disconnects a direct connection between their device and the communication device and thereby terminates permission to send images through the direct connection). EX1004, [0374]; EX1005, [0325]. The teacher can select icons of students 1-20 to move them into the presentation region 748 and/or the standby region 749. EX1004, FIG. 21, [0255], [0261]-[0263], [0274]-[0276], [0281]-[0282], [0302]-[0307]; EX1005, [0206], [0212]-[0214], [0225]-[0227], [0232]-[0233], [0250]-[0255].

FIG. 21



92. As discussed above, to the extent the action taking place in Iwami is not explicitly described as terminating permission, Kim describes that the information terminating connection is information to terminate permission. See [1f] above.

2. **[5b] receives an input operation for terminating the permission, and transmits the information to terminate the permission to the communication device in accordance with the input operation for terminating the permission.**

93. Iwami teaches receiving an input operation for terminating the permission and transmitting the information to terminate the permission to the

communication device. As noted above, the touch screen of the control device 740 shows students 1-20, a presentation region 748, and a standby region 749. Pressing the presentation region 748 is used to switch from standby mode to image transmission mode (i.e., putting a student 1-20 in the presentation region connects their device with the communication device) and, as discussed above, will cause another student's device currently in the main channel transmission mode to be switched into the standby mode. Pressing the standby region 749 is used to switch from image transmission mode to standby mode. Both of these actions are input operations. In both cases, moving a student 1-20 from the presentation region to the standby region disconnects their device from the communication device/information processing device 730. The teacher can select icons of students 1-20 to move them into the presentation region 748 and/or the standby region 749. When the teacher moves an icon from the presentation region 748 to the standby region 749, the corresponding student information processing device is switched to the standby mode and no longer connects to the information processing device 730 to send display information to the information processing device 730. When this happens, the control device 740 (first communication terminal) outputs notification information to the information processing device 730 (communication device) indicating that the communication mode of the student's information processing device (second communication terminal) has changed (e.g., to standby mode). In

the standby mode, the student device (e.g., device 710) disconnects a direct connection with the information processing device 730. EX1004, FIG. 21, [0255], [0261]-[0263], [0274]-[0276]. [0281]-[0282], [0302]-[0307], [0389]-[0390]; EX1005, [0206], [0212]-[0214], [0225]-[0227], [0232]-[0233], [0250]-[0255], [0313]-[0314].

94. As discussed above, to the extent the information of Iwami is not explicitly described as relating to permission, Kim describes that the information terminating connection is information to terminate permission. See limitation [1f] above.

95. As described at limitation [1f] above, a POSITA would have modified the communication system 700 of Iwami to send an explicit message from a first communication terminal to terminate permission for a second communication terminal to connect with a communication device as taught by Kim. As discussed above, a POSITA would have been motivated to combine Iwami and Kim because they are in a same field of art, Iwami teaches that terminating permission is desirable, and Kim describes a known technique for terminating such permission that a POSITA would reasonably expect to be successful.

D. Claim 13

1. **[13a] The communication system according to claim 1, wherein, the second communication terminal controls the**

**communication device while maintaining the connection
with the communication device, and**

96. As discussed above for limitation [1e], Iwami teaches that in cases such as those illustrated in FIG. 22b and 22c, the connection between the source information processing device 710 and the information processing device 730 is maintained as the image transmission mode changes from the low frequency band in FIG. 22b to the high frequency band in FIG. 22c. That is, the image is transmitted from the information processing device 710 to the information processing device 730 and displayed in the peripheral channel region 734 in FIG. 22b and, when a command comes in to switch the mode as described above, the image continues to be transmitted from the information processing device 710 to the information processing device 730 but is now displayed in the middle channel region 733 in FIG. 22c . EX1004, [0284]-[0295]; EX1005, [0235]-[0246]. During the period of this transition, the information processing device 730 is being controlled by second communication terminal/information processing device 710 in that this device is sending the data that is displayed in on the information processing device 730 (initially in peripheral channel region 734 and later in the middle channel region 733).

97. Iwami also teaches that the command to switch the mode can come not only from the control device 740, but also from a command entered into and transmitted from the source device in operation (B1). In such a case, the second

communication terminal (source device such as information processing device 710) controls the communication device (information processing device 730) while maintaining the connection with the communication device. EX1004, [0296]-[0302]; EX1005, [0247]-[0350].

2. [13b] the first communication terminal controls the communication device while maintaining the connection with the communication device via the access point.

98. As discussed above for limitations [1c], [1e], and [13a], Iwami teaches the control device 740 switching the mode used by the information processing device 730 by transmitting information to the information processing device 730 that causes the band of the source device 710 to be increased or decreased. During the period of this transition, the information processing device 730 is also being controlled by the control device 740 in that this device is sending information that determines where the information processing device 730 will display the information from source device 710. The information is transmitted from the control device 740 to the information processing device 730, indicating that the connection between the two is maintained. Moreover, as described above, control device 740 can connect to the access point 701 and communicate with the information processing device 730 via the access point 701. EX1004, [0250]. [0296]-[0308]; EX1005, [0247]-[0356]. See limitation [1b] above.

E. Claim 14

1. [14pre] A communication terminal comprising:

99. Iwami in view of Kim teaches a communication terminal. See limitations [1pre] and [1c] above (e.g., first communication terminal of claim 1).

2. [14a] a wireless connection interface configured to connect to a communication device via an access point device; and

100. Iwami in view of Kim teaches a wireless connection interface configured to connect to a communication device via an access point device. See limitations [1a], [1b], and [1c] above (e.g., where the first communication terminal of claim 1, Iwami's control device 740, is configured to connect to the communication device of claim 1, Iwami's information processing device 730, via the access point device of claim 1, Iwami's access point 701). In one embodiment, the control device 740 connects to the information processing device 730/display device 731 via the access point 701 (not shown in Fig. 17). EX1004, [0250]; EX1005, [0201]. Iwami's control device 740 necessarily has a wireless connection interface configured to connect to a communication device via an access point device in this embodiment in order to be able to connect to the information processing device 730/display device 731 via the access point 701.

3. [14b] a controller configured to control the wireless connection interface and to transmit a command to

remotely control a display operation on the communication device connected with the communication terminal,

101. Iwami in view of Kim teaches a controller configured to control the wireless connection interface and to transmit a command to remotely control a display operation on the communication device connected with the communication terminal. See limitations [1a] and [1c] above (e.g., where the first communication terminal of claim 1, Iwami's control device 740, includes a controller (control unit 747 as discussed in paragraphs [0258], [0252]-[0255], [0291] and Figs. 17- 21) that is configured to wirelessly transmit a command to remotely control a display operation on the communication device of claim 1, i.e., information processing device 730 which includes display device 731 and display unit 732).

4. [14c] wherein the controller is configured to transmit permission to establish a connection for the communication device and another communication terminal,

102. Iwami in view of Kim teaches that the controller of Iwami's control device 740 is configured to transmit permission to establish a connection for the communication device and another communication terminal. See limitations [1c] and [1d] above (e.g., where the second communication terminal of claim 1, an Iwami student device 710 or 720, establishes a connection with the communication device of claim 1, Iwami's information processing device 730, if it receives permission from the first communication terminal of claim 1, Iwami's control device 740).

5. **[14d] wherein, while the communication device outputs data received from the another communication terminal that has established the connection with the communication device, the controller is configured to transmit the command to control how to display the data while the communication device and the another communication terminal are connected, and**

103. Iwami in view of Kim teaches that while the communication device outputs data received from the another communication terminal that has established the connection with the communication device, the controller is configured to transmit the command to control how to display the data while the communication device and the another communication terminal are connected. See limitation [1e] above (e.g., where the first communication terminal of claim 1, Iwami's control device 740, transmits a command to control how to display data to the communication device of claim 1, Iwami's information processing device 730, while the second communication terminal of claim 1, an Iwami student device 710 or 720, is connected to the communication device and the communication device outputs data from the second communication terminal).

6. **[14e] wherein, when the controller transmits information to terminate the permission from the communication terminal, the controller is configured to transmit the information to terminate the connection with the another communication terminal to the communication device.**

104. Iwami in view of Kim teaches that when the controller transmits information to terminate the permission from the communication terminal, the

controller is configured to transmit the information to terminate the connection with the another communication terminal to the communication device. See [1f] above (e.g., where the first communication terminal of claim 1, Iwami's control device 740, transmits information (a command) to the communication device of claim 1, Iwami's information processing device 730, to terminate the connection between the communication device and the second communication terminal of claim 1, an Iwami student device 710 or 720).

F. Claim 15

1. [15pre] A communication device comprising:

105. Iwami in view of Kim teaches a communication device. See limitations [1pre] and [1a] above (e.g., communication device of claim 1, Iwami's information processing device 730/display device 731).

2. [15a] a wireless connection interface configured to connect to a communication terminal and another communication terminal; and

106. Iwami in view of Kim teaches a wireless connection interface configured to connect to a communication terminal and another communication terminal. See [1a], [1b], [1c], and [1d] above (e.g., where the first communication terminal of claim 1, Iwami's control device 740 connects to the communication device of claim 1, Iwami's information processing device 730, via the access point device of claim 1, Iwami's access point 701, and the second communication

terminal of claim 1, an Iwami student device 710 or 720, connects to the communication device).

3. [15b] a controller configured to control the wireless connection interface,

107. Iwami in view of Kim teaches a controller configured to control the wireless connection interface. See [1a] above (e.g., where the communication device of claim 1 is an information processing device 730 including a controller (control unit 370) as discussed in EX1004, [0102], [0240] and FIG. 3; EX1005, [0053], [0191], and FIG. 3.

4. [15c] wherein the wireless connection interface is configured to connect to the communication terminal via an access point device,

108. Iwami in view of Kim teaches a wireless connection interface configured to connect to a communication terminal via an access point device. See [1a], [1b], and [1c] above (e.g., where the first communication terminal of claim 1, Iwami's control unit 740, connects to the communication device of claim 1, Iwami's information processing device 730, via the access point device of claim 1, Iwami's access point 701).

5. [15d] wherein the controller is configured to control to establish a connection with the another communication terminal, if having permission from the communication

terminal, and control data received from the another communication terminal,

109. Iwami in view of Kim teaches that the controller is configured to control to establish a connection with the another communication terminal, if having permission from the communication terminal, and control data received from the another communication terminal. See 1[c] and 1[d] above (e.g., where the second communication terminal of claim 1, an Iwami student device 710 or 720, establishes a connection with the communication device of claim 1, Iwami's information processing device 730, if the first communication terminal of claim 1, Iwami's control unit 740, gives permission).

6. **[15e] wherein, while the controller controls the data received from the another communication terminal and upon receiving at the wireless communication interface, from the communication terminal, a command to remotely control how the data received from the another communication terminal is displayed, the controller is configured to control the data received from the another communication terminal in accordance with the command from the communication terminal while maintaining the connection with the another communication terminal, and**

110. Iwami in view of Kim teaches that while the controller controls the data received from the another communication terminal and upon receiving at the wireless communication interface, from the communication terminal, a command to remotely control how the data received from the another communication terminal is displayed, the controller is configured to control the data received from

the another communication terminal in accordance with the command from the communication terminal while maintaining the connection with the another communication terminal. See [1e] above (e.g., where the first communication terminal of claim 1, Iwami's control unit 740, transmits a command to control how to display data to the communication device of claim 1, Iwami's information processing device 730, while the second communication terminal of claim 1, an Iwami student device 710 or 720, is connected to the communication device and the communication device outputs data from the second communication terminal).

7. **[15f] wherein, when the wireless communication interface receives information to terminate the permission from the communication terminal, the controller is configured to terminate the connection with the another communication terminal.**

111. Iwami in view of Kim teaches that when the wireless communication interface receives information to terminate the permission from the communication terminal, the controller is configured to terminate the connection with the another communication terminal. See [1f] above (e.g., where the first communication terminal of claim 1, Iwami's control unit 740, transmits information to the communication device of claim 1, Iwami's information processing device 730, to terminate the connection between the communication device and the second communication terminal of claim 1, an Iwami student device 710 or 720, and the

communication device terminates the connection with the second communication terminal).

VII. GROUND 2: CLAIMS 2 AND 12 ARE OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF LIANSKY

A. Motivation to Combine

112. Iwami, alone or as modified by Kim, teaches that devices can request to connect to other devices in a network. EX1004, [0318]-[0322]; EX1005, [0266]-[0270]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]. Iwami, alone or as modified by Kim, also teaches that connections can be allowed, managed, and/or terminated according to permissions. EX1004, [0406]-[0407], [0448]-[0455]; EX1005, [0330]-[0331], [0372]-[0377]; EX1006, [0037]-[0045]; EX1007, [0043]-[0052]. A POSITA would have found it obvious, and would have been motivated to, modify the Iwami-Kim system by incorporating elements of the Liansky security techniques, such as short range communication and/or scannable codes, to provide connection security within the communication system 700 of Iwami. Doing so would have simply involved combining known prior art elements (i.e., the communication system 700 elements of Iwami, alone or in view of Kim) according to known methods (i.e., the security features of Liansky) to yield predictable results (i.e., a communication system 700 whose elements can communicate with one another, or not, based on permission or

lack thereof with short range communication and/or scannable code features to enhance security).

113. Iwami, Kim, and Liansky are analogous art and are directed toward the same or similar problems. For example, as noted above, Iwami and Kim both relate to media transmission and display in a network environment and both discuss using permission to control connections between devices in the network environment. EX1004, (57), [0002], [0009], [0406]-[0407], [0448]-[0455]; EX1005, [Abstract], [0001], [0008], [0330]-[0331], [0372]-[0377]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]. Similarly, Liansky is directed to network communication, including security techniques such as creating a dynamic image code that can be transmitted in a short range communication by a first device and read by a second device, where a network connection is established using information encoded in the dynamic image code. EX1012, (57), 1:32-49, 2:5-24. For example, Liansky describes a process where a QR code or other scannable code encodes connection information. Upon scanning this code at short range, a device can decode the connection information and use it to connect to a network device. EX1012, 5:3-37.

114. A POSITA would have been capable of modifying, and motivated to modify, Iwami's communication system 700 (considered alone or as modified by Kim and/or a POSITA's knowledge), and individual elements thereof and/or

actions performed by those elements, by the teachings of Liansky for several reasons as discussed herein. Additionally, a POSITA would have understood that Liansky supplies a complete description of security features that are compatible with the communication system 700 of Iwami. It is my understanding from Counsel that these are proper rationales to support an obviousness analysis.

B. Claim 2

- 1. The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and the second communication terminal connects to the communication device by using the connection information.**

115. As discussed above with respect to limitation [1d], Iwami discloses or renders obvious a first communication terminal giving permission to a second communication terminal to connect with a communication device. Liansky teaches sending connection information using a form of short range communication, specifically the display of a bar code representing connection information on a display screen of a first device, wherein a second device captures an image of the bar code with a camera to read the connection information. I note that short range communication is defined in claim 12 to include this form of communication (the display of a bar code by one device and the capture of an image of the bar code by a second device), which is also consistent with the description of short range

communication in EX1001 at 4:67-5:1 and 26:7-17. For example, Liansky teaches that a barcode is an optical machine-readable representation of data relating to the object to which it is attached, and gives a QR-code as a specific example of a two-dimensional barcode. EX1012, 3:35-37, 4:4-8.

116. In FIG. 2, Liansky illustrates a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

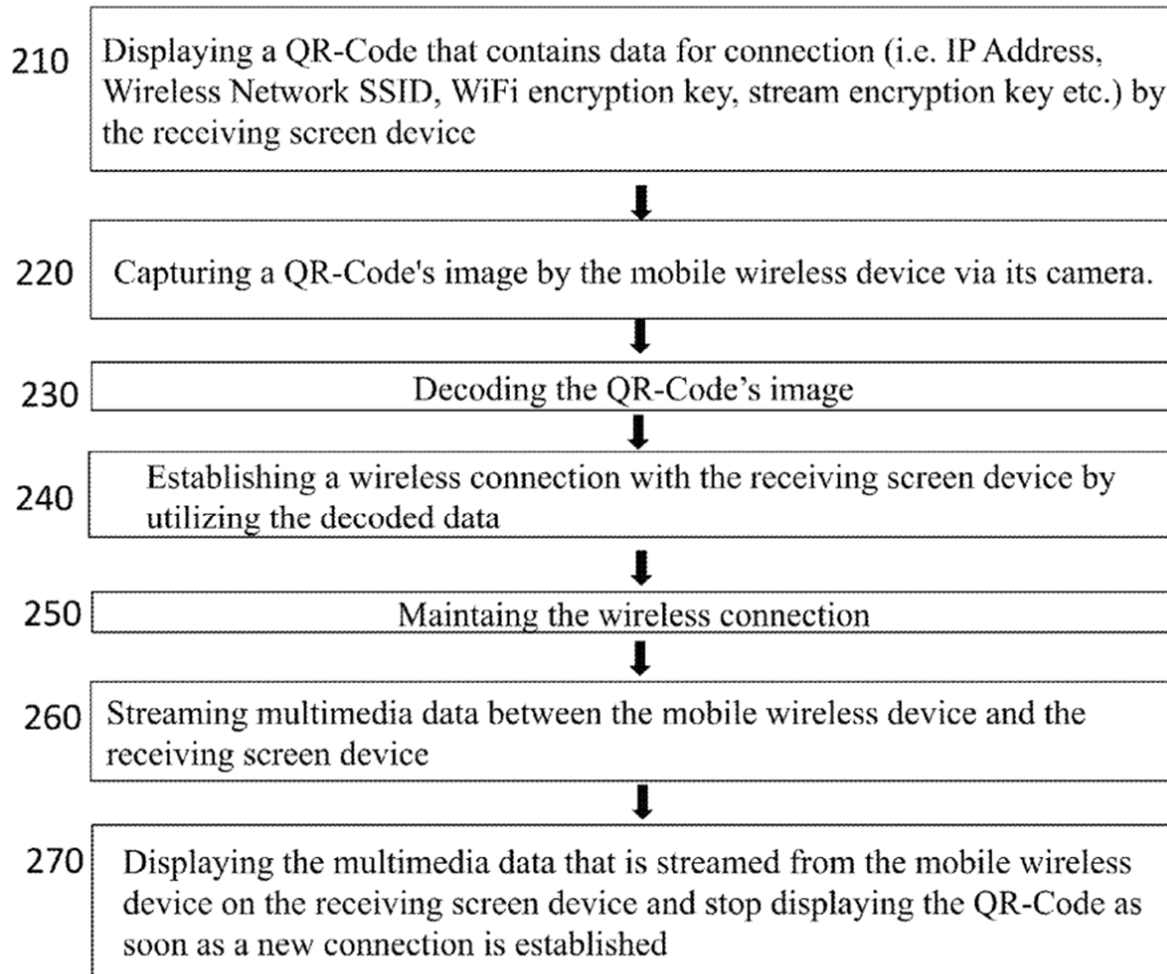


Fig.2

117. Based on the teachings of Liansky, a POSITA would have modified the communication system 700 of Iwami, alone or in view of Kim, to configure any and/or all of the devices within communication system 700 to transmit bar codes representing connection information and/or any and/or all of the devices within communication system 700 to read the connection information from the bar codes. A POSITA would not necessarily send the exact sequence of messages to/from the exact sources/destinations specified by Liansky. Rather, a POSITA would have understood from Liansky that messages can include bar codes

including connection information. As discussed above, a POSITA would have been motivated to combine the Iwami-Kim system with Liansky because they are in a same field of art, Iwami teaches that communicating permission and/or connection information is desirable, and Liansky describes specific message content, including bar codes, that a POSITA would reasonably expect to be successful when used in combination with the Iwami-Kim system.

C. Claim 12

1. **[12a] The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal,**

118. As discussed above with respect to claims 1 and 2, Iwami in view of Kim and Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device, the permission includes connection information necessary for a connection, and the connection is through a short range communication.

119. As discussed above, Liansky describes a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream

encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

2. [12b] the second communication terminal connects to the communication device by using the connection information, and

120. As discussed above with respect to claims 1 and 2, Iwami in view of Kim and Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device. In the Iwami-Kim-Liansky combination, the first communication terminal transmits connection information to the second communication terminal and the transmitting is through a short range communication from the first communication terminal to the second communication terminal. As discussed by Iwami, and the second communication terminal connects to the communication device in response to receiving the permission, and as discussed by Liansky, the connection is made by using the connection information provided in the QR code. EX1004, [0409], [0413], [0448]-[0455]; EX1005, [0333], [0337], [0372]-[0377]; EX1012, FIG. 2, 5:3-37. See [1d], [2], and [12a] above.

3. **[12c] in the short range communication, the first communication terminal displays a bar code representing the connection information on a display screen thereof and the second communication terminal captures an image of the bar code with a camera to read the connection information.**

121. As discussed above, Liansky teaches short range communication wherein a display screen of a first device displays a bar code representing connection information, and a second device captures an image of the bar code with a camera to read the connection information. For example, Liansky teaches that a barcode is an optical machine-readable representation of data relating to the object to which it is attached, and gives a QR-code as a specific example of a two-dimensional barcode. EX1012, 3:35-37, 4:4-8. *See also* claim 2 above.

122. In FIG. 2, Liansky illustrates a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera, decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

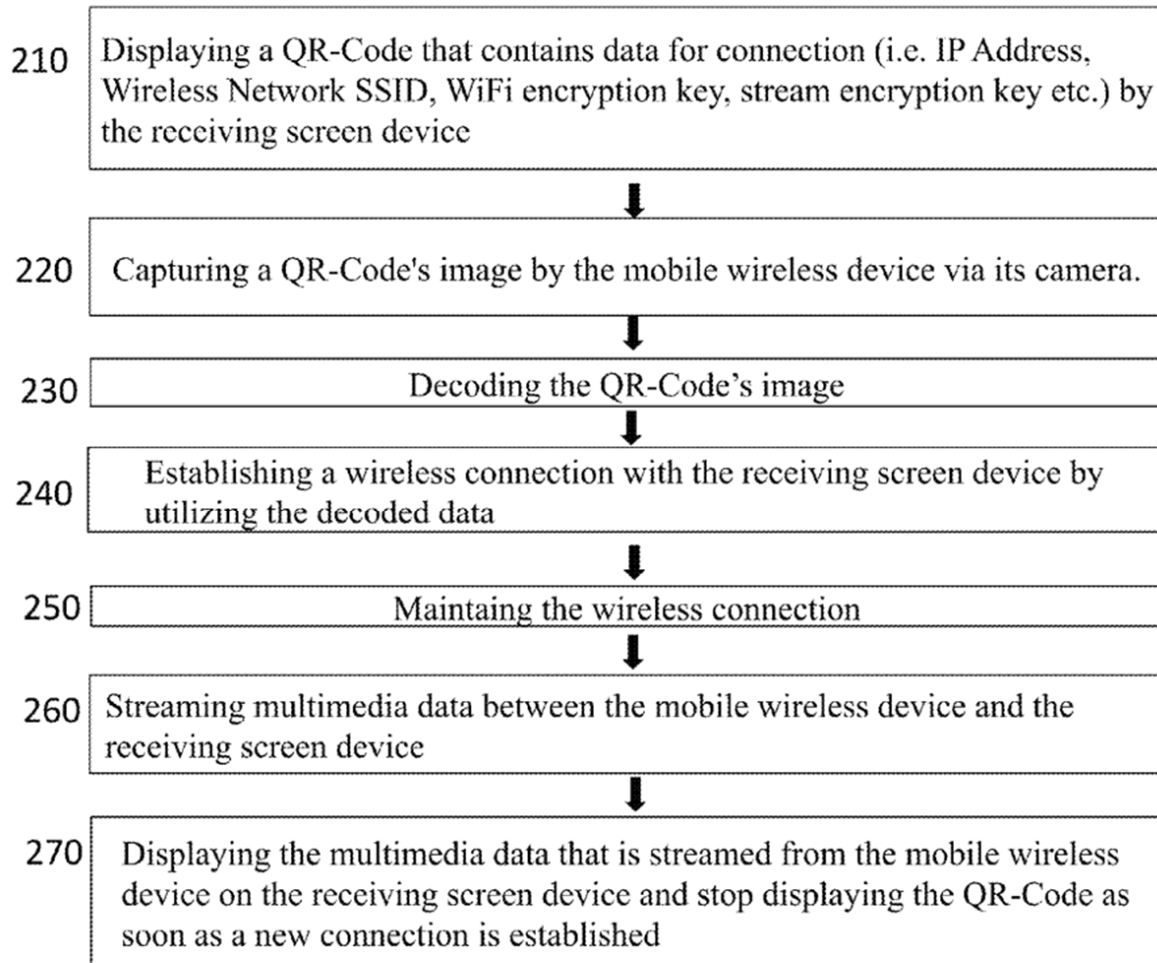


Fig.2

123. Based on the teachings of Liansky, a POSITA would have modified the communication system 700 of Iwami, alone or in view of Kim, to configure any and/or all of the devices within communication system 700 to transmit bar codes representing connection information and/or any and/or all of the devices within communication system 700 to read the connection information from the bar codes. A POSITA would not necessarily send the exact sequence of messages to/from the exact sources/destinations specified by Liansky. Rather, a POSITA would have understood from Liansky that messages can include bar codes

including connection information. As discussed above, a POSITA would have been motivated to combine the Iwami-Kim system with Liansky because they are in a same field of art, Iwami teaches that communicating permission and/or connection information is desirable, and Liansky describes specific message content, including bar codes, that a POSITA would reasonably expect to be successful when used in combination with the Iwami-Kim system.

VIII. GROUND 3: CLAIMS 7, 8, AND 10 ARE OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF LIANSKY AND WEISER

A. Motivation to Combine

124. Iwami, alone or as modified by Kim and Liansky, teaches that devices can request to connect to other devices in a network. EX1004, [0318]-[0322]; EX1005, [0266]-[0270]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]. Iwami, alone or as modified by Kim and Liansky, also teaches that connections can be allowed, managed, and/or terminated according to permissions. EX1004, [0406]-[0407], [0448]-[0455]; EX1005 [0330]-[0331], [0372]-[0377]; EX1006, [0037]-[0045]; EX1007, [0043]-[0052]. A POSITA would have found it obvious, and would have been motivated to, modify the Iwami-Kim-Liansky system by implementing elements of the Weiser permission and security techniques including the use of blacklists and/or whitelists to provide connection security and a straightforward way for the control device 740 of Iwami to enable and/or disable connections by information processing

devices 703, 704, 710, and/or 720. Doing so would have simply involved combining known prior art elements (i.e., the communication system 700 elements of Iwami, alone or in view of Kim and Liansky) according to known methods (i.e., the security features of Weiser) to yield predictable results (i.e., a communication system 700 whose elements can communicate with one another, or not, based on permission or lack thereof with whitelist and blacklist features to enhance security and connection management).

125. Iwami, Kim, Liansky and Weiser are analogous art and are directed toward the same or similar problems. For example, as noted above, Iwami and Kim both relate to media transmission and display in a network environment and both discuss using permission to control connections between devices in the network environment, and Liansky relates to additional permission and/or security controls for the connections in the same or similar network environment. EX1004, (57), [0002], [0009], [0406]-[0407], [0448]-[0455]; EX1005, [Abstract], [0001], [0008], [0330]-[0331], [0372]-[0377]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]; EX1012, (57), 1:32-49, 2:5-24. Similarly, Weiser is directed to streaming video content in a network environment. EX1008, (57), [0001], [0006]. Weiser also discloses the importance of security for the network environment, and in particular describes how

connection permission can be managed using blacklists and whitelists. EX1008, [0185]-[0202].

126. A POSITA would have been capable of modifying Iwami's communication system 700 (considered alone or as modified by Kim, Liansky, and/or a POSITA's knowledge), and individual elements thereof and/or actions performed by those elements, by the teachings of Weiser, and would have had a reasonable expectation of success in so doing for several reasons as discussed herein. Additionally, a POSITA would have understood that Weiser supplies a complete description of security and device management features that are compatible with the communication system 700 of Iwami. It is my understanding from Counsel that these are proper rationales to support an obviousness analysis.

B. Claim 7

1. **[7a] The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through short range communication with the second communication terminal, and**

127. As discussed above with respect to claims 1 and 2, Iwami in view of Kim and Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device, the permission includes connection information necessary for a connection, and the communication of such permission is through a short range communication.

128. As discussed above, Liansky describes a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

2. [7b] the second communication terminal transmits address information on the second communication terminal to the first communication terminal,

129. As noted above, in the Iwami-Kim-Liansky system, the short range communication (i.e., the QR code) encodes address information such as a Mac address and/or an IP address. EX1012, FIG. 2, 5:3-37. See [2] and [7a] above. Kim also teaches sending address information, such as when the control point 110 invokes the MulticastStart() action in communication S101, and the media server 120 delivers a RTSP URL (RTSP server address) to the control point 110 in

response in communication S102. The RTSP URL is address information.

EX1006, FIG. 1, [0036]; EX1007, FIG. 1, [0041]-[0042].

130. Weiser also teaches transmitting address information. For example, Weiser teaches that a first client 602 and second client 606 may wish to communicate with one another but, in some cases, the second client 606 does not know the IP address of the first client 602. Opening a port and waiting for a connection exposes the second client 606 to attack. EX1008, FIG. 6A, [0190].

131. In the embodiment of FIG. 6B, Weiser introduces a system to solve this problem including a proxy/video conference bridge 608. The bridge 608 sends its own address information to the first client 602 in response to an invitation sent by the first client 602 intended for the second client 606, such that the first client 602 believes it is connected with the second client 606 while in reality it is connected to the bridge 608. EX1008, FIG. 6B, [0192].

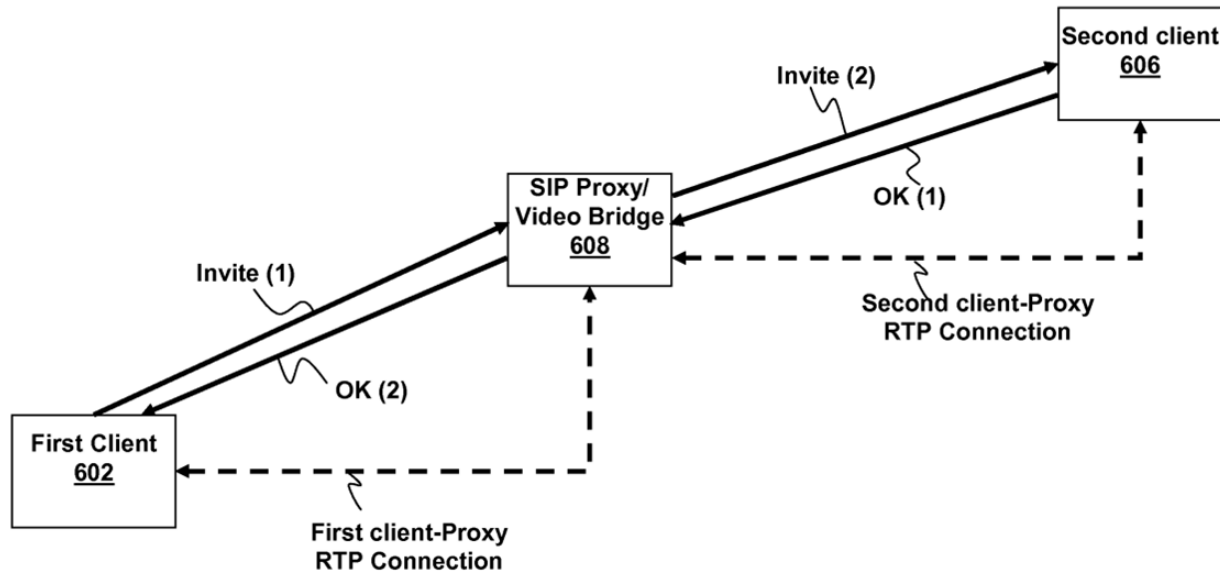


FIG. 6B

3. **[7c] the first communication terminal transmits the address information on the second communication terminal to the communication device,**

132. In Weiser, the first client 602 sends a message intended for the second client 606 that includes an address of the second client 606. Moreover, the bridge 608 also sends its own address information to the second client 606 in such a way that the second client 606 believes it is connected with the first client 602 while in reality it is connected to the bridge 608. To summarize, a POSITA would have understood from Weiser that clients and/or bridges can send their own address information or address information of other devices to one another. EX1008, FIG. 6B, [0192].

4. **[7d] the communication device registers the address information on the second communication terminal into a permission list,**

133. Weiser teaches registering address information of the clients (e.g., clients 602 and/or 606) into a whitelist, or permission list. EX1008, FIG. 6B, [0194].

5. **[7e] the second communication terminal connects to the communication device by using the connection information.,**

134. As discussed above with respect to claim 2, Iwami-Kim-Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device. Iwami-Kim-Liansky also teaches that the first communication terminal transmits connection information to the second communication terminal, the transmitting is through a short range communication from the first communication terminal to the second communication terminal, and the second communication terminal connects to the communication device by using the connection information. See [1d] and [2] above.

135. As discussed above, in Liansky, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two

devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

136. Additionally, Weiser teaches that the first client 602 and the second client 606 connect with the bridge 608 using information provided by the bridge 608. EX1008, FIG. 6B, [0192].

6. **[7f] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list of the communication device, and,**

137. Weiser teaches that clients that are not allowed to connect to the bridge 608 can be blacklisted. Weiser also teaches that being blacklisted may refer not only to being added to a blacklist, but being omitted from a whitelist. Accordingly, Weiser teaches adding a client address to a blacklist to explicitly deny connection permission, and this can include deleting the client address from the whitelist. EX1008, FIG. 6B, [0194], [0209].

7. **[7g] upon the address information on the second communication terminal being not registered in the permission list, the communication device terminates the connection with the second communication terminal.**

138. Weiser teaches that blacklisting a client causes bridge 608 to deny communication requests from the client. Accordingly, deleting a client address

from a whitelist will stop any communications from that client to the bridge 608.

EX1008, FIG. 6B, [0194].

139. Based on the teachings of Weiser, a POSITA would have been motivated to modify the communication system 700 of Iwami, alone or in view of Kim and Liansky, to configure any and/or all of the devices within communication system 700 to transmit connection information and/or address information, maintain a permissions list, and use the permissions list to enable or terminate connections between devices. A POSITA would not necessarily send the exact sequence of messages to/from the exact sources/destinations specified by Weiser. Rather, a POSITA would have understood from Weiser that messages can include address information, and address information can be added to and/or removed from lists to control access permission. As discussed above, a POSITA would have been motivated to combine Iwami-Kim-Liansky with Weiser because they are in a same field of art, Iwami teaches that terminating permission is desirable, Kim describes a known technique for terminating such permission, and Weiser describes specific message content and white/blacklist techniques that a POSITA would reasonably expect to be successful when used in combination with one another.

C. Claim 8

1. **[8a] The communication system according to claim 1, wherein, for the permission, the first communication terminal transmits, to the second communication terminal, connection information necessary for a connection through**

short range communication with the second communication terminal, and

140. As discussed above with respect to claims 1, 2, and 7, Iwami in view of Kim and Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device, the permission includes connection information necessary for a connection, and the communication of such permission is through a short range communication.

141. As discussed above, Liansky describes a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

2. [8b] the second communication terminal transmits address information on the second communication terminal to the first communication terminal,

142. As noted above, in the Iwami-Kim-Liansky system, the short range communication (i.e., the QR code) encodes address information such as a Mac address and/or an IP address. EX1012, FIG. 2, 5:3-37. See [2] and [7a] above. Kim also teaches sending address information, such as when the control point 110 invokes the MulticastStart() action in communication S101, and the media server 120 delivers a RTSP URL (RTSP server address) to the control point 110 in response in communication S102. The RTSP URL is address information. EX1006, FIG. 1, [0036]; EX1007, FIG. 1, [0041]-[0042]. See also [7b].

143. As discussed above at [7b], Weiser also teaches transmitting address information by the first client 602, second client 606, and bridge 608. EX1008, FIG. 6B, [0192]. See also [7b].

3. [8c] the first communication terminal registers the address information on the second communication terminal into a permission list,

144. Weiser teaches registering address information of the clients (e.g., clients 602 and/or 606) into a whitelist, or permission list. EX1008, FIG. 6B, [0194]. See also [7d] above.

4. [8d] the second communication terminal connects to the communication device by using the connection information,

145. As discussed above with respect to claims 2, and 7, Iwami-Kim-Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device. Iwami-Kim-Liansky also teaches that the first communication terminal transmits connection information to the second communication terminal, the transmitting is through a short range communication from the first communication terminal to the second communication terminal, and the second communication terminal connects to the communication device by using the connection information. See [1d], [2], and [7e] above.

146. As discussed above, in Liansky, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37..

147. Additionally, Weiser teaches that the first client 602 and the second client 606 connect with the bridge 608 using information provided by the bridge 608. EX1008, FIG. 6B, [0192].

5. **[8e] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list, and**

148. Weiser teaches that clients that are not allowed to connect to the bridge 608 can be blacklisted. Weiser also teaches that being blacklisted may refer not only to being added to a blacklist, but being omitted from a whitelist. Accordingly, Weiser teaches adding a client address to a blacklist to explicitly deny connection permission, and this can include deleting the client address from the whitelist. EX1008, FIG. 6B, [0194], [0209]. See also [7f] above.

6. **[8f] the communication device performs communication for confirmation with the first communication terminal and,**

149. Weiser teaches that the blacklist can be maintained by a device other than that which ultimately allows or denies the communication between the client and the bridge. For example, Weiser teaches a firewall of a device receiving a data packet from the client can determine to allow or deny the request. In some embodiments, the firewall makes the determination on its own. However, in other embodiments, the firewall makes the determination in combination with one or more security modules such as authentication engines, pinhole filters, or other

modules. In the latter case, a POSITA would have understood that the firewall must communicate with the one or more security modules to confirm whether to allow the connection. EX1008, [0200].

7. [8g] upon the address information on the second communication terminal being not registered in the permission list of the communication device, terminates the connection with the second communication terminal.

150. Weiser teaches that blacklisting a client causes bridge 608 to deny communication requests from the client. Accordingly, deleting a client address from a whitelist will stop any communications from that client to the bridge 608. EX1008, FIG. 6B, [0194]. See also [7g] above.

151. Based on the teachings of Weiser, a POSITA would have modified the communication system 700 of Iwami, alone or in view of Kim and Liansky, to configure any and/or all of the devices within communication system 700 to transmit connection information and/or address information, maintain a permissions list, and use the permissions list to enable or terminate connections between devices. A POSITA would not necessarily send the exact sequence of messages to/from the exact sources/destinations specified by Weiser. Rather, a POSITA would have understood from Weiser that messages can include address information, and address information can be added to and/or removed from lists to control access permission. As discussed above, a POSITA would have been motivated to combine Iwami-Kim-Liansky with Weiser because they are in a same

field of art, Iwami teaches that terminating permission is desirable, Kim describes a known technique for terminating such permission, and Weiser describes specific message content and white/blacklist techniques that a POSITA would reasonably expect to be successful when used in combination with one another.

D. Claim 10

- 1. [10a] The communication system according to claim 1, wherein, for the permission, the second communication terminal performs short range communication with the communication device,**

152. As discussed above with respect to claims 1, 2, 7, and 8, Iwami in view of Kim and Liansky teaches devices communicating through a short range communication. As discussed above, Liansky describes a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code), and the mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication). EX1012, FIG. 2, 5:3-37.

- 2. [10b] the communication device transmits, to the second communication terminal, connection information necessary for a connection, and**

153. As discussed above with respect to claims 1, 2, 7, and 8, Iwami in view of Kim and Liansky teaches sending connection information necessary for a connection. For example, when the screen device 110 displays a QR code (bar

code), the QR code includes parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

3. [10c] the second communication terminal transmits address information on the second communication terminal to the communication device,

154. As noted above, Liansky and Weiser disclose transmitting address information.

155. As discussed above at [7b] and [8b], Liansky discloses short range communication between devices, wherein the short range communication is by a QR code including address information. EX1006, FIG. 1, [0036]; EX1007, FIG. 1, [0041]-[0042]. See also [7b] and [8b].

156. As discussed above at [7b] and [8b], Weiser also teaches transmitting address information by the first client 602, second client 606, and bridge 608. EX1008, FIG. 6B, [0192]. See also [7b] and [8b].

4. **[10d] the communication device registers the address information on the second communication terminal into a permission list,**

157. Weiser teaches registering address information of the clients (e.g., clients 602 and/or 606) into a whitelist, or permission list. EX1008, FIG. 6B, [0194]. See also [7d] and [8c] above.

5. **[10e] the second communication terminal connects to the communication device by using the connection information,**

158. As discussed above with respect to claims 1, 2, 7, and 8, Iwami-Kim-Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device. Iwami-Kim-Liansky also teaches that the first communication terminal transmits connection information to the second communication terminal, the transmitting is through a short range communication from the first communication terminal to the second communication terminal, and the second communication terminal connects to the communication device by using the connection information. See [1d], [2], [7e], and [8d] above.

159. As discussed above, in Liansky, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two

devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37.

160. Additionally, Weiser teaches that the first client 602 and the second client 606 connect with the bridge 608 using information provided by the bridge 608. EX1008, FIG. 6B, [0192].

6. **[10f] upon confirming the permission is to be terminated, the first communication terminal causes the communication device to delete the address information on the second communication terminal from the permission list of the communication device, and,**

161. Weiser teaches that clients that are not allowed to connect to the bridge 608 can be blacklisted. Weiser also teaches that being blacklisted may refer not only to being added to a blacklist, but being omitted from a whitelist. Accordingly, Weiser teaches adding a client address to a blacklist to explicitly deny connection permission, and this can include deleting the client address from the whitelist. EX1008, FIG. 6B, [0194], [0209]. See also [7f] and [8e] above.

7. **[10g] upon the address information on the second communication terminal being not registered in the permission list, the communication device terminates the connection with the second communication terminal.**

162. Weiser teaches that blacklisting a client causes bridge 608 to deny communication requests from the client. Accordingly, deleting a client address

from a whitelist will stop any communications from that client to the bridge 608.

EX1008, FIG. 6B, [0194]. See also [7g] and [8g] above.

163. Based on the teachings of Weiser, a POSITA would have modified the communication system 700 of Iwami, alone or in view of Kim and Liansky, to configure any and/or all of the devices within communication system 700 to transmit connection information and/or address information, maintain a permissions list, and use the permissions list to enable or terminate connections between devices. A POSITA would not necessarily send the exact sequence of messages to/from the exact sources/destinations specified by Weiser. Rather, a POSITA would have understood from Weiser that messages can include address information, and address information can be added to and/or removed from lists to control access permission. As discussed above, a POSITA would have been motivated to combine Iwami-Kim-Liansky with Weiser because they are in a same field of art, Iwami teaches that terminating permission is desirable, Kim describes a known technique for terminating such permission, and Weiser describes specific message content and white/blacklist techniques that a POSITA would reasonably expect to be successful when used in combination with one another.

IX. GROUND 4: CLAIMS 9 AND 11 ARE OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF LIANSKY AND KATO**A. Motivation to Combine**

164. Iwami, alone or as modified by Kim and Liansky, teaches that devices can request to connect to other devices in a network. EX1004, [0318]-[0322]; EX1005, [0266]-[0270]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]. Iwami, alone or as modified by Kim and Liansky, also teaches that connections can be allowed, managed, and/or terminated according to permissions. EX1004, [0406]-[0407], [0448]-[0455]; EX1005 [0330]-[0331], [0372]-[0377]; EX1006, [0037]-[0045]; EX1007, [0043]-[0052]. A POSITA would have found it obvious, and would have been motivated to, modify the Iwami-Kim-Liansky system by implementing a one-time password element of the Kato security techniques to provide connection security within the communication system 700 of Iwami as discussed in further detail below. The provisioning and use of a one-time password can help the control device 740 determine whether to enable and/or disable connections by information processing devices 703, 704, 710, and/or 720. Doing so would have simply involved combining known prior art elements (i.e., the communication system 700 elements of Iwami, alone or in view of Kim and Liansky) according to known methods (i.e., the security features of Kato) to yield predictable results (i.e., a communication

system 700 whose elements can communicate with one another, or not, based on permission or lack thereof with one-time password features to enhance security).

165. Iwami, Kim, Liansky and Kato are analogous art and are directed toward the same or similar problems. For example, as noted above, Iwami and Kim both relate to media transmission and display in a network environment and both discuss using permission to control connections between devices in the network environment, and Liansky relates to additional permission and/or security controls for the connections in the same or similar network environment. EX1004, (57), [0002], [0009], [0406]-[0407], [0448]-[0455]; EX1005, [Abstract], [0001], [0008], [0330]-[0331], [0372]-[0377]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]; EX1012, (57), 1:32-49, 2:5-24. Similarly, Kato is directed to network communication, including communication management features that determine whether to permit a requested connection between network devices. EX1009, (57), [0008], [0009]; EX1010, [0005]-[0008]; EX1011, [0005]-[0008]. Kato describes security features that enable determination whether to permit a connection, including one-time password generation and use. EX1009, [0082]-[0083], [0086]-[0090]; EX1010, [0056]-[0057], [0059]-[0062]; EX1011, [0059]-[0060], [0063]-[0066].

166. A POSITA would have been capable of modifying Iwami's communication system 700 (considered alone or as modified by Kim, Liansky,

and/or a POSITA's knowledge), and individual elements thereof and/or actions performed by those elements, by the teachings of Kato, and would have has a reasonable expectation of success in so doing for several reasons as discussed herein. Additionally, a POSITA would have understood that Kato supplies a complete description of security features that are compatible with the communication system 700 of Iwami. It is my understanding from Counsel that these are proper rationales to support an obviousness analysis.

B. Claim 9

- 1. [9a] The communication system according to claim 1, wherein, for the permission, the first communication terminal requests a one-time password from the communication device, and the communication device responds with the one-time password,**

167. Iwami teaches information processing device 710 (the second communication terminal) sending a GO_Negotiation_Request (or “group owner” negotiation request) to information processing device 730 (the communication device) and receiving a GO_Negotiation_Response from the information processing device 730. After the GO_Negotiation_Response message is sent, the two devices in communication with one another share credentials. EX1004, FIG. 24, [0319]-[0322]; EX1005, FIG. 24, [0267]-[0270].

168. In Iwami, the above-cited communication is between the second communication terminal and the communication device. However, Iwami also

teaches that the control device 740 and the information processing devices 703, 704, 710, and 720 all use the same network (i.e., the wireless LAN) to communicate with the information processing device 730. Iwami also teaches that the control device 740 has a protocol for establishing a connection with the access point 701 and with the information processing device 730 via the access point 701. EX1004, [0246], [0250]; EX1005, [0197], [0201]. At minimum, Iwami teaches a protocol for establishing a connection between the first communication terminal and the communication device, which a POSITA would have understood to include exchange of messages. Given that the control device 740 can communicate with the information processing device 730 on the same network the information processing device 710 communicates with the information processing device 730, the control device 740 could send similar GO_Negotiation_Response messages and exchange credentials to establish connection.

169. After the GO_Negotiation_Response message is sent, the two devices in communication with one another share credentials. Iwami does not specifically teach that the credentials can include a one-time password giving permission. Kato discloses a communication system 500 including a communication apparatus 10da and an external input device 40da. The communication apparatus 10da includes a password generation unit 610 that generates a one-time password that is included in login information. The communication apparatus 10da also includes a display

unit 603 that displays the login information. EX1009, FIG. 6, [0082]-[0083], [0086], [0088]; EX1010, FIG. 6, [0056]-[0057], [0059], [0061]; EX1011, [0059]-[0060], [0063], [0065]. It would have been obvious to modify Iwami's credential exchange to include a one-time password as at least one of the credentials. A POSITA would have been motivated to require a one-time password as taught by Kato to ensure that the communication being attempted is permitted during the present session, which both Iwami and Kato describe as desirable. EX1004, [0273], [0407]; EX1005, [0224], [0331]; EX1009, [0089]; EX1010, [0061]; EX1011, [0065].

2. [9b] the first communication terminal transmits, to the second communication terminal, connection information including the one-time password necessary for a connection through short range communication with the second communication terminal, and

170. As discussed above with respect to claims 1, 2, 7, and 8 Iwami in view of Kim and Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device, the permission includes connection information necessary for a connection, and the communication of such permission is through a short range communication.

171. As discussed above, Liansky describes a process of connecting a mobile wireless device 120 and a screen device 110 for video streaming from the

mobile wireless device 120 to the screen device 110. In this process, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37. As discussed above and disclosed by Kato, the information sent by short range communication can include the one-time password used as connection information by the system of Kato, and it would have been obvious to give the same password for the same session to both the first communication terminal and the second communication terminal to allow them to both connect during the same session. EX1009, FIG. 6, [0082]-[0083], [0086], [0088]; EX1010, FIG. 6, [0056]-[0057], [0059], [0061]; EX1011, [0059]-[0060], [0063], [0065]. See [2] and [9a].

3. [9c] the second communication terminal connects to the communication device by using the connection information including the one-time password.

172. As discussed above with respect to claims 1, 2, 7, and 8, Iwami-Kim-Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device. Iwami-Kim-

Liansky also teaches that the first communication terminal transmits connection information to the second communication terminal, the transmitting is through a short range communication from the first communication terminal to the second communication terminal, and the second communication terminal connects to the communication device by using the connection information. See [1d], [2], [7e], and [8d] above.

173. As discussed above, in Liansky, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless connection with the screen device 110. EX1012, FIG. 2, 5:3-37. Moreover, when the connection information includes a one-time password as taught by Kato, the device receiving the one-time password uses the one-time password to connect. For example, in Kato, the server unit 608 of the communication apparatus 10da supplies a web page to the external input device 40da. The web page accepts input of the one-time password and, based on correct entry of the one-time password, a login authentication unit 609 of the communication apparatus 10da permits login

by the communication apparatus 10da. EX1009, FIG. 6, [0082]-[0083], [0089]-[0090]; EX1010, FIG. 6, [0056]-[0057], [0061]-[0062]; EX1011, [0059]-[0060], [0065]-[0066].

C. Claim 11

- 1. [11a] The communication system according to claim 1, wherein, for the permission, the second communication terminal requests a one-time password from the communication device through short range communication with the communication device, and**

174. Iwami teaches information processing device 710 (the second communication terminal) sending a GO_Negotiation_Request to information processing device 730 (the communication device) and receiving a GO_Negotiation_Response from the information processing device 730. After the GO_Negotiation_Response message is sent, the two devices in communication with one another share credentials. EX1004, FIG. 24, [0319]-[0322]; EX1005, FIG. 24, [0267]-[0270]. See [9a].

175. After the GO_Negotiation_Response message is sent, the two devices in communication with one another share credentials. Iwami does not specifically teach that the credentials can include a one-time password giving permission. Kato discloses a communication system 500 including a communication apparatus 10da and an external input device 40da. The communication apparatus 10da includes a password generation unit 610 that generates a one-time password that is included

in login information. The communication apparatus 10da also includes a display unit 603 that displays the login information. EX1009, FIG. 6, [0082]-[0083], [0086], [0088]; EX1010, FIG. 6, [0056]-[0057], [0059], [0061]; EX1011, [0059]-[0060], [0063], [0065]. It would have been obvious to modify Iwami's credential exchange to include a one-time password as at least one of the credentials. A POSITA would have been motivated to require a one-time password as taught by Kato to ensure that the communication being attempted is permitted during the present session, which both Iwami and Kato describe as desirable. EX1004, [0273], [0407]; EX1005, [0224], [0331]; EX1009, [0089]; EX1010, [0061]; EX1011, [0065].

2. [11b] the communication device transmits connection information including the one-time password necessary for a connection to the second communication terminal, and

176. As discussed above, after the GO_Negotiation_Response message is sent, the two devices in communication with one another share credentials, indicating that the communication device transmits information to the second communication terminal. Iwami does not specifically teach that the credentials can include a one-time password giving permission. However, as discussed above and disclosed by Kato, the information sent by the communication device can include the one-time password used as connection information by the system of Kato. EX1009, FIG. 6, [0082]-[0083], [0086], [0088]; EX1010, FIG. 6, [0056]-[0057],

[0059], [0061]; EX1011, [0059]-[0060], [0063], [0065]. See [2], [9a], [9b], and [11a].

3. [11c] the second communication terminal connects to the communication device by using the connection information including the one-time password.

177. As discussed above with respect to claims 1, 2, 7, 8, and 9, Iwami-Kim-Liansky teaches a first communication terminal giving permission to a second communication terminal to connect with a communication device. Iwami-Kim-Liansky also teaches that the first communication terminal transmits connection information to the second communication terminal, the transmitting is through a short range communication from the first communication terminal to the second communication terminal, and the second communication terminal connects to the communication device by using the connection information. See [1d], [2], [7e], and [8d] above.

178. As discussed above, in Liansky, the screen device 110 displays a QR code (bar code) including parameters such as Mac address, SSID, WiFi encryption key, PIN code, IP address, and/or stream encryption key (connection information necessary for a connection represented by the bar code). The mobile wireless device 120 captures a visual image of the QR code using its camera (i.e., the two devices perform a short range communication), decodes the image, and uses the connection information obtained from the decoding to establish a wireless

connection with the screen device 110. EX1012, FIG. 2, 5:3-37. Moreover, when the connection information includes a one-time password as taught by Kato, the device receiving the one-time password uses the one-time password to connect. For example, in Kato, the server unit 608 of the communication apparatus 10da supplies a web page to the external input device 40da. The web page accepts input of the one-time password and, based on correct entry of the one-time password, a login authentication unit 609 of the communication apparatus 10da permits login by the communication apparatus 10da. EX1009, FIG. 6, [0082]-[0083], [0089]-[0090]; EX1010, FIG. 6, [0056]-[0057], [0061]-[0062]; EX1011, [0059]-[0060], [0065]-[0066].

X. GROUND 5: CLAIM 6 IS OBVIOUS OVER IWAMI AND KIM IN FURTHER VIEW OF DOWLING

A. Motivation to Combine

179. Iwami, alone or as modified by Kim, teaches that devices can request to connect to other devices in a network. EX1004, [0318]-[0322]; EX1005, [0266]-[0270]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]. Iwami, alone or as modified by Kim, also teaches that connections can be allowed, managed, and/or terminated as required, for example according to permissions. EX1004, [0406]-[0407], [0448]-[0455]; EX1005, [0330]-[0331], [0372]-[0377]; EX1006, [0037]-[0045]; EX1007, [0043]-[0052]. A POSITA would have found it obvious, and would have been motivated to, modify

the Iwami-Kim system by incorporating elements of the Dowling network management techniques, such as local network connection management and maintenance features, to maintain connection status for devices within communication system 700 of Iwami.

180. In particular, Dowling discloses using a periodic heartbeat packet sent from member devices to a commander device to enable the commander device to detect when a member device has become inactive so that the connection of the member device can be terminated to keep the number of connections low. EX1021, 19:31-48. In view of this teaching, a POSITA would have found it obvious to configure Iwami's source information processing devices 710, 720 to periodically transmit a heartbeat packet when in standby mode to the information processing device 730. In standby mode, the source devices 710, 720 are not transmitting video and thus have minimal and infrequent communications with sink device 730. EX1004, [0270], [0289]-[0290]; EX1005, [0221], [0240]-[0241]. Also, in a classroom setting as contemplated by Iwami, such as a university lecture hall environment, a POSITA would have understood that students will be transitory, thus it would be desirable to terminate connections for student devices 710, 720 when those students leave a classroom. Indeed, Iwami describes connecting student devices 710, 720 upon check-in using near-field communication, where a student touches a device to an NFC reader. This indicates these devices are not

always present in the classroom but rather are coming and going. EX1004, [0256], [0351], [0435]-[0442]; EX1005, [0207], [0359]-[0366]. A POSITA would have understood that detecting the absence of a heartbeat signal from a student device 710, 720 would be a suitable technique for detecting student departures and terminating those connections. Doing so would have simply involved combining known prior art elements (i.e., the communication system 700 elements of Iwami, alone or in view of Kim) according to known methods (i.e., the local network management features of Dowling) to yield predictable results. A POSITA would have had a reasonable expectation of success because heartbeat signals were well-known in the art and modifying Iwami in this manner involved only routine skill.

181. Iwami, Kim, and Dowling are analogous art and are directed toward the same or similar problems. For example, as noted above, Iwami and Kim both relate to media transmission and display in a network environment and both discuss using permission to control connections between devices in the network environment. EX1004, (57), [0002], [0009], [0406]-[0407], [0448]-[0455]; EX1005, [Abstract], [0001], [0008], [0330]-[0331], [0372]-[0377]; EX1006 (57), [0001], [0018], [0037]-[0045]; EX1007, [0007], [0020]-[0028], [0043]-[0052]. Similarly, Dowling is directed to network communication, including network management techniques such as automatic device discovery and device connection management. EX1021, (57), 1:8-11, 6:42-7:18, 18:10-20:44. For example,

B. Claim 6

- 1. [6a] The communication system according to claim 1, wherein, in a case that the communication device is able to receive information from the first communication terminal, the communication device controls the communication device in accordance with information from the first communication terminal,**

182. See limitations [1c], [1e] and [1f] above. Causing the image from a selected information processing device to be moved from the peripheral channel region 734 to the middle channel region 733, as described in sections [1c], [1e] and [1f] above, constitutes the communication device controlling how to display the data received from the second communication terminal by the communication device in accordance with information (a command) received from the first communication device.

183. As discussed above, Iwami and Kim disclose a first communication terminal configured to connect to the communication device via the access point device and transmit a command to remotely control a display operation on the communication device connected with the first communication terminal. See limitation [1c] above. Moreover, Iwami describes an operation example wherein the control device 740 switches a communication mode used by the information processing device 730 by which the information processing device 730 receives transmitted data from a source (e.g., information processing devices 703-705 and 720). Specifically, the control device 740 transmits information to the information

processing device 730 that causes the band of the source device to be increased or decreased. When the information processing device 730 receives the band control information, the information processing device 730 controls itself and the display device 731 to display images in the peripheral channel region 734 and/or the middle channel region 733 according to the specified band. EX1004, [0284]-[0308]; EX1005, [0235]-[0256]. See limitation [1e] above. Controlling by the control device 740 whether the image information is displayed in the peripheral channel region 734 and/or the middle channel region 733 by controlling the frequency band is remotely controlling a display operation as recited in claim 1.

184. Iwami also describes an operation example involving the control device 740 (first communication terminal), information processing device 710 (second communication terminal), and information processing device 730 (communication device) where the connection between the information processing device 710 and the information processing device 730 depends on permission for “outdoor use,” or connection through a different network than a typical network as provided by access point 701. In this example, when information processing device 730 has connection permission information allowing information processing device 710 to connect, information processing device 710 receives the connection permission information and connects. Iwami also teaches that the connection permission information can be provided to the information processing device 730

from the control device 740. In other words, the information processing device 730 (communication device) is able to receive connection permission information from the control device 740 (first communication device), and therefore controls itself to send the connection permission information to, and connect with, the information processing device 710 (second communication device). EX1004, FIGS. 29-30, [0405]-[0410]; EX1005, FIGS. 29-30, [0329]-[0334].

2. [6b] wherein, in a case that the communication device is unable to receive information from the first communication terminal, the communication device terminates the connection with the second communication terminal.

185. See the claim construction for this element above. Iwami teaches that the access point 701 is an access point of a wireless LAN and is connected with information processing device 710, information processing device 730 (by wired or wireless connection), and control device 740. Information processing device 710, information processing device 730, and control device 740 communicate with one another using the wireless LAN provided by access point 701. EX1004, FIGS. 17-18, [0235]-[0239], [0250]; EX1005, FIGS. 17-18, [0186]-[0190], [0201]. A POSITA would have known that if access point 701 stops working to provide the wireless LAN (e.g., due to a malfunction or power loss), it would create a case where the communication device (information processing device 730) is unable to receive information from the first communication terminal (control device 740).

186. In the communication system 700 of Iwami, information processing device 710 and information processing device 730 are sometimes connected with one another via access point 701 while information processing device 710 is in standby mode. EX1004, [0270], [0289]-[0290]; EX1005, [0221], [0240]-[0241].

187. In the case where the communication device (information processing device 730) is unable to receive information from the first communication terminal (control device 740) because access point 701 is down, information processing device 730 would also not receive communications from the second communication terminal (information processing device 710) sent through the LAN provided by access point 701. Specifically, information processing device 730 would not receive a heartbeat packet from information processing device 710. In this case, information processing device 730 would consider information processing device 710 to be inactive, which would cause information processing device 730 to terminate the connection with processing device 710. As described above at [1f], for example, Iwami-Kim uses termination of a connection to stop data transmission between information processing device 730 and information processing device 710. Accordingly, in the Iwami-Kim-Dowling combination, the communication device (information processing device 730) terminates the connection with the second communication terminal (information processing device 710) in the case where the communication device is unable to receive

information from the first communication terminal (control device 740) , for example due to access point 701 problems also affecting communication between the communication device and the second communication terminal.

188. Based on the teachings of Dowling, a POSITA would have modified the communication system 700 of Iwami, alone or in view of Kim, to configure information processing device 710 to transmit heartbeat packets to information processing device 730 and configure information processing device 730 to terminate its connection with information processing device 710 in the event that no heartbeat packet is received after a certain amount of time. A POSITA would have recognized that the ability to terminate connections after failure to receive a heartbeat packet would be beneficial in a classroom setting where students may leave a class without remembering to leave the group by entering a command on a user interface of their device, especially for large-sized classes such as university lectures, for example. *See* EX1004, [0383]; EX1005, [0307]. A POSITA would not necessarily send the exact sequence of messages to/from the exact sources/destinations specified by Dowling, nor would a POSITA necessarily perform the specific deactivation action specified by Dowling. Rather, a POSITA would have understood from Dowling that connections between devices can be monitored on a local network and, if necessary, deactivated or terminated. As discussed above, a POSITA would have been motivated to combine the Iwami-

Kim system with Dowling because they are in a same field of art, Iwami teaches that establishing and maintaining device connections with permission is desirable, and Dowling describes specific connection monitoring and maintenance techniques that a POSITA would reasonably expect to be successful when used in combination with the Iwami-Kim system.

XI. CONCLUSION

189. For at least the above reasons, it is my opinion that the Challenged Claims are unpatentable over the cited combinations discussed above in Grounds 1-4.

APPENDIX A

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

School of Architecture and Planning Faculty Personnel Record

Date: April 2025

Full Name: Joseph A. Paradiso

Department: Program in Media Arts and Sciences

1. **Date of Birth:** December 20, 1955

2. **Citizenship:** USA
Immigration Status: N/A

3. **Education:**

<u>School</u>	<u>Degree</u>	<u>Date</u>
MIT	Ph.D. in Physics	May, 1981
Tufts University	BS in Electrical Engineering and Physics	May, 1977

4. **Title of Thesis for Most Advanced Degree:**

Characteristics of Muon Pair Production in P-P Collisions at Very High Energies as a Probe of Proton Constituents

5. **Principal Fields of Interest:**

Sensor Applications and Sensor Networks
Ubiquitous Computing and the Internet of Things
Wearable Sensing Systems
Energy Harvesting for Embedded and Wearable Sensing
Human-Computer Interaction (HCI)
Augmented and Virtual Reality, Digital Twins
Energy Management in the Built Environment
Space Systems
Interactive Media and Electronic/Computer Music Generation & Performance

6. **Non-MIT Experience (including military service):**

<u>Employer</u>	<u>Position</u>	<u>Beginning</u>	<u>Ending</u>
Draper Laboratory Sensor and Signal Processing Directorate	Technical Staff	4/89	7/94
Swiss Federal Institute of Technology (ETH Zurich) Lab for High Energy Physics	Visiting Scientist	8/92	10/92
Swiss Federal Institute of Technology (ETH Zurich) Lab for High Energy Physics	Visiting Scientist	10/91	12/91
Draper Laboratory Control and Decision Systems Directorate	Technical Staff	2/84	4/89
Swiss Federal Institute of Technology (ETH Zurich) Lab for Nuclear Physics	Postdoc	11/81	12/83

Brookhaven National Laboratory Instrumentation Laboratory	Consulting Physicist	7/81	10/81
Draper Laboratory	Engineering Aide	6/74	9/77
Infoton, Inc.	Electronics Technician	1/73	9/73

7. History of MIT Appointments:

<u>Department</u>	<u>Rank</u>	<u>Beginning</u>	<u>Ending</u>
Media Arts and Sciences	Acting Academic Head	9/23	9/24
Media Arts and Sciences	Associate Academic Head	9/17	9/23
Media Arts and Sciences	Full Professor	7/15	present
Media Arts and Sciences	Associate Prof. w. Tenure	7/07	7/15
Media Arts and Sciences	Associate Professor	7/02	7/07
Media Arts and Sciences	Principal Research Scientist	7/98	7/02
Media Arts and Sciences	Research Scientist	7/94	7/98
Media Arts and Sciences	Research Affiliate	1/93	7/94
Physics Department	Compton Fellow	9/77	9/80
Physics Department	Research Associate	9/80	5/81

8. Consulting Record:

<u>Firm</u>	<u>Beginning</u>	<u>Ending</u>
Hive Robotics (advisor)	1/25	present
Nocturnal.health (advisor)	10/24	present
Samsung Electronics (Next Tech UX Global Expert Panel)	5/25	5/25
Buchalter (Technical Expert)	12/24	present
Unified Patents (Technical Expert)	4/23	present
Alston & Bird LLP (Technical Expert)	3/20	11/23
Gibson, Dunn & Crutcher LLP (Technical Expert)	3/20	1/21
Erse IP, P.A. (Technical Expert)	3/20	10/20
Neoteny Capital (Technical Consultant)	2/20	3/20
Paul Hastings, LLP (Technical Expert)	12/19	5/21
O'Melveny & Myers LLP (Technical Expert)	7/19	10/20
Covington & Burling LLP (Technical Expert)	8/18	7/2024
Wilson Sonsini Goodrich & Rosati, P.C. (Technical Expert)	11/18	2/19
Orrick, Herrington & Sutcliffe LLP (Technical Expert)	5/18	1/23
DLA Piper LLP (Technical Expert)	10/18	10/23
Metabolic Design Office (IoT consultant)	7/17	12/17
Baker Botts LLP (Technical Expert)	10/17	12/17
Haynes & Boone LLP (Technical Expert)	8/18	1/20
Foley & Lardner LLP (Technical Expert)	10/17	3/20
Morrison & Foerster LLP (Technical Expert)	10/16	present
Gibson, Dunn & Crutcher LLP (Technical Expert)	7/15	5/16
Banner & Witcoff, Ltd (Technical Expert)	8/14	11/14
Weil, Gotshal & Manges LLP (Technical Expert)	7/14	4/16
Moog Music Inc. (organized daylong seminar on research	4/14	4/14

in electronic music at MoogFest 2014)		
Durie Tangri LLP (Technical Expert)	3/14	7/23
Samsung Electronics (Samsung Research Funding & Incubation Center For Future Technology [SRFIC] Expert Reviewer)	2/14	present
Transitio Mexico City (electronic music seminar series)	10/11	10/11
Nokia Research (visiting researcher at NRC Santa Monica)	7/11	8/11
Swedish Foundation for Strategic Research (expert reviewer)	11/10	12/10
Microsoft (visiting researcher at MSR Cambridge UK)	7/10	8/10
Nokia Research Center Activity Review Panel	12/09	12/09
UPF Barcelona (invited week-long seminar series)	4/09	4/09
Microsoft Corp. (Distinguished ALT-TAB for Mobility)	4/08	5/08
Swedish Foundation for Strategic Research (expert reviewer)	3/08	4/08
A.I.E.P. Milano (Seminar series on computer music)	2/07	2/07
Hermann Miller, Inc.	1/05	8/06
Seneca Corporation (Technology Advisory Board)	7/03	7/04
Synectics, Inc.	7/04	7/04
Swedish Foundation for Strategic Research (onsite evaluation)	5/03	5/03
MediaLabEurope, Dublin	6/01	6/02
Diller and Scofidio (architects)	6/00	6/02
University of Limerick (Ireland), External Examiner for Graduate Program in Interactive Media	9/99	9/04
IBM T.J. Watson Research Center	1/99	7/99
British Telecom	4/97	3/99
Fibersense, Inc. (Technology Board Member)	4/97	4/98
Takata Inc., Automotive Systems Laboratory	11/96	12/96
Boston University Photonics Center	11/95	12/95
Optron Systems, Inc.	12/93	4/94
Lyle Mays, Inc.	5/87	12/90
Draper Laboratory	1/78	6/78

11. Department and Institute Committees, Other Assigned Duties

<u>Activity</u>	<u>Beginning</u>	<u>Ending</u>
MIT Faculty Advisory Council to the Vice Provost for Faculty	1/24	1/25
MIT Faculty Leadership panelist, "Managing Teams" Workshop	10/24	10/24
MIT Ignite GenAI Competition, Judge	10/23	10/23
MIT Decarbonization Working Group	9/23	present
MIT Media Lab & College of Computing Faculty Search (cochair)	2/23	6/23
MIT Department Heads Meeting, Special Panel on Engaging with Students	7/21	7/21
MIT New Faculty Orientation Panel, Zoom session on Handling Challenging Meetings with Student Advisees	8/21	8/21
MIT Media Lab Faculty Tenure Committee (chair)	7/21	1/22
MIT Ad Hoc Committee on Graduate Advising and Mentoring	4/21	5/21
MIT LMS Advisory Committee	7/20	10/21
MIT Task Force 2021 – Research Committee	6/20	12/20

MIT New Faculty Orientation Panel (2019)	8/19	8/19
MIT New Faculty Orientation Panel (2018)	9/18	9/18
MIT ESI (Environmental Solutions Initiative)		
Faculty Advisory Committee	10/18	6/25
MIT Media Lab MASCOM-PhD (committee chair)	7/19	9/24
MIT Faculty Leadership Program, Work Design and Personal Productivity Session, Led session on Time Management	5/19	5/19
MIT Committee on Graduate Programs	9/17	9/21
MIT 'Engine' Conflict of Interest Working Group	12/17	12/18
MIT ACT (Art, Culture, Technology) Faculty Search Committee	9/16	7/17
James R. Killian Jr. Faculty Achievement Award		
Selection Committee	7/15	7/17
Selection Committee Chair	7/16	7/17
MIT Creative Arts Council	1/17	1/22
Media Arts and Sciences Search Committee	7/17	7/18
Faculty Advisor, Media Lab Space Exploration Initiative	1/17	present
Undergraduate Advisor	8/14	8/17
MIT Committee for Launch of the Capital Campaign	6/14	6/14
Music and Theater Arts Faculty Search Committee	1/14	7/15
Media Arts and Sciences Faculty Search Committee	11/13	7/14
MIT CUP (Committee on the Undergraduate Program)	9/12	9/15
MIT Committee on Intellectual Property	9/10	9/16
Media Lab IP Commission Member	1/11	9/12
MISTI Global Seed Funds Proposal Evaluator	10/13	present
2012 d'Arbeloff Alumni Class Funds Review Committee	10/12	12/12
Senior faculty search committee for faculty in Built Environments	6/10	9/11
Member, IPCOM (Media Lab Intellectual Property Committee)	7/13	present
Director, IPCOM (Media Lab Intellectual Property Committee)	1/10	7/13
Manager, Media Lab 'HowTo' orientation seminar for new RAs	9/09	1/13
2020 Committee: Vision for Shared Materials Facilities	7/08	7/09
Technology Broadcasting Corporation:		
Board Member	1/06	present
Vice President	7/21	7/23
Horowitz Award Selection Committee (Dept. of Architecture)	5/04	5/06
Media Lab Intellectual Property Committee (IPCOM)	11/02	05/05
MAS Departmental Committee on Graduate Students	8/03	8/04
Deshpande Center Proposal Reviewer	8/03	9/03
Media Arts and Sciences Faculty Search Committee	9/02	6/05
Co-Director, Things That Think Consortium (Media Lab)	7/02	7/16
MAS Departmental Committee on Graduate Students	8/00	8/01
Technology Director, Things That Think Consortium (Media Lab)	1/96	5/01

12. Government and Other Outside Committees, Service, etc.:

<u>Committee</u>	<u>Beginning</u>	<u>Ending</u>
Invited Lecturer, CUSO Winter School 2025 on Human-AI Collaboration, Champéry Switzerland	1/25	1/25
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Revisiting Cross Reality	6/24	12/25
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on The Pervasive Metaverse	1/23	1/24
International Advisory Board, Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT), Montreal	5/23	5/24
Lead Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Pervasive Computing for Space Applications	1/22	1/23
Scientific Board (Consiglio Scientifico), School for Advanced Studies, University of Macerata (Italy)	5/21	present
Co-Organizer, ACM Space-CHI Workshop	5/21	present
Proposal Evaluator, Austrian Science Fund (FWF)	5/21	5/22
Proposal Evaluator, Leverhulme Trust (UK)	1/21	1/21
Technical Program Committee, IEEE BSN 2021	1/21	6/21
Competition Judge, Copernicus Space Hackathon (Vincenze IT)	2/20	2/20
Faculty Liaison, MIT Reality Hack	1/20	present
Lead Guest Editor, IEEE Pervasive Computing Magazine, Special Issue Managing Attention - Human and Machine Focus in Pervasive Computing	5/19	5/20
Workshop Co-Organizer, 'On-Body Interaction: Embodied Cognition Meets Sensor/Actuator Engineering to Design New Interfaces,' Schloss Dagstuhl (Leibnitz Center for Informatics), Germany	5/18	6/18
Invited Participant, 'Unpacking the Future of IoT', UW Allen School MSR Summer Institute 2017	7/18	8/18
Digital Media & Interaction Research Center, University of Aveiro, Portugal (External Advisory Committee)	1/18	8/24
Advisory Board, EU H2020 VI-DAS Project	11/17	1/19
Invited Participant, 2017 UW CSE/MSR Summer Institute, "Unpacking the Future of IOT"	7/17	8/17
Invited Participant, 'Ambient Notification Environments,' Schloss Dagstuhl (Leibnitz Center for Informatics), Germany	4/17	4/17
The San Diego Zoo, Technology/Sensing Consulting Panel	4/17	4/17
Figure8, Inc. (Technical Advisor)	4/17	present
Co-Chair, IOT 2017 Conference	1/17	12/17
Pro ² Future Austria (Advisory Board)	1/16	present

Guest Editor, IEEE Pervasive Computing (Special Issue on Energy Harvesting and Power Management)	12/15	12/16
Scientific Evaluator, The Hasler Foundation (Switzerland)	12/15	1/16
TPC member: NextMote workshop at EWSN 2016	9/15	1/16
Judge, Guthman Competition, Georgia Tech Music Dept.	2/15	2/15
Strategies In Light Industrial Conference (Advisory Board)	5/15	5/16
Baylor University (External Proposal Reviewer)	4/14	5/14
Appointment Advisory Committee, Faculty of Radiation Science, TU Delft	4/14	5/14
White House Cities, Counties and States Climate Data Workshop	3/14	3/14
World Bank Workshop on Building Climate and Disaster Resilience through Open Data and Innovation	3/14	3/14
AMI'13 (Intl. Conf. on Ambient Intelligence) TPC	6/13	12/13
Habilitation (HRD) Committee, University Pierre et Marie Curie, (CEA) Paris	12/13	12/13
NSF Workshop on Future Directions in Wireless Networking	11/13	11/13
Board of Advisors - Intel Science and Technology Center for Pervasive Computing (ISTC-PC) at U. Washington	5/13	5/16
International Advisory Board, Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT), Montreal	5/13	5/14
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Attention Management	1/13	1/14
ESPRC (UK) Proposal Reviewer	12/12	1/13
Scientific Advisory Board for iPack, Swedish Excellence Centre for research and innovation in electronics at KTH	11/12	11/15
Invited Participant, "'Interaction Beyond the Desktop,' Schloss Dagstuhl (Leibnitz Center for Informatics), Germany	8/12	8/12
NSF Proposal Review Panel	6/12	6/12
NSF Proposal Reviewer	2/12	2/12
European Commission (reviewer for FET projects)	12/11	12/11
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Pervasive Interaction	4/11	4/12
NSF Proposal Review Panel	4/11	4/11
Associate TPC Chair for Input Devices Track, CHI 2011	8/10	3/11
Guest Editor, IEEE Pervasive Computing Magazine Special Issue on Automotive Pervasive Computing	7/10	7/11
TEI 2011		
(Intl Conf. on Tangible, Embedded, Embodied Interaction) TPC	6/10	9/10
NIH Workshop on Personal Motion Technologies for	6/10	6/10

Healthy Independent Living		
Texas Higher Education (Committee to evaluate Proposed Ph.D. in Arts and Technology Degree at UTD)	6/10	6/10
WirelessHealth 2010 TPC	4/10	8/10
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Smart Energy Systems	1/10	1/11
Swiss National Science Foundation Proposal Reviewer	12/09	1/10
NSF Workshop on Future Directions in Sensing Systems	11/09	11/09
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Hostile Environments	10/09	10/10
Associate Editor in Chief, IEEE Pervasive Computing Magazine	4/09	4/15
TPC, BSN (Intl. Conf. on Wearable/Implantable Body Sensor Networks) 2009	1/09	6/09
TPC, ISWC (Wearable Computing Conference) 2009	12/08	9/09
Guest Editor, IEEE Pervasive Computing Magazine Special Issue on Cross-Reality Environments	7/09	7/09
NSF Proposal Review Panel	6/08	6/08
TPC, European Workshop on Sensor Networks (EWSN) '09	5/08	12/08
Guest Editor, IEEE J-SAC Special Issue on BAN (Body Area Networks)	1/08	1/09
IPSN (Intl. Conf. on Information Processing in Sensor Networks) 2008 TPC	8/07	1/08
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Hacking in Pervasive Computing	7/07	7/08
BodyNets 2008 TPC	7/07	12/07
NSF-IC Power Sources Workshop	4/07	4/07
Guest Editor, IEEE Pervasive Computing Magazine, Special Issue on Implantable Electronics	7/07	7/08
TPC, ACM MobiEval 2007	2/07	7/07
Editorial Board, ACM/Springer Wireless Networks Journal	2/07	1/09
NSF Workshop on Integrating the Social Sciences into NSF Observatories	1/07	1/07
Co-chair, ISWC 2007 (International Symposium on Wearable Computing)	1/07	10/07
Editorial Board, IEEE Pervasive Computing	9/06	present
Technical Program Committee Co-Chair, The Fourth Workshop on Embedded Networked Sensors (EmNets 2007)	7/06	6/07
Technical Program Committee, Sensor Platform Tools and Design Methods for Networked Embedded Systems (SPOTS),	7/05	5/06

6'th International IEEE Conference on Information Processing in Sensor Networks (IPSN07)		
Technical Program Committee, Second International ACM Conference on Body Area Networks (BodyNets 07)	12/06	6/07
Technical Program Committee, 3'rd IEEE/ACM International Conference On Distributed Computing in Sensor Systems DCOSS'07	10/06	6/07
Technical Program Committee, Fourth International Conference on Networked Sensing Systems (INSS 07)	10/06	6/07
Technical Program Committee, 20'th International Conference on Architecture of Computing Systems (ARCS 2007)	7/06	3/07
Technical Program Committee, 4'th International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2007)	6/06	5/07
Steering Committee, IEEE International Conference on Wearable and Implantable Body Sensor Networks (BSN)	6/06	1/20
Proposal Reviewer, Adventure Fund, Innovative Manufacturing & Construction Research Centre Wolfson School of Mechanical & Manufacturing Engineering, Loughborough University, UK	5/06	6/06
Microelectronics Advisory Council, Fraunhofer Gesellschaft (Germany)	4/06	4/09
Program Committee, (re)Actor: The First International Conference of Digital Live Art	4/06	9/06
Technical Program Committee, ACM Sensys 2006	1/06	9/06
Technical Program Committee, Workshop on World-Sensor-Web (WSW'2006): Mobile Device Centric Sensory Networks and Applications (at ACM Sensys 2006)	1/06	9/06
Singapore Science & Engineering Research Council (SERC) (Proposal Reviewer)	8/05	9/05
Chair, Sensor Platform Tools and Design Methods for Networked Embedded Systems (SPOTS), 5'th International IEEE Conference on Information Processing in Sensor Networks (IPSN06)	7/05	5/06
ERCIM (EU) Beyond-The-Horizon working group on Pervasive Computing & Communications	7/05	12/05
Program Committee, The Fourth International Conference on Pervasive Computing (Pervasive 2006)	7/05	4/06
Co-Chair, IEEE International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2006)	6/05	5/06
Science Foundation Ireland (Proposal Reviewer)	6/05	7/05
External Ph.D. Examiner, National Sensor Center at Dublin City University (DCU)	5/05	6/05

Austrian Science Foundation (Proposal Reviewer)	3/05	4/05
Nokia academic working group on sensor networks	2/05	2/10
Organizing Committee and Technical Program Committee, Sensor Platform Tools and Design Methods for Networked Embedded Systems (SPOTS), 4'th International IEEE Conference on Information Processing in Sensor Networks (IPSN05)	8/04	4/05
Program Committee, International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2005)	4/04	4/05
Program Committee, Workshop on End-to-End, Sense-and-Respond Systems, Applications, and Services (at ACM MobiSys 2005)	12/04	5/05
Program Committee, 2005 IEE Workshop on Intelligent Environments (IE05)	9/04	6/05
Program Committee, 18'th International Conference on Architecture of Computing Systems (ARCS 2005)	7/04	11/04
Program Committee, The Second International Conference on Pervasive Computing (Pervasive 2004)	10/03	5/04
National Research Council Canada (Proposal Reviewer)	1/04	2/04
Science Foundation Ireland (Proposal Reviewer)	2/04	3/04
National Science Foundation, ECE Division (sensors) (Proposal Review Panel in Washington DC)	12/03	12/03
Fonds Québécois de Recherche sur la Société et la Culture, Canada Foundation for Innovation (CFI) (Proposal Review Panel in Montreal)	8/03	8/03
Swedish Foundation for Strategic Research, Visiting Committee Member for 5-year evaluation of all Swedish Interactive Institutes	5/03	6/03
Jury Member, Prix Ars Electronica, Interactive Art Category	3/03	9/03
Guest Editor, <i>IEEE Computer Graphics and Applications</i> Special Issue on SIGGRAPH Emerging Technologies	1/03	1/04
Art Interactive Gallery, Cambridge MA (Arts Advisory Board)	7/02	9/07
Program and Steering Committees, Int. Conference on New Interfaces for Musical Expression (NIME 2003-2006)	7/02	Present
Guest Editor, <i>Journal of New Music Research</i> Special Issue on New Interfaces for Musical Expression	6/02	6/03
Program Committee, The Second International Conference on Ubiquitous Computing (UbiComp 2002)	3/02	6/02
Chief Organizer, First International Conference on New Interfaces for Musical Expression (NIME 2002)	6/01	6/02
Technical Program Committee, ACM/CHI New Interfaces for Musical Expression Workshop	1/01	5/01
Jury, Emerging Technologies program, ACM SIGGRAPH (member of Jury panel 01,02,03)	1/01	6/03

External Examiner, Interactive Media Program, University of Limerick (Ireland) ('99,00,01,02,03,04)	9/99	9/04
Guest Editor, <i>IEEE Computer Graphics and Applications</i> , Special Issue on Input Devices	1/98	6/98
American Institute of Aeronautics and Astronautics (AIAA), Jury for the Columbus 500-year Anniversary Earth-Moon Solar Sail Race	11/89	12/89
Tufts University Radio WMFO – Lead Engineer and Coordinator For Custom Redesign/Rebuild of all Studios	2/85	2/87
Photo Editor, Tufts University 'Jumbo' 1977 Yearbook	7/76	7/77

Paper Reviewer:

See Program Committee memberships and Guest Editorships above. Some of the other conferences and journals that I've reviewed for include:

IMWUT 2021, ISWC 2021, BSN 2019, IEEE Transactions on Sensor Networks, IEEE Sensors Journal, IEEE Transactions on Robotics, IEEE Pervasive Computing, BSN 2006-2013, Pervasive 2012, Pervasive 2006, UbiComp 2014, UbiComp 2010, UbiComp 2009, UbiComp 2008, UbiComp 2006, UbiComp 2005, UbiComp 2004, ACM CHI 2020, ACM CHI 2019, ACM CHI 2017, ACM CHI 2016, ACM UIST 2020, ACM UIST 2019, ACM UIST 2018, UIST 2017, UIST 2015, UIST 2014, UIST 2012, UIST 2011, UIST 2003, UIST 2002, ACM CHI 2016, ACM CHI 2014, CHI 2013, CHI 2011, ACM CHI 2009, ACM CHI 2002, ACM CHI 2000, TEI 2011, SIGGRAPH 2011, SIGGRAPH 2014, IEEE ISWC (International Symposium for Wearable Computers) 1998, NIME 2002-2022, ACC 1994, IEEE/ASME Trans on Mechatronics, Transactions on Neural Systems & Rehabilitation Engineering, ACM Computing Surveys, Heliyon, Communications of the ACM, Computer Music Journal, Journal of New Music Research, IBM Systems Journal, IEEE Information Systems, AIAA Journal of Guidance and Control, IEEE Journal of Neural Networks, Pattern Analysis and Applications Journal, Electronics Letters, IEEE Pervasive Computing, Aerospace Science and Technology, IEEE Computer Graphics & Applications

13. Awards Received:

<u>Award</u>	<u>Date</u>
2023 IEEE Pervasive Computing <i>Best Paper of The Year Award</i>	12/24
2022 Tech Briefs Design Award, <i>Grand Prize</i> [FlowIO Platform]	11/22
2022 Tech Briefs Design Award, Aerospace & Defense Category, <i>First Prize</i> [The Well-Dressed Spacecraft: Electronic Textile Enhanced Thermal Blanket as Debris (and Cosmic Dust) Sensor]	11/22
Best Paper Award, ACM SmartWear '22	10/22

Fast Company's 2022 Innovation by Design Award [3DKnITS wearable e-textile project Finalist (students) and Honorable Mention (experimental)]	10/22
2022 MIDI Association MIDI Innovation Award (Artistic/Visual Project or Installation – Tapis Magique)	5/22
Featured Article Selection, IEEE Transactions on EMB	1/21
AIAA Space Architecture Technical Committee Best Professional Paper Award 2019/2020	1/20
Distinguished Paper Award, Proceedings of the ACM IMWUT (Vol. 2)	9/19
Best Poster Award, NIME 2019	6/19
20-Year Impact Award, ISWC 2018	10/18
Best Paper Award, SIRS 2018	9/18
SXSW Interactive Innovation Award	2/18
Honorable Mention (Best Paper), ISWC 2017	9/17
Best Presentation Award, NIME 2017	5/17
Best Paper Award (Second Prize), Augmented Human 2016	2/16
Best Paper Award, ACM UIST 2016	10/16
Best Presentation Award, ACM Buildsys 2015	11/15
Alexander W. Dreyfoos (1954) Faculty Chair (MIT)	7/15
Honorable Mention (Best Paper) CHI 2015	5/15
Best Session Paper, BSN 2013	6/13
Best Paper Award, CHI 2013	5/13
Best Demo Award (3 rd place) ACM UIST 2012	10/12
IEEE (EMB) Transactions on Information Technology in Biomedicine 2012 Outstanding Paper Award	8/12
Design Contest Winner (ISLPED'08)	8/08
Best Paper Award, ISPN'08 (SPOTS Track)	5/08
Best Presentation Award, ACM Sensys 2007	11/07
Best Paper Award, The 3 rd International Conference on Pervasive Computing (Pervasive 2005)	5/05
Best Paper Award, IPSN'07 (SPOTS Track)	4/07
Best Paper Award, 2003 IEEE International Conference on Sensors (student paper, third prize)	10/03
Sony Career Development Chair (MIT)	9/02
Discover Magazine Award for Technical Innovation (semifinalist, Entertainment category)	6/01
Discover Magazine Award for Technical Innovation (winner, Entertainment category)	6/00

Swets and Zeitlinger Distinguished Paper Award of ICMC 1999 (second prize)	10/99
Draper Laboratory, Recognition Award (for underwater sonar systems)	12/94
Draper Laboratory, Recognition Award (for precision alignment systems in high-energy physics detectors)	7/93
MIT, K.T. Compton Physics Department Fellowship	6/77
Tufts University, BS Summa cum Laude	6/77
Tufts University, Burden Engineering Prize (first prize, undergraduate engineering competition)	6/77
Tufts University, Alumni Award (annually presented to 16 students on basis of grades, activities, etc.)	3/77
Tufts University, Class of 1898 Award (presented to student best displaying competence and capability)	5/76
The 1973 Boston Globe Scholastic Art and Photography Awards (Gold Key Winner, Photography)	3/73
Certificate of Merit Award in Photography, The New York Times	9/72
National Honor Society (Medford High School)	9/72

14. Current Organization Membership:

Organization & Offices Held

ACM (Association for Computing Machinery, SIGCHI and SIGGRAPH)
AIAA (American Institute of Aeronautics and Astronautics – Senior member)
APS (American Physical Society)
IEEE (Senior Member)
IEEE Computer Society
IEEE Control Systems Society
IEEE Signal Processing Society
Sigma Xi
Eta Kappa Nu (Tufts University Chapter President, 1976/77)
Tau Beta Pi

15. Issued Patents and Published or Pending Patent Applications:

- 1) Marrin, T., Paradiso, J.A., Machover, T., Verplaetse, C., and Orth, M., "Apparatus for Controlling Continuous Behavior through Hand and Arm Gestures," U.S. Patent No. 5875257, February 23, 1999.
- 2) Paradiso, J., Hsiao, K., "Multi-axis Tracking of Passive Resonators," U.S. Patent No. 6,404,340, June 11, 2002.
- 3) Knaian, A., Paradiso, J.A., "Wireless Roadway Monitoring System," U.S. Patent 6,662,099, December 9, 2003.
- 4) Maue, W.H., Meinzer, R., Paradiso, J., Feldmeier, M., "Self-Powered Wireless Switch," U.S. Patent No. 6,700,310, March 2, 2004.

- 5) Morrison, G.O., Maue, W.H., Skarb, B.P., Berta, M.J., Meinzer, R., Paradiso, J., Feldmeier, M., Youngs, J., "Self-Powered Wireless Switch," US Patent 6,933,655, August 23, 2005.
- 6) Paradiso, J.A., Ma, H., Lippman, A.B., "Tag Interrogation With Observable Response Signal," US Patent 7,109,865, September 19, 2006.
- 7) Paradiso, J., Lifton, J., Feldmeier, M., Ono, Y., "Platform for Ubiquitous Sensor Deployment in Occupational and Domestic Environments," US Patent Application US20080094210A1, published April 24, 2008.
- 8) Paradiso, J.A., Leo, C-K., Checka, N., "Systems and methods for tracking impacts," US Patent 7,643,015 B2, January 5, 2010.
- 9) Paradiso, J.A., Leo, C-K., Checka, N., "Systems and methods for tracking impacts," US Patent 7916128 B2, March 29, 2011.
- 10) Ma, H. and Paradiso, J.A., "Input device based on frustrated total internal reflection," US Patent 7,432,893, October 7, 2008.
- 11) Paradiso, J.A. and Laibowitz, M.J., "Parasitic Mobility in Dynamically Distributed Sensor Networks," US Patent No. 7,429,936, September 30, 2008.
- 12) Lapenta, J.M. and Paradiso, J.A., "Real-time 3-D Localization using Radar and Surface Acoustic Wave Transponders," US Patent 7,924,160, April 12, 2011.
- 13) Paradiso, J.A., Ma, H., Lippman, A.B., "Quasi-passive wakeup function to reduce power consumption of electronic devices," U.S. Patent No. 7,864,051, January 4, 2011.
- 14) Paradiso, J.A., Borque, L.L., "Continuous Capacitive Slider Controller for a Smooth-Surfaced Cooktop," US Patent No. 8,017,890, September 13, 2011.
- 15) Laibowitz, M., Samanta, V., Paradiso, J.A., "Performing a Function," US Patent Application 20130154951-A1, Dec. 15, 2011.
- 16) Feldmeier, M., Paradiso, J. "Personalized Building Comfort Control," US Patent Application No. US20120031984A1, February 9, 2012.
- 17) Paradiso, J.A., Bainbridge, R., "Wireless Hand Gesture Capture," US Patent Application No. US20120139708A1, June 7, 2012.
- 18) Paradiso, J.A. and Ono, Y., "Distributed acoustic conversation shielding system," US Patent No. 8,229,130, July 24, 2012.
- 19) Aldrich, M., Feldmeier, M., Paradiso, J., "Apparatus and methods for interactive illumination," US Patent 8,593,073, Nov. 26, 2013.
- 20) Laibowitz, M., Samanta, V., Paradiso, J.A., "Methods, apparatuses, and computer program products for enabling use of remote devices with pre-defined gestures," U.S. Patent 8,902,180, Dec. 2, 2014.
- 21) Gong, N.-W., Hodges, S.E., Villar, N., and Paradiso, J.A., "Sensing floor for locating people and devices," U.S. Patent 9,077,343, July 7, 2015.
- 22) Zoran, A., Paradiso, J., Shilkrot, R., "Methods and Apparatus for Handheld Tool," US Patent 9342632B2, May 17, 2016.
- 23) Goyal, P. and Paradiso, J., "System for Introspection and Annotation of Electronic Design Data," U.S. Patent No. 9,411,010, August 9, 2019.

- 24) Goyal, P., Zoran, A., Paradiso, J., “Methods and Apparatus for Handheld Inkjet Printer,” U.S. Patent No. 9,446,585, September 20, 2016.
- 25) Paradiso, J., Aldrich, M., Zhao, N., “Methods and Apparatus for Illumination Control,” U.S. Patent No. 9,674,929 B2, June 6, 2017.
- 26) Azaria, A., Mayton, B., and Paradiso, J., “Methods and apparatus for detecting hand-to-mouth compulsive habits,” US Patent No. 10335061, July 6, 2020.
- 27) Zhao, N., Azaria, A., Paradiso, J. “Methods and Apparatus for Multimedia Presentation,” US Patent No. 10,705,706 B2, July 7, 2018.
- 28) Zhao, N., Paradiso, J., “Methods and Apparatus for Image Analysis for Lighting Control,” US Patent No. 10,708,992 B2, July 7, 2020.
- 29) Zhao, N., Paradiso, J., Reches, Y., “Methods and apparatus for producing a multimedia display that includes olfactory stimuli,” US Patent No. 10,706,820 B2, July 7, 2020.
- 30) Ekblaw, A. and Paradiso, J.A., “Methods and Apparatus for Autonomous 3D Self-Assembly, Spatial Docking and Reconfiguration,” US Patent No. 12,110,131 B2, October 8, 2024.
- 31) Paradiso, J.A. and Wicaksono, I., “Three-dimensional machine knitting of electronic textile for activity recognition and biomechanical monitoring,” US Patent No. 12,247,332 B2, March 11, 2025.
- 32) Cherston, J.M. and Paradiso, J.A., “Aerospace Grade Sensing Textile With Sensor Topology,” US Patent Application 18/447,699 filed August 10, 2023.

16. Professional Registration: None

17. Projects

(Public installations, performances or exhibitions – otherwise, my Media Lab research projects are listed at <http://resenv.media.mit.edu/projects/> and detailed in my publications. This list omits many installations that my students have presented based on research that I’ve supervised, as well as installations at conferences (e.g., SIGGRAPH, CHI, etc.) – published descriptions of these are included in my publication list.

- 1) Commissioned concert (funded by MIT CAST) by renowned Grammy-Award-Winning keyboardist Jordan Rudess and my team at MIT, who developed an AI model running in real time and honed on his playing styles for AI-augmented live virtuosic musical performance. *Jordan and the Jam Bot*, <https://news.mit.edu/2024/model-virtuosity-jordan-rudess-jam-bot-1119>, November 19, 2024.
- 2) Custom autonomous synthesizer stream music composition to the *Arts on The Radar Festival* at MIT (and worldwide), September 9, 2022.
- 3) Invited autonomous synthesizer stream music composition to the ETH Pavilion at the *World Economic Forum*, Davos, Switzerland, January 18-25, 2020.
- 4) Invited exhibition and musical installation, MIT Plasma Science and Fusion Center (for the 50th anniversary of MIT CAVS), *reSynthesizer* (see <http://act.mit.edu/projects-and-events/events/events/joe-paradiso-resynthesizer/>), April 27-May 31, 2018.

- 5) Invited exhibition and musical installation, MIT Museum, Cambridge MA, *The Paradiso Synthesizer*, January 12 – April 10, 2012. (see <http://synth.media.mit.edu>)
- 6) Invited installation, Ars Electronica Festival 2011, *DoppelLab and Digital Excavation*, August 31 - September 6, 2011. (see <http://doppelab.media.mit.edu>)
- 7) Invited installation at Ars Electronica 2009 (with students Alex Reben, Matt Laibowitz, Nan-Wei Gong), *Ubiquitous Sensor Network Navigator*, September 3-8, 2009. (see <http://www.aec.at/humannature/mit-medialab/ubiquitous-sensor-network-navigator>)
- 8) Invited exhibition and performance of my homemade modular music synthesizer at the 25'th anniversary Ars Electronica Festival, *Timeshift*, Linz, Austria, September 3-7, 2004; also presented an invited artists' seminar on history and design of modular synthesizers. (see <http://web.media.mit.edu/~joep/synthars.html>)
- 9) Invited installation of the *Interactive Window* impact tracker at the Innovation Corner, Motorola iDEN facility, Plantation, Florida, October 30, 2003 – 2006. (see <http://resenv.media.mit.edu/Tapper/Motorola.html>)
- 10) Exhibition at the Artbots Robotic Talent Show in New York City: *Tribblation* (a sphere tiled by a reactive sensor net skin), with student Josh Lifton, July 12-13, 2003. (see <http://resenv.media.mit.edu/tribble/>)
- 11) Exhibition of the *Magic Carpet* installation at the MIT Museum as *Stomping Ground*, February 28, 2002 – April 5, 2004. (see <http://web.media.mit.edu/~joep/SpectrumWeb/captions/Carpet.html>)
- 12) Installation of interactive window in collaboration with American Greetings at their flagship card store at Rockefeller Center in New York City, Dec. 9, 2001- Feb. 18, 2002. (see <http://resenv.media.mit.edu/Tapper/AmGreet.html>)
- 13) Exhibition of window tap-tracking interface at the Kitchen Gallery in New York City in *Telephone Story* as part of the *ID/Entity Exhibition*, Nov. 30, 2001- Jan. 15, 2002. (see <http://resenv.media.mit.edu/Tapper/IdEntity.html>)
- 14) Invited exhibition of *Interactive Window* System at the Ars Electronica Center, Linz Austria, September 1, 2001 - September 1, 2004. (see <http://resenv.media.mit.edu/Tapper/ResWindow.html>)
- 15) Invited installation, *Atmospheres*, (in collaboration with Prof. John Maeda) at the *Workspheres* Exhibition, Museum of Modern Art (MOMA), New York, February 7 through April 22, 2001. (see <http://resenv.media.mit.edu/atmo/index.html>)
- 16) Invited installation of *Magic Carpet* musical installation at the Current Science and Technology Center, Boston Museum of Science, February 1 through April 20, 2001. (see <http://web.media.mit.edu/~joep/SpectrumWeb/captions/Carpet.html>)
- 17) Invited installation of *Musical Trinkets* at the SMAU Convention, Milan Italy, October 19-23, 2000. (see <http://resenv.media.mit.edu/sweptRF.html>).
- 18) Invited photographic exhibition, Wessell Library, Tufts University, 1974.

(Completed Musical Recordings composed by me – all performed using my custom-built and self-designed electronic music equipment and recorded either in my studio or live at public

installations – see <http://paradiso.media.mit.edu/synth.html> . Content is also streamed and posted off @ParadisoModular on YouTube)

- 1) **Patchwork**, July 1, 2000
<https://joeparadiso.bandcamp.com/album/patchwork>.
- 2) **State Machine Music**, January 1, 2002
<https://joeparadiso.bandcamp.com/album/state-machine-music>.
- 3) **Timeshift - Live at Ars Electronica 2004**, September 30, 2004
<https://joeparadiso.bandcamp.com/album/timeshift-live-at-ars-electronica-2004>.
- 4) **Synth Dystopia**, March 20, 2020
<https://joeparadiso.bandcamp.com/album/synth-dystopia>.
- 5) **Synth Utopia, Vol. 1**, March 7, 2021
<https://joeparadiso.bandcamp.com/album/synth-utopia-vol-1>.
- 6) **Nebulosity**, April 1, 2021
<https://joeparadiso.bandcamp.com/album/nebulosity>.
- 7) **Synth Utopia, Vol. 2**, April 3, 2021.
<https://joeparadiso.bandcamp.com/album/synth-utopia-vol-2>.
- 8) **My Tangled Roots**, July 14, 2022.
<https://joeparadiso.bandcamp.com/album/my-tangled-roots>.

I have been producing and airing programs for Boston-area college radio featuring progressive/avant-garde rock and jazz, 20th century classical music, and experimental/electronic compositions since 1973, including hosting occasional interviews and live performances. I started at WMFO (Tufts University), and produced many programs there from 1973-1987 (I also served a few years as Production Director and led a team that redesigned/rebuilt this radio station between 1985-1987). I also did many programs at MIT's radio station WMBR, including "Camembert Electrique" (1978), "The Asylum" (guesting on shows 1978-1983), "Difficult Listening Hour" (1984-1985) and "Electronic Countermeasures" (1986-1994). I still do occasional guest shows at WMBR and WZBC (Boston College, one of the USA's most influential experimental music stations) and serve as an officer in WMBR's governing body, the Technology Broadcast Corporation.

18. Symposia Organized:

(External academic workshops or conferences – in addition, I have organized several themed symposia with invited speakers for Media Lab consortia meetings, which I am omitting here)

Workshop Co-Organizer, SpaceCHI (CHI 2021, CHI 2022, and MIT 2023), May 14, 2021, May 1, 2022, and June 22-23, 2023.

Workshop Co-Organizer, On-Body Interaction: Embodied Cognition Meets Sensor/Actuator Engineering to Design New Interfaces, Schloss Dagstuhl (Leibnitz Center for Informatics), Germany, May 22-24, 2018.

Conference Co-Chair, IOT 2017, Linz Austria, October 22-25, 2017.

Local Chair, IEEE International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2015), Cambridge MA, June 9-12, 2015.

Local Chair, IEEE International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2013), Cambridge MA, May 6-9, 2013.

Co-chair, ISWC 2007 (International Symposium on Wearable Computing), Boston MA, Oct. 11-13, 2007.

Technical Program Committee Co-Chair, The Fourth Workshop on Embedded Networked Sensors (EmNets 2007), Cork Ireland, June 25-26, 2007

Chair, Sensor Platform Tools and Design Methods for Networked Embedded Systems (SPOTS), 5'th International IEEE Conference on Information Processing in Sensor Networks (IPSN06), Nashville TN, April 19-21, 2006.

Co-Chair, IEEE International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2006), Cambridge MA, April 3-5, 2006.

Chief Organizer, First International Conference on New Interfaces for Musical Expression (NIME 2002), Dublin Ireland, May 24-26, 2002.

19. Teaching Experience of Joseph A. Paradiso:

As Course founder/lecturer or co-founder/co-lecturer or sole instructor or supervising faculty:

<u>Term</u>	<u>Sub. No.</u>	<u>Title</u>	<u>Role</u>	<u>Enrollment</u>
ST24	MAS.837	Principles of Electronic Music Interfaces	Instructor	10
FT23	MAS.921	Proseminar in Media Arts & Sciences	Instructor	25
FT23	MAS.S90	Introduction to Media Arts & Sciences	Supervising Faculty	20
FT23	MAS.838	Designing & Deploying Projects for Zero Gravity Flights	Co-Instructor	15
ST 23	MAS.S61	The Metaverse: What, How, Why and When (although only 4 took it for credit, up to 150 attended lectures)	Chief Instructor	4
FT22	MAS.921	Proseminar in Media Arts & Sciences	Instructor	20
FT22	MAS.S90	Introduction to Media Arts & Sciences	Supervising Faculty	20
ST22	MAS.836	Sensor Technology for Interactive Environments	Instructor	20

FT21	MAS.921	Proseminar in Media Arts & Sciences	Instructor	25
FT21	MAS.838	Designing & Deploying Projects for Zero Gravity Flights	Supervising Faculty	10
FT21	MAS.S90	Introduction to Media Arts & Sciences	Supervising Faculty	15
ST 21	MAS.S76	Adventures in Sensing (although only 2 took it for credit, up to 100 attended lectures)	Instructor	2
FT20	MAS.921	Proseminar in Media Arts & Sciences	Instructor	25
FT20	MAS.S66	Designing & Deploying Projects for Zero Gravity Flights	Supervising Faculty	10
FT20	MAS.S90	Introduction to Media Arts & Sciences	Supervising Faculty	15
FT19	MAS.S63	Designing & Deploying Projects for Zero Gravity Flights	Supervising Faculty	5
FT19	MAS.921	Proseminar in Media Arts & Sciences	Instructor	25
ST19	MAS.836	Sensor Technology for Interactive Environments	Instructor	20
FT18	MAS.921	Proseminar in Media Arts & Sciences	Instructor	25
FT18	MAS.S64	Designing & Deploying Projects for Zero Gravity Flights	Supervising Faculty	10
IAP18		An Introduction to Prog Rock	Instructor	20
FT17	MAS.921	Proseminar in Media Arts & Sciences	Co-Instructor	25
ST17	MAS.836	Sensor Technology for Interactive Environments	Instructor	20
FT16	MAS.S60	Sci Fab 2050 SF-Inspired Envisioneering & Futurecasting	Supervising Faculty	10
FT16	MAS.S68	Here, There and Everywhere: The Future of Music in Sound, Space, and Place	Co-Instructor	20
FT16	MAS.500	Hands on Foundations in Media Technology	Chief Instructor	20
ST16	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
FT15	MAS.837	Principles of Electronic Music Interfaces	Instructor	10

FT15	MAS.500	Hands on Foundations in Media Technology	Chief Instructor	20
ST15	MAS.836	Sensor Technologies for Interactive Environments	Instructor	15
FT14	MAS.S62	New Paradigms in Musical Instruments	Co-Instructor	10
FT14	MAS.500	Hands on Foundations in Media Technology	Chief Instructor	20
ST14	MAS.S63	Silicon Menagerie: From Bioinspiration to Biomimetics	Co-Instructor	13
ST14	MAS.500	Hands on Foundations in Media Technology	Chief Instructor	20
FT13	4.523	Second Nature: Design of Low-Power Environmental Sensors & Networks	Co-Instructor	10
FT13	MAS.500	Hands on Foundations in Media Technology	Chief Instructor	20
ST13	MAS.826	Future of Festivals	Co-Instructor	15
FT12	MAS.837	Principles of Electronic Music Interfaces	Instructor	10
ST12	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
FT11	MAS.S61	Emerging Technologies in Location-Aware Computing	Instructor	10
ST11	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
FT10	MAS.837	Principles of Electronic Music Interfaces	Instructor	10
ST10	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
ST09	MAS.969	Building Cross-Reality Applications	Instructor	7
FT08	MAS.837	Principles of Electronic Music Interfaces	Instructor	10
ST08	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
ST07	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
FT06	MAS.960	Principles of Electronic Music Controllers	Instructor	10
ST06	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20

FT05	MAS.961	Developing Applications for Sensor Networks	Instructor	12
ST05	MAS.836	Sensor Technologies for Interactive Environments	Instructor	20
FT04	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
ST04	MAS.836	Sensor Technologies for Interactive Environments	Instructor	16
FT03	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
ST03	MAS.965	Electronic Skins and Dense Sensor Networks	Instructor	15
FT02	MAS.963	Principles of Electronic Music Controllers	Instructor	10
FT02	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
FT01	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
ST01	MAS.967	Sensor Technologies for Interactive Environments	Instructor	17
FT00	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
FT99	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
FT98	MAS.863	How to Make (Almost) Anything	Co-Instructor	16
ST83	VP (ETHZ)	Praktikum für Vorgerückte (Junior Physics Lab)	Instructor	10

As Guest Lecturer:

FT24	2.177/2.178	Designing Virtual Worlds	Guest Lecturer	25
ST24	4.s42	Decarbonizing the MIT Campus	Guest Lecturer	19
FT22	4.183	Architectural Design Workshop: The Big Zero (Energy Harvesting)	Guest Lecturer	12
ST22	ASP XVII Alta Scuola Politecnica, Milano	L.A.D.E.: Lunar Architecture Design Exploration	External Tutor	10
FT21	4.154/4.S01	Fashion, Design & Technology: Intelligent Skin	Guest Lecturer	15
FT21	MAS.825J	Reimagining Hyperinstruments: Musical Aesthetics and Media Technology	Guest Lecturer	15
FT21	056141 Politecnico di Milano	Design Exploration: Towards a Moon Architecture	Guest Lecturer & Faculty Advisor	115
FT20	056141 Politecnico di Milano	Architecture for Human Space Exploration	Guest Lecturer	90

ST20	18-745	Rapid Prototyping of Computer Systems (CMU)	External Final Project Evaluator	20
FT18	6.UAR	SuperUROP Seminar	Guest Lecturer	150
ST14	4.373	Sound installations + sonic interventions	Project Jury	10
ST13	15.356	How to Develop Breakthrough Products and Services	Guest Lecturer	30
ST12	15.356	How to Develop Breakthrough Products and Services	Guest Lecturer	30
ST12	4.333	(in)dependent people: advanced seminar in networked cultures and participatory media	Guest Lecturer	10
ST11	15.356	How to Develop Breakthrough Products and Services	Guest Lecturer	30
FT11	MPATE-GE-2038	Creating with Interactive Media: Buchla to Ableton (NYU)	Guest Lecturer	15
FT11	MAS.825J	ARTS@MEDIA LAB	Guest Lecturer	20
ST10	15.356	How to Develop Breakthrough Products and Services	Guest Lecturer	30
ST09	15.356	How to Develop Breakthrough Products and Services	Guest Lecturer	30
ST08	15.356	How to Develop Breakthrough Products and Services	Guest Lecturer	30
ST08	CSIM	5 guest lectures on ‘Advanced Interface Design’ at the Universitat Pompeu Fabra (UPF) in Barcelona	Guest Lecturer	29
FT07	MAS.825J	Musical Aesthetics and Media Technology	Guest Lecturer	15
ST06	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
ST06	MAS.960	Digital Innovations	Guest Lecturer	25
ST06	CMS.876	History of Media and Technology	Guest Lecturer	15
ST05	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
ST05	591b	Active Materials (Yale Architecture Dept.)	Guest Lecturer	10
FT04	MAS.965	Deep Engagement	Guest Lecturer	10
ST04	6.ThT	Preparation for Masters of Engineering Thesis	Guest Lecturer	15
ST04	MAS.968	Concept Car	Guest Lecturer	7

ST04	MAS.963	Ambient Intelligence	Guest Lecturer	15
ST04	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
FT03	1.961	Sensor Based Monitoring of Physical Infrastructure and the Environment	Guest Lecturer	10
ST03	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
FT02	6.191	Prototyping Research Results	Guest Lecturer	15
ST02	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
FT01	6.191	Prototyping Research Results	Guest Lecturer	10
ST01	Music 250A	Human Computer Interaction Theory and Practice: Designing New Devices (Stanford University)	Guest Lecturer	20
ST01	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
ST01	4.259J	Urban Narratives: Making the City Speak	Guest Lecturer	15
ST00	15.356	Development of Concepts for Very Novel Products and Services	Guest Lecturer	30
ST00	MS-335	Advanced Modular Synthesis (Berklee School of Music)	Guest Lecturer	10
FT99	6.191	Prototyping Research Results	Guest Lecturer	10
ST98	SEM.DL2	Scientific & Engineering Problems...	Guest Lecturer	10
FT97	MAS.962	Interacting w. Synthetic Characters	Guest Lecturer	20
FT97	MAS.846	Workshop in Elastic Movie Time	Guest Lecturer	20
FT97	MAS.825J	Musical Aesthetics & Media Tech.	Guest Lecturer	20
ST97	SEM.DL2	Scientific & Engineering Problems...	Guest Lecturer	10
ST96	SEM.DL2	Scientific & Engineering Problems...	Guest Lecturer	10
ST95	SEM.DL2	Scientific & Engineering Problems...	Guest Lecturer	10
ST94	SEM.DL2	Scientific & Engineering Problems...	Guest Lecturer	10
ST92	SEM.DL2	Scientific & Engineering Problems...	Guest Lecturer	10

Note – Enrollment numbers are estimated from memory, generally accurate to within 20%

20. Publications of Joseph A. Paradiso (Google Scholar h-index 73):

a. Papers in Refereed Journals:

- 1) * Chwalek, P., Kuronaga, M., Zhu, I., Montague, S., Robinson V.C., Lohrmann, J., Gil, C.A.V., Susič, D., Gradišek, A., Schul, J., Paradiso, J.A., Arbetman, M., “High-Res Acoustic and Environmental Data to Monitor *Bombus Dahlbomii* Amid Invasive Species, Habitat Loss,” *Nature Scientific Data*, Vol. 12, No. 1, April 2025.
- 2) *Zhong, S., Chwalek, P., Perry, N., Ramsay, D., Miller, C., Lalanne, D., Alavi, H.S., Paradiso, J.A., “Sensors and Sensibilities: Exploring Interactions for Habitat Comfort with an Environmental-Physiological Sensing Eyewear in the Wild,” *International Journal of Human-Computer Studies*, Volume 200, April, 2025, pg. 103510.
- 3) Röddiger, T., Küttner, M., Lepold, P., King, T., Moschina, D., Bagge, O., Paradiso, J.A., Clarke, C., Beigl, M., “OpenEarable 2.0: Open-Source Earphone Platform for Physiological Ear Sensing,” in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, Vol. 9, No. 1, April, 2025, pp. 1-33.
- 4) Chwalek, P., Coblenz, M., Montague, S., Kuronaga, M., Zhu, I., Paradiso, J.A., “Acoustic data collection in arctic environments during the midnight sun using multi-channel SoundSHROOMs,” *Nature Scientific Data*, Vol. 12, No. 1, February 2025.
- 5) Chwalek, P., Zhong, S., Perry, N., Liu, T., Miller, C., Alavi, H.S., Lalanne, D., Paradiso, J.A., “A dataset exploring urban comfort through novel wearables and environmental surveys,” *Nature Scientific Data*, Vol. 11, No. 1, Article No. 1423, December 2024.
- 6) Wolpert, D.H., Korbelt, J., Lynn, C.W., Tasnim, F., Grochow, J.A., Kardeş, G., Aimone, J.B., Balasubramanian, V., De Giuli, E., Doty, D., Freitas, N., Marsili, M., Ouldrige, T.E., Richa, A.W., Riechers, P., Roldán, E., Rubenstein, B., Toroczkai, Z., Paradiso, J., “Is stochastic thermodynamics the key to understanding the energy costs of computation?” in the Proc. of the National Academy of Sciences, Vol. 121, No. 45, November 2024.
- 7) Wicaksono, I., Tianhong, C.Y, Cheng, T. Danieleescu, A., Zhang, C., Mueller, S., Paradiso, J., Luo, Y., "Design and Fabrication of Multifunctional E-Textiles by Upcycling Waste Cotton Fabrics through Carbonization," *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 8(2), June, 2024, Article 45, pp. 1-31.
- 8) *Ekblaw, A., Cherston, J., Liu, F., Wicaksono, I., Haddad, D.D., Sumini, V., and Paradiso, J.A., “From UbiComp to Universe—Moving Pervasive Computing Research Into Space Applications,” *IEEE Pervasive Computing*, Vol. 22, No. 2, April-June, 2023, pp. 27-42.
2023 IEEE Pervasive Computing Best Paper of The Year Award
- 9) *Najjar, D., Rainbow, J., Timilsina, S. S., Jolly, P., de Puig, H., Yafia, M., Durr, N., Sallum H., Alter, G., Li, J.Z., Xu, G.Y., Walt, D.R., Paradiso, J.A., Estrela, P., Collins, J.J., Ingber, D.E., Lab-on-a-chip multiplexed electrochemical sensor enables simultaneous detection of SARS-CoV-2 RNA and host antibodies,” *Nature Biomedical Engineering*, 6(8), August 2022, pp. 968-978.

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- 10) *Zhao, N., Kodama, E.C., Paradiso, J.A., “Mediated Atmosphere Table (MAT): Adaptive Multimodal Media System for Stress Restoration,” *IEEE Internet of Things Journal*, Vol. 9, No. 23, July 2022, pp. 23614-23625.
- 11) *Chwalek, P., Ramsay, D., Paradiso, J.A., “Captivates: A Smart Eyeglass Platform for Across-Context Physiological Measurement,” *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, Vol. 5, No. 3, Article No. 93, September 2021, pp. 1-32. **Distinguished Paper Award**
- 12) *Wicaksono, I., Cherston, J., and Paradiso, J.A., “Electronic Textile Gaia: Ubiquitous Computational Substrates Across Geometric Scales,” *IEEE Pervasive Computing*, Vol. 20, No. 3, July-Sept. 2021, pp. 18-29.
- 13) *Dementyev, A., Jitosho, R.M., Paradiso, J.A., “Mechanical Imaging of Soft Tissues With Miniature Climbing Robots,” *IEEE Transactions on Biomedical Engineering* 68(10), April 2021, pp. 3142-3150. **Featured Article Selection & Issue Cover**
- 14) Rojas, C., Poulsen, N., Van Tuyl, M., Vargas, D., Cohen, Z., Paradiso, J., Maes, P., Esvelt, K., and Adib, F., “A Scalable Solution for Signaling Face Touches to Reduce the Spread of Surface-Based Pathogens,” *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, Vol. 5, No. 1, Article No. 31, March 2021, pp. 1-22.
- 15) *Zhao, N., Seiting, S., Richer, R., Paradiso, J.A., “Real-time work environment optimization using multimodal media and body sensor network,” *Smart Health*, Vol. 19, March 2021, pp. 1-19.
- 16) *Ananthabhotla, I., Ramsay, D.B., Duhart, C., Paradiso, J.A., “Cognitive Audio Interfaces: Mediating Sonic Information With an Understanding of How We Hear,” *IEEE Pervasive Computing*, Vol. 20, No. 2, February 2021, pp. 36-45.
- 17) Richer, R., Zhao, N., Eskofier, B.M., and Paradiso, J.A., “Exploring Smart Agents for the Interaction with Multimodal Mediated Environments.” *Multimodal Technologies and Interaction*, 4(2), June 6, 2020, pp. 1-18.
- 18) *Ramsay, D.B. and Paradiso, J.A., “The LearnAir Network: Leveraging Sensor Heterogeneity to Improve Air Quality Estimation for the Semantic Web,” in *IEEE Pervasive Computing*, Vol. 18, No. 3, July-September, 2019, pp. 9-20.
- 19) Beker, M., Bobbink, G., Bouwens, B., Deelen, N., Duinker, P., van Eldik, J.; de Gaay Fortman, N., van der Geer, R., van der Graaf, H., Groenstege, H., Hart, R., Hashemi, K., van Heijningen, J., Kea, M., Koopstra, J., Leijtens, X., Linde, F., Paradiso, J. A.; Tolsma, H., Woudstra, M., “The Rasnik 3-Point Optical Alignment System,” *Journal of Instrumentation*, Volume 14, Issue 8, pp. P08010, August 2019.
- 20) *Lapinski M., Brum Medeiros C., Moxley Scarborough D., Berkson E., Gill T.J., Kepple T., Paradiso J.A., “A Wide-Range, Wireless Wearable Inertial Motion Sensing System for

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- Capturing Fast Athletic Biomechanics in Overhead Pitching,” *Sensors* (Basel), 19(17), Aug 21, 2019.
- 21) *Ou, J., Oran, D., Haddad, D.D., Paradiso, J., and Ishii, H., “SensorKnit: Architecting Textile Sensors with Machine Knitting,” *3D Printing and Additive Manufacturing*, Vol. 6, No. 1, February 2019, pp. 1-11.
- 22) *Zhao, N., Reinhart, C.F., Paradiso, J.A., “Image-Based Perceptual Analysis of Lit Environments,” *Lighting Research & Technology*, 51(5), 704-724, 2018.
- 23) *Ananthabhotla, I. and Paradiso, J.A., "SoundSignaling: Realtime, Stylistic Modification of a Personal Music Corpus for Information Delivery", in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)*, December 2018.
- 24) *Dementyev, A., Hernandez, J., Choi, I., Follmer, S., Paradiso, J., “Epidermal Robots: Wearable Sensors That Climb on The Skin,” in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)*, Vol. 4, No. 3, Sept. 2018, pp. 102:1-102:21. **Distinguished Paper Award, Proceedings of the ACM IMWUT (Vol. 2)**
- 25) *Mayton, B., Dublon, G., Russell, S., Lynch, E.F., Haddad, D.D., Ramasubramanian, V., Duhart, C., Davenport, G., and Paradiso, J.A., “The Networked Sensory Landscape: Capturing and Experiencing Ecological Change Across Scales”, *Presence: Teleoperators and Virtual Environments*, 26(2), MIT Press, 2017.
- 26) Nakagaki, K., Follmer, S., Dementyev, A., Paradiso, J.A., Ishii, H., “Designing Line-Based Shape-Changing Interfaces,” *IEEE Pervasive Computing*, Vol. 16, No. 4, October 2017, pp. 36-46.
- 27) *Zhao, N., Azaria, A., Paradiso, J.A., “Mediated atmospheres: A multimodal mediated work environment,” in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)*, Vol. 1, No. 2, June 2017, pp. 31:1-31:23.
- 28) Shilkrot, R., Maes, P., Paradiso, J.A., and Zoran, A., “Augmented Airbrush for Computer Aided Painting (CAP),” *ACM Transactions on Graphics*, Vol. 34, No. 2, March 2015, Article No. 19, pp. 1-11.
- 29) Gillian, N. and Paradiso, J.A., “The Gesture Recognition Toolkit,” *Journal of Machine Learning Research*, Vol. 15, October 2014, pp. 3483-3487.
- 30) *Zoran, A., Shilkrot, R., Goyal, P., Maes, P., Paradiso, J.A., “The Wise Chisel: The Rise of the Smart Handheld Tool,” *IEEE Pervasive Computing*, 13(3), July-Sept. 2014, pp.48-57.
- 31) Ray, S.D, Gong, N.-W., Glicksman, L.R., Paradiso, J.A., “Experimental characterization of full-scale naturally ventilated atrium and validation of CFD simulations,” *Energy and Buildings*, Volume 69, February 2014, pp. 285–291.

- 32) *Zoran, A., Shilkrot, R., Nanyakkara, S., Paradiso, J., “The Hybrid Artisans: A Case Study in Smart Tools,” *ACM Trans. Comput.-Hum. Interact. (ToCHI)*, Vol. 21, No. 3, Article 15 (June 2014), 29 pages.
- 33) *Mittal, M., and Paradiso, J.A., “Ubicorder: A Mobile Device for Situated Interactions with Sensor Networks,” *IEEE Sensors Journal*, Vol. 11, No. 3, March 2011, pp. 818-828.
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- 65) Haddad, D.D. and Paradiso, J.A., “Kinesynth: Patching, Modulating, and Mixing a Hybrid Kinesthetic Synthesizer,” In *Proc. of NIME 2018*, Blacksburg, VA, June 3-6, 2018, pp. 35-36.
- 66) Richer R., Zhao N., Amores J., Eskofier B.M., Paradiso J.A., “Real-time Mental State Recognition using a Wearable EEG,” in *Proc. of the International Conference of the IEEE Engineering in Medicine and Biology Society*, July 17-21, 2018, Honolulu, HI, pp. 5495-5498.
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- 71) Vega, K., Jiang, N., Liu, X., Kan, V., Barry, N., Maes, P., Yetisen, A.K., Paradiso, J.A., “The dermal abyss: interfacing with the skin by tattooing biosensors,” in *Proceedings of the 2017 ACM International Symposium on Wearable Computers - ISWC ’17*, Maui, Hawaii, September 11-15, 2017, pp. 138-145. **Best Paper Award – Honorable Mention**
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- 73) *Cherston, J. and Paradiso, J.A., “Space Webs as Infrastructure for Crawling Sensors on Low Gravity Bodies,” in *Proc. of the 31st Annual AIAA/USU Conference on Small Satellites (SmallSat)*, Logan, Utah, Aug. 1-6, 2017, Paper No. SSC17-P2-03.

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- 75) *Wicaksono, I. and Paradiso, J.A., “FabricKeyboard: Multimodal Textile Sensate Media as an Expressive and Deformable Musical Interface,” in *Proc. of NIME’17*, Copenhagen, Denmark, May 15-19, 2017, pp. 348-353.
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- 93) Benavides, X., Zhu, Chang Long, Maes, P., Paradiso, Joseph A., “KickSoul: A Wearable System for Feet Interactions with Digital Devices,” in Proc. of *ACM UIST (User interface software and technology)* November, 2015.
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- 100) Kleinberger, R., Dublon, G., Paradiso, J.A., and Machover, T., “PHOX Ears: A Parabolic, Head-mounted, Orientable, eXtrasensory Listening Device presented at *International Conference on New Interfaces for Musical Expression (NIME ’15)*, Baton-Rouge, LA, 2015.
- 101) Kao, H-L., Dementyev, A., Paradiso, J.A., and Schmandt, C., “NailO: Fingernails as Input Surfaces,” in the *Proceedings of the International Conference on Human Factors in Computing Systems (CHI’15)*, Seoul Korea, April 2015, pp. 3015-3018. **Honorable Mention for Best Paper**
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- 114) *Gong, N.-W., Zoran, A., Paradiso, J.A., “Inkjet-printed Conductive Patterns for Physical Manipulation of Audio Signals,” in the *Adjunct Proceedings of the 26th annual ACM symposium on User interface software and technology (UIST 2013)*, pp. 13-14.
- 115) *Mayton, Brian D., Zhao, N., Aldrich, M., Gillian, N., Paradiso, Joseph A., “WristQue: A personal sensor wristband,” in *Proc. of the IEEE International Conference on Wearable and Implantable Body Sensor Networks (BSN '13)*, pp.1-6, 2013. **Best Session Paper**
- 116) *Zoran, A. and Paradiso, J.A., “FreeD – A Freehand Digital Sculpting Tool”, in The 31st International Conference on Human Factors in Computing Systems (CHI '13). ACM, Paris, France, April/May 2013, pp. 2613-2616. **Best Paper Award**
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- 118) *Joliat, N., Mayton, B., Paradiso, J.A., “Spatialized Anonymous Audio for Browsing Sensor Networks Via Virtual Worlds,” in *The 19th International Conference on Auditory Display (ICAD)*, Lodz, Poland, July 2013, pp. 67-75.

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- 130) *Reben, A. and Paradiso, J.A., "A Mobile Interactive Robot for Gathering Structured Social Video," in *Proceedings of ACM Multimedia '11*, Scottsdale, Arizona, Nov. 28-Dec. 1, 2011, pp. 917-920.

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- 149) *Ari Y. Benbasat and Joseph A. Paradiso, “A Framework for the Automated Generation of Power-Efficient Classifiers for Embedded Sensor Nodes,” in *Proceedings of the 5th ACM Conference on Embedded Networked Sensor Systems (SenSys'07)*, November 6–9, 2007, Sydney, Australia, pp. 219 - 232.
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- 93) Paradiso, J., "Application of Miniature Cameras in Video Straightness Monitor Systems," GEM Collaboration Report (SSCL), GEM-TN-94-608, June 1994.
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- 100) Paradiso, J., "Analysis of an Alignment Scheme for the GEM Muon Barrel," GEM Collaboration Report (SSCL), GEM-TN-92-150, October 1992.
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- 103) My presentations have been archived in the following GEM collaboration meeting compilation documents:
 - "*Alignment Concepts*" in GEM Muon Group Meeting – Tucson (GEM TN-9280, March 8, 1992),
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“Alignment” in GEM Muon Review Meeting – SSCL, (GEM TN-93381, March 16, 1993)

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- 116) Fehlmann, J., Paradiso, J., Viertel, G., "Drift velocities and spatial distributions of Electrons in several Gas mixtures," L3 Collaboration Technical Note 83, February 1982.
- 117) Fehlmann, J., Paradiso, J., Viertel, G., "Status report on TEC Development," L3 Collaboration Technical Note 81, February 1982.
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- 122) Paradiso, J., "Characteristics of Muon Pair Production in P-P Collisions at Very High Energies as a Probe of Proton Constituents," PhD Thesis, MIT Physics Dept., April 1981.
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- 124) Paradiso, J., "Design and Test of a Simple Peak-Gated Sampler," Draper Intralab Memorandum ESC-93-310, November 23, 1993.
- 125) Paradiso, J., "Backgammon Electronics: Past, Present, & Future," Draper Intralab Memorandum EJC-91-1100, October 13, 1991.
- 126) Paradiso, J., "The Backgammon Timing/Gating Utility," Draper Intralab Memorandum EJC 91-1101, October 12, 1991.
- 127) Paradiso, J., "The Quadrature Sampler," Draper Intralab Memorandum EJC 91-1029, May 30, 1991.
- 128) Paradiso, J., "Electronics for Testing the Wideband Monopulse Sonar," Draper Intralab Memorandum EJB-91-029, March 20, 1991.
- 129) Paradiso, J., "Sonar Application of a Quadrature-Sampled Interpolation Beamformer," Draper Intralab Memorandum EJB 90-191, December 31, 1990.

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- 130) Paradiso, J., "Methods of Smoothing CMG Gimbal Rates Calculated by Linear Programming," Draper Intralab Memorandum SpaceStation-87-20, November 20, 1987.
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- 132) Paradiso, J., "Selection and Management of Magnetically Gimbaleed CARES Gyroscopes via Linear Programming," Draper Intralab Memorandum SpaceStation-86-19, December 1, 1986.
- 133) Paradiso, J., "An Efficient OFS-Compatible Kinematic Model for Generalized CMGs," Draper Intralab Memorandum SpaceStation 85-9, March 25, 1985.
- 134) Paradiso, J., "Versatek Software," Draper Intralab Memorandum MX/S-005, August 1, 1977.
- 135) Paradiso, J., "Sigma 5 Calcomp Plotting Package," Draper Intralab Memorandum, TEST-099-75, August 15, 1975.

Other Technical Reports

- 136) Paradiso, J., Borque, L., Bramsen, P., Laibowitz, M., Ma, H., and Malinowski, M., "Sensing Systems for Glass Ceramic Cooktops," Internal MIT Media Lab Report, July 18, 2003 (38 p).
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- 141) Paradiso, J., "The Complete Technical Guide to WMFO," a tutorial on the design of a radio studio and associated electronics, March 1987 (283 p).
- 142) Paradiso, J., "Reaction Wheel Energy Storage," Draper Laboratory Internal Report, January 17, 1992 (50 p).
- 143) Paradiso, J., "A Brief Sketch of Proposed TEC Data Flow," ETH-Zurich Time-Expansion-Chamber (TEC) Group Technical Report, April 29, 1983 (6 p.).

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- 144) Paradiso, J., "Description of TEC Analysis Utility Routines," ETH-Zurich Time-Expansion-Chamber (TEC) Group Technical Report, April 20, 1983 (16 p).
- 145) Paradiso, J., "The Design, Construction, and Operation of an Electronic Music Synthesizer," Tufts University Electrical Engineering Department Undergraduate Special Project Report (**Winner of the 1977 Burden Engineering Prize**), May 1977 (140 p).

* Outgrowth of supervised thesis

21. Invited Lectures, Seminars, Panels, Performances, and Exhibitions:

- 1) Opening Keynote, MIT/Harvard AI Film Hackathon, Cambridge MA, *Rise of Our Electronic Id*, February 16, 2025.
- 2) Invited Colloquium, EPFL Laboratory of Intelligent Systems, Lausanne Switzerland, *Towards Human Augmentation*, February 4, 2025.
- 3) Closing Keynote Lecture, CUSO Winter School on AI/Human Interaction, Champéry, Switzerland, *Approaching the Augmented Human*, Jan. 31, 2025.
- 4) Closing Keynote, Recanati Smart Land Conference, Recanati, Italy, *Wearable and Dense In-Situ Sensing for Building Control and Human Interaction*, July 4, 2024.
- 5) Kickoff Keynote, MIT Media Lab x Smart Living Lab Workshop, University of Fribourg, Switzerland, *An Introduction to Sensing, Hardware, and Visualization*, Jan. 15, 2024.
- 6) Panel Moderator, A3E Session at NAMM 2025, *Launching AI onto the Live Stage: Jordan Rudess on the Future of Generative AI for Live Music Performances*, Jan. 25, 2025.
- 7) Invited Lecture and Panel, MIT Faculty Leadership Seminar, Cambridge MA, *Some notes on MIT Leadership*, October 15, 2024.
- 8) Panel Moderator, Audio Engineering Society (AES 2025) Convention, New York, NY, *Towards AI-augmented Live Music Performances*, October 10, 2024.
- 9) Invited talk, MIT task force on the Future of the Arts at MIT, Cambridge MA, *Some Reflections on the Arts at MIT*, October 8, 2024.
- 10) Invited Panelist and Presenter at the 2024 DDes Conference, “RealTimeNature” at the Harvard Graduate School of Design Piper Auditorium, Cambridge MA, *Uncanny Valley Session*, September 27, 2024.
- 11) Invited talk, The 12th Edition of the Large Hadron Collider Physics (LHCP) Conference, Northeastern University, Boston MA, *Making Music From Physics & a tour through related projects at the MIT Media Lab*, June 7, 2024.
- 12) Invited Seminar, Epoch Foundation, Taipei, Taiwan, *Scaling Embedded Human Connection*, May 22, 2024.
- 13) Invited Seminar, TSMC Corporation, Taiwan, *Scaling Embedded Human Connection*, May 21, 2024.
- 14) Invited talk, Canadian Imperial Bank of Commerce (CIBC) AI Seminar, Cambridge, *A Saga of Sound, Sensing, Hardware, & AI*, May 1, 2024.
- 15) Invited talk, Martin Family Trust Dirt Road Session, MIT Cambridge, *Wearable and dense in-situ sensing for building control*, April 4, 2024.

- 16) Invited talk, MIT Morningside/HPI (Hans Plattner Institute) Seminar, Cambridge MA, *Sensing Systems for Environmental Monitoring*, March 21, 2024.
- 17) Invited Keynote, Festival of Learning, Institute for Future Technologies at the De Vinci Innovation Center, Paris, France, The Future of Sensory Entrepreneurship: Creating Human-Centered Experiences Session, *A Saga of Sound, Sensing, Hardware, and Visualization*, March 7, 2024.
- 18) Featured Lecture, Swiss Museum of Electronic Music (SMEM), Fribourg, Switzerland, *Hatched in Zürich and Honed at MIT - A Sonic Tour Through Time and Technology Featuring the Paradiso Synthesizer*, January 18, 2024.
- 19) Invited speaker to represent MIT, Alexander W. Dreyfoos Memorial, Kravis Center, West Palm Beach, Florida, *Remembering Alex Dreyfoos*, November 13, 2023.
- 20) Computer Science Department Colloquium, San Diego State University (SDSU), *Sensing and Connecting Across Scales*, November 3, 2023.
- 21) Invited Talk, Materials Science Department, FCT NOVA (Nova School of Science and Technology), Lisbon, Portugal, *Sensing and Connecting Across Scales*, October 18, 2023.
- 22) Invited Panelist, Body Sensor Networks Conference (BSN 2023), Cambridge MA, Session on: *The past, present, and Future of Body Sensing and Digital Health*, October 9, 2023.
- 23) Invited Keynote, AFFOA Annual Meeting, Boston, MA, *The Age of Sensate Media*, September 26, 2023.
- 24) Invited Academic Lecture, Qualcomm Inc., San Diego, CA, *Sensing and Connecting Across Scales*, August 21, 2023.
- 25) Invited Talk, Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT) Scientific Event and General Assembly, Montreal Canada, *Knitted Textiles for Musical Control and Interaction*, May 25, 2023.
- 26) Invited Lecture, New England Synthfest Spring Meeting, Burlington MA, *Between My Basement and the Media Lab: Designing New Synth Modules, Cool Hacks, and Musical Controllers*, April 22, 2023.
- 27) Invited Opening Keynote, Harvard Reality Hackathon, Cambridge MA, *Take Me To Your Future*, April 14, 2023.
- 28) Invited Seminar, Amazon Robotics, North Reading MA, *Sensing and Connecting Across Scales*, March 17, 2023.
- 29) Invited Keynote, Institute for Future Technologies at the De Vinci Innovation Centre (DVIC), Paris France, *Sensing and Connecting Across Scales*, March 9, 2023.

Presentations by Joseph A. Paradiso (cont.)

- 30) Discussion Leader, ‘Sisters With Transistors’ screening at Bartos Theater, Cambridge MA, *Launched discussion and led Q&A on the historical role of women in electronic music*, March 3, 2023.
- 31) Invited Opening Keynote, MIT Reality Hackathon, Cambridge MA, *Take Me To Your Future*, January 12, 2023.
- 32) Invited Talk in the “Beyond The Elephant In The Room” Symposium, MIT Media Lab Southeast Asia Forum, Bangkok, Thailand, *Living in X-Reality: The Generalization of Presence as Real and Virtual Collide*, December 19, 2022.
- 33) Invited Talk in the “Beyond The Elephant In The Room” Symposium, MIT Media Lab Southeast Asia Forum, Bangkok, Thailand, *Some Perspectives on Humans and Space*, December 19, 2022.
- 34) Invited Panelist, IEEE Metaverse Congress, Session 5: Behind and Beyond the Metaverse, Online Webinar, *XV (eXtended meta/uni/Verse) Panel*, December 8, 2022.
- 35) Invited Lecture, McKinsey Digital NA Leadership Summit, Boston MA, *Living in Metaversality: The Generalization of Presence as Real and Virtual Collide*, May 3, 2022.
- 36) Invited Keynote, Osmocosm ’22 Conference, Cambridge MA, *Scalable Presence: The Multi-Sensory Nature of Future Media*, October 20, 2022.
- 37) Invited Keynote, European Workshop on Wireless Sensor Networks (EWSN 2022), Linz Austria, *Sensing and Connecting Across Scales*, October 4, 2022.
- 38) Invited Talk, NSF Workshop on The Thermodynamics of Natural and Artificial Distributed Computational Systems, Santa Fe Institute, Santa Fe, New Mexico, *Sensor Network Testbeds*, August 15, 2022.
- 39) Opening Keynote, Wearable Technologies 2022, San Francisco, CA, *Looking Past The Goggles: New Ways Wearables Will Bridge Real & Virtual*, July 26, 2022.
- 40) Invited JPL-Wide Talk, NASA Jet Propulsion Laboratory (streamed online), *Sensing and Connecting Across Scales*, July 19, 2022.
- 41) Invited Talk, International Conference on Learning Representations (ICLR), AI for Earth Science Workshop, *Connecting With A Restored Wetland Via a Large-Scale Multimodal Sensor Deployment*, Online Session, April 29, 2022.
- 42) Invited Lecture, ‘Designers Worth Knowing’ Speaker Series, Technology Leaders Program, University of Virginia, *A Selection of Recent ResEnv Work*, February 24, 2021.
- 43) Invited Presentation, Distinguished Engineers Meeting, Honeywell, Inc., (online), *Sensor Systems Across Scales*, February 23, 2022.

- 44) Special Briefing to Comcast Technical Management (video segment), *Experience Re-Experienced*, February 11, 2021.
- 45) Invited Panelist, IEEE BSN/BHI 2021 (online), BHI-BSN Roadmap: The Celebration – Godfathers of BSN Segment, *BSN Retrospective*, July 28, 2021.
- 46) Invited Panelist, MIT Department Heads Meeting, Special Panel on *Engaging with Students*, Online, July 15, 2021.
- 47) Invited Panelist, MIT New Faculty Orientation, Special Panel on *Handling Challenging Meetings with Student Advisees*, August 31, 2021.
- 48) Invited Lecture, Politecnico Milano, Design Exploration: Towards a Moon Architecture Seminar Series, *Some Perspectives on Humans and Space*, September, 22, 2021.
- 49) Invited Interview with Gerfried Stocker (director), Ars Electronica Festival, Linz Austria, *Art Thinking*, Session on Ars Electronica Channel, September 12, 2021.
- 50) Invited Keynote Speaker, Pro²Future Partner Conference and HQ Opening, Johannes Kepler Universität (JKU), Linz, Austria, *What's New at ResEnv (with a touch of AI)*, Sept. 9, 2021.
- 51) Invited Keynote Talk, 25th Anniversary of the Graduate School of Informatics, Middle East Technical University (METU), Ankara, Turkey (online), *Examples of How AI, Shared Environments, & Distributed Sensing are Changing Interaction*, October 22, 2021.
- 52) Invited Lecture, Politecnico Milano, Design Exploration: Architecture for Human Space Exploration, *Some Perspectives on Humans and Space*, November, 20, 2020.
- 53) Invited Seminar, University of Bologna, EE Department, *Sensory Augmentation in a Post-IoT World*, February 16, 2020
- 54) Invited Opening Lecture, EU Copernicus 'Space Economy' Hackathon, Vincenza, Italy, *Hacking for Space*, February 15, 2020.
- 55) Keynote Lecture, 1st Summit for Digital and Space Economy for SMEs, Vincenza, Italy, *Space: Yesterday's Dreams, Today's Boom, Tomorrow's Reality*, February 14, 2020.
- 56) Invited talk, NSF Tripod Grant Kickoff, Tufts University, Medford MA, *Data as the Canvas of Future Artists*, January 31, 2020.
- 57) Invited lecture, ETH Circle Spotlight Event at the ETH Pavilion at Davos, Switzerland, *Building Synthesizers at ETHZ in 1983*, January 23, 2020.
- 58) Invited panelist, Rethinking Creativity Session at the ETH Pavilion at Davos, Switzerland, January 22, 2020.

- 59) Podcast Session, ETH News, *Joe Paradiso and his passion for the sound of the ETH parking garage*, Recorded February 20, 2020, Posted at: <https://ethz.ch/en/news-and-events/eth-news/news/2020/01/podcast-joe-paradiso.html> .
- 60) Opening keynote, MIT AR Hackathon, MIT 10-250, Cambridge MA, *Welcome To Our Networked Future in a Post-IoT World*, January 16, 2020.
- 61) Invited talk, TU Berlin, Institut für Ökologie, Smart Nature Session for Tegel Projekt Leadership, *Tidmarsh @ Tegel*, December 4, 2019.
- 62) Invited talk at the Colloque Léonard de Vinci, ESILV Pole Léonard de Vinci, La Défense, Paris, *La recherche – Les Sciences: Forges For Future Leonardos*, 12/3/2019.
- 63) Invited talk, MIT Future of Fabric Summit, Cambridge MA, *Smart Fabrics for Responsive Environments*, November 22, 2019.
- 64) Keynote Lecture, Texas Wireless Summit, UT Austin, *How We Will Connect To Our Networked Future in a Post-IoT World*, November 12, 2019.
- 65) Keynote Lecture, 50 Jahre Informatik an der JKU Celebration, Johannes Kepler Universität, Linz Austria, *How We Will Connect To Our Networked Future in a Post-IoT World*, November 8, 2019.
- 66) Invited Seminar, Analog Heaven Northeast (AHNE) Event, Burlington, MA, *Designing and fielding custom synths & music controllers over a quasi-lifetime*, September 19, 2019.
- 67) Invited Lecture, Fraunhofer IML, Dortmund Germany, *An Introduction to ResEnv, The Media Lab, and Beyond*, September 25, 2019.
- 68) Invited Talk, NASA/JPL, Pasadena California, *An Introduction to ResEnv, The Media Lab, and Beyond*, September 12, 2019.
- 69) UC Berkeley EECS Colloquium, *How We Will Connect to Our Networked Future in a Post-IoT World*, Berkeley, CA, September 4, 2019.
- 70) MIT New Faculty Orientation Seminar, *Some notes on building your research team,* MIT Samberg Center, August 28, 2019.
- 71) Invited Talk, University of Dortmund Engineering and Logistics Depts, *Looking Past the Internet of Things – How We Will Connect To Our Networked Future*, Dortmund Germany, May 22, 2019.
- 72) Panel Leader, MIT Faculty Leadership Program, Work Design and Personal Productivity Segment, *Time Management Session*, Samberg Center, MIT Cambridge, May 30, 2019.
- 73) Kickoff lecture and panel chair, *The Future of Homo Sapiens* Event, MIT 26-100, Cambridge MA, March 7, 2019.

Presentations by Joseph A. Paradiso (cont.)

- 74) Black Mirror Technical Seminar, MIT Media Lab, Cambridge MA, *Prelude to Metalhead – Power Management, Ubicomp, Localization, & Drones...*, February 21, 2019.
- 75) Invited Lecture, MIT Super-UROP Seminar, MIT Stata Center, *Responsive Environments for Super UROPs*, February 14, 2019.
- 76) Invited Talk, NASA/TRISH Workshop on Spaces in Space: Optimizing Behavioral Health and Cognitive Performance in Confined Environments, *Towards Responsive Environments for Space Missions*, February 7, 2019.
- 77) Invited Talk, HubMontreal, Montreal QC, Canada, *How Humans will Connect to Our Networked Future*, November 14, 2018.
- 78) Invited Talk to the AMS Collaboration, CERN Geneva, Switzerland, *Looking Past The Internet of Things – How Humans Will Connect To Our Networked Future*, November 6, 2018.
- 79) Invited Keynote, Ergo'IA Conference, Biarritz, France, *Looking Past The Internet of Things (from an anti-disciplinary perspective)*, October 4, 2018.
- 80) Invited Keynote, Human Experience and Technology: Future Perspectives Symposium, University of Macerata, Italy, *How Humans Will Connect To Their Environments in the PostApp Age*, October 17, 2018.
- 81) MIT New Faculty Orientation Seminar, *Some notes on building your research team,* MIT Samberg Center, September 24, 2018.
- 82) Invited Talk, MIT Science and Engineering Program for Teachers, MIT Building 26 TEAL Center, Cambridge MA, *From Smart Buildings to Smart Planets – A Personal Voyage...*, June 29, 2018.
- 83) Invited Lecture, Beyond Smart Cities Professional Course, MIT Media Lab, Cambridge, MA, *From Smart Buildings to Smart Planets*, June 27, 2018.
- 84) Invited Talk, Workshop on On-Body Interaction: Embodied Cognition Meets Sensor/Actuator Engineering to Design New Interfaces, Schloss Dagstuhl (Leibnitz Center for Informatics), Germany, *What is a Wearable*, May 21, 2018.
- 85) Invited Talk, TechConnect 2018, Anaheim, CA, *Beyond Visualization- Vivid Frameworks for Ubiquitous Sensor Data*, May 15, 2018.
- 86) Invited Talk, MIT International Office Hangzhou/Wanxiang Seminar, *From Smart Buildings to Smart Planets*, Hangzhou China, March 21, 2018.
- 87) Invited Talk and Panelist, SXSW 2018 (Technology + Buildings: Creating a New Experience), Austin TX, *From Smart Buildings to Smart Occupants*, March 13, 2018.

- 88) Panel Moderator, ‘Our Sci-Fi Space Future’ panel, Beyond The Cradle symposium, MIT Media Lab, Cambridge MA, March 10, 2018.
- 89) Invited Talk and Panelist in Session EC11 – Teaching Electronic Musical Instrument Design: Technologies and Techniques, Audio Engineering Society Annual Meeting (AES’17), Javits Center, New York City, *15 Years of Teaching Musical Controllers, etc. @ The MIT Media Lab*, October 20, 2017.
- 90) Opening Keynote, IOT Solutions World Congress (IOTSWC), Barcelona Spain, *Live After The App – How Humans Will Connect With The Internet of Things*, October 3, 2017.
- 91) Panelist in AI and IoT session, IOT Solutions World Congress (IOTSWC), Barcelona Spain, October 5, 2017.
- 92) Invited Talk, MIT ESI/CI Workshop on Advancing Conservation with Artificial Intelligence, Samberg Center, MIT Cambridge, *Connecting to The Tidmarsh Wildlife Sanctuary*, September 18, 2017.
- 93) Invited NASA/JPL LEAP Innovation series talk, NASA/JPL, Pasadena, CA, *How Humans Will Connect to Ubiquitous Sensing*, July 25, 2017.
- 94) Invited Talk, 2017 UW CSE/MSR Summer Institute - "Unpacking the Future of IOT," *Pre-Cognitive Human Extension as the Future of IoT*, August 1, 2017.
- 95) Invited Talk, Annual MIT President’s CEO Advisory Board Meeting, Samberg Center, MIT Cambridge, *How Humans Will Connect to The Internet of Things*, June 21, 2017.
- 96) Invited Talk, ‘Electronically-Augmented Instruments’ Session of the Acoustics Society of America (ASA) Annual Meeting, Boston MA, *Astounding Sounds, Amazing Music at the Crossroads of Audio Control*, June 26, 2017.
- 97) Invited Talk, Nordic Smart Building Convention, Helsinki Finland, *Smart Spaces as Pre-Cognitive Human Extension*, June 15, 2017.
- 98) Invited Lecture, Open Music Initiative Workshop, IDEO Studio, Cambridge MA, *Music <-> Data*, June 6, 2017.
- 99) The Dennis Gabor Lecture, Imperial College Electrical Engineering Department, London UK, *Life After The App – How Humans Will Connect to Ubiquitous Sensing*, May 25, 2017.
- 100) Invited Colloquium, University of Aveiro, Portugal, *Augmented Human Interaction with Nature, Buildings, and Things*, May 3, 2017.
- 101) Invited Colloquium, University of Aveiro, Portugal, *Two Decades of Responsive Environments at the MIT Media Lab*, May 5, 2017.

- 102) Invited Colloquium, Technical University of Lisbon (Instituto Superior Técnico Lisboa), Lisbon, Portugal, *Life After The App – How Humans Will Connect To The Internet of Things*, May 2, 2017.
- 103) Panel Participant, ‘The Future of Space Research’ panel, Beyond The Cradle symposium, MIT Media Lab, Cambridge MA, March 12, 2017.
- 104) Invited Talk, Dagstuhl Workshop on Ambient Notification Environments, Schloss Dagstuhl, Germany, *Notifications vs. Augmentation*, April 17, 2017.
- 105) Invited Lecture, Singularity U, INK India, Mumbai, *Life After IoT*, April 8, 2017.
- 106) Invited Lecture, Voltage Connect Conference, Berklee School of Music, Boston, MA., *The Modular Resurgence – Déjà vu or Something New?*, March 11, 2017.
- 107) Invited Talk, MIT Living Observatory Summit, MIT Cambridge MA, *Sensing & Interaction for the Networked Landscape*, March 1, 2017.
- 108) Invited Panelist, *Future of Wireless Session*, IEEE Globecom 2016, Washington DC, December 7, 2016.
- 109) Invited Inspirational Lecturer, YouthConnect 2016, Expo 2020, Dubai UAE, 19 November 2016.
- 110) Keynote Lecture, Intel Software Professionals Conference, Hillsboro Oregon, *Beyond IoT – Ubiquitous Sensing and Human Experience*, October 19, 2016.
- 111) Invited Colloquium, Johannes Kepler University, Linz Austria, *Beyond IoT – Ubiquitous Sensing and Human Experience*, September 2016.
- 112) Invited Panelist and talk, Ars Electronica 2016, Linz Austria, ‘Radical Atoms’ Panel, *From Sensory Landscapes to Radical Subatoms*, September 9, 2016.
- 113) Keynote Lecture, IEEE PIMRC 2016, Valencia Spain, *Beyond IoT – Ubiquitous Sensing and Human Experience*, September 6, 2016.
- 114) Invited Colloquium, Bose Corporation, Framingham MA, *Beyond IoT – Ubiquitous Sensing and Human Experience*, August 27, 2016.
- 115) Invited talk in the ‘Personalized Computing with Interconnected Wearables’ session *Fun With Wearables*, at the *17th Annual Microsoft Research Summit*, Redmond WA, July 13-15, 2016.
- 116) Kickoff Lecture, MIT & Berklee School of Music’s Open Music Initiative, *Some Musical Frontiers*, Cambridge MA, July 11, 2016.
- 117) Invited Lecture, Institut des Systèmes Complexes, Paris France, *Beyond IoT – Ubiquitous Sensing and Human Experience*, June 21, 2016.

- 118) Keynote Lecture, MIT World Real Estate Forum, *Beyond IoT – Ubiquitous Sensing and Human Experience*, May 19, 2016.
- 119) Invited talk at the *Environmental IoT: Taking Advantage of Chile's Natural Laboratories Conference*, Santiago, Chile, April 18-19, 2016.
- 120) Invited Talk at the ATLAS Outreach Session, CERN Geneva, *A Collaboration Between ATLAS and the MIT Media Lab to Build a Generalized Framework for Data-Driven Music*, February 23, 2016.
- 121) Video Lecture on sensing applications for the Internet of Things for the EDx Online Course *Connected World: Technology of The Internet Of Things (IoT)*, 2016.
- 122) Invited talk, Qualcomm Inc., *Beyond IoT - Ubiquitous Sensing and Human Experience*, San Diego CA, December 9, 2015.
- 123) Invited panelist, IEEE GlobeComm 2015, *Wearables: Our Experiences and Thoughts for the Future*, San Diego CA, December 8, 2015.
- 124) Distinguished Lecture Series, University of Michigan Computer Science and Engineering Dept., Ann Arbor MI, *Connecting with the Emerging Nervous System of Ubiquitous Sensing*, November 6, 2015.
- 125) Invited Panelist and talk, Chicago Ideas Week 2015, Chicago, IL, *Disruptive Innovation*, October 15, 2015.
- 126) Invited talk, Visualized 2015, *Redefining Presence Through Ubiquitous Sensing*, New York, NY, October 8-9, 2015.
- 127) Invited talk, Capital Magazine's Internet of Things Summit Meeting, Istanbul, Turkey, *Beyond IoT - Connecting with the Emerging Nervous System of Ubiquitous Sensing*, September 30, 2015.
- 128) Invited keynote, IoT Solutions World Congress (IoTS), Barcelona Spain, *Things That Think*, September 17, 2015.
- 129) Invited talk, KTH iPack Center Annual Meeting, Stockholm (Svartsjö), Sweden, *Beyond IoT – Ubiquitous Sensing and Human Experience*, August 28, 2015.
- 130) Invited talk, Huawei Strategy and Technology Workshop (STW), Shenzhen China, *Beyond 'Big Data' – Ubiquitous Sensing and how it will interact with people*, May 20, 2015
- 131) Invited talk, Toshiba Corporate R&D Center, Network System Laboratory, Kawasaki Japan, *At the Edges of 'Big Data'*, March 26, 2015.
- 132) Invited talk and panelist, Safecast Conference 2015, Tokyo Japan, *Art x Science – Connecting People to Environmental Sensing*, March 22, 2015.

- 133) Invited talk, Strategies in Light Conference, Las Vegas, NV, *New Interface Paradigms for Lighting Control*, February 26, 2015.
- 134) Invited keynote lecture, Guthman Musical Instrument Competition, Georgia Tech, Atlanta GA, *40 Years of Music & Technology in 20 Minutes*, February 20, 2015.
- 135) Invited panelist at the 2015 Harvard National Collegiate Research Conference (NCRC), Environmental Engineering session, January 23, 2015.
- 136) Welcome address, MIT Media Lab India's Design Innovation Workshop, PDPU, Gandhinagar, India, January 17, 2015.
- 137) Invited talk, Smart Device Innovation Science Team, Intel Corporation, Santa Clara CA, *At the Edges of 'Big Data'*, November 10, 2011.
- 138) Invited panelist and talk, Re-Think Food Conference, Culinary Institute of the Arts, St. Helena CA, *The Virtualization of Food*, November 9, 2011.
- 139) Invited conference keynote, IEEE Dallas Circuits and Systems Conference 2014, University of Texas at Dallas, TX, *At the Edges of 'Big Data'*, October 13, 2014.
- 140) Invited panelist and talk, 2014 LVP (Longworth Venture Partners) Tech Gathering, Internet of Things Panel, Cambridge MA, October 6, 2014.
- 141) Invited talk, MIT Physics Dept. Faculty Lunch Seminar, MIT Cambridge MA, *At the edges of 'Big Data'*, September 25, 2014.
- 142) Invited talk and panelist, MIT-KIT (Kerberos and Internet Trust) Annual Conference, Cambridge MA, *At the Edges of 'Big Data'*, September 18, 2014.
- 143) Invited video interview, panel discussion, and mini documentary about the future of networked sensors and our Tidmarsh Project, *John Roese – ReallTy*, EMC Innovation Network, September 11, 2014, <https://community.emc.com/docs/DOC-36727>.
- 144) Invited Keynote Speaker, Annual Retreat for the Intel Science and Technology Center for Pervasive Computing (ISTC-PC) at U. Washington, Alderbrook Resort, WA, *At the Edges of 'Big Data'*, August 12, 2014.
- 145) Faculty representative and conference panelist, Hackathon Natura Campus Media Lab, Natura Campus, Cajamar SP, Brazil, August 6, 2014.
- 146) Invited talk, MIT Media Lab @ Tokyo 2014, Tranomon Hills Forum, Tokyo Japan, *Where Big Data Touches People* July 10, 2014.
- 147) Invited corporate talks in Japan: NEC Research Lab, Kawasaki; TOPPAN, Koishikawa, Panasonic Headquarters, Osaka; Toshiba R&D Center, Kawasaki, *Where Big Data Touches People*, July 7-9, 2014.

- 148) Session host and speaker, Forum Academy Global Technology Outlook Online Lecture Series on Sensor Networks, World Economic Forum, July 2014:
https://forumacademy.weforum.org/courses/ForumAcademy/PLM14101/Summer_2014/about
- 149) Invited talk and coordinator of the Sensors Track for the MIT Media Lab Boost Week In Kenya, iHub Nairobi, *Where Big Data Touches People*, May 26, 2014.
- 150) Invited panelist, Together Festival, 'I Dream of Wires Documentary Screening and Discussion,' ICA Boston, May 18, 2014.
- 151) Outreach lecture, Brooks Elementary School, Medford MA, *A Tour Through Space, as We Search for Extraterrestrial Life*, April 30, 2014.
- 152) Invited session organizer and presenter, 'New Musical Frontiers @ the MIT Media Lab,' Moogfest 2014, Asheville North Carolina, *Musical Machines*, April 25, 2014.
- 153) Invited colloquium, TU Delft (Delft University of Technology), Department of Radiation Science & Technology, Delft, Netherlands, *Where Big Data Meets People*, April 17, 2014.
- 154) Invited panelist and talk, Machine Fantasies: A Workshop on Music Technologies–Past, Present, and Future ('Futures' Session), Tufts University, Medford MA, April 5, 2014.
- 155) Invited talk, 2014 EMC Technology Conference (D² - Disruptive Discovery), Cambridge MA, *Where Big Data Meets People*, April 3, 2014.
- 156) Invited keynote, Intel IPG Leadership Summit, Folsom CA, *Where Big Data Meets People*, March 5, 2014.
- 157) Invited talk and coordinator of the Sensors and Networks track for the Media Lab 2104 CREATE | ITERATE | INNOVATE Workshop, *Where Big Data Meets People*, Abu Dhabi, UAE, February 27, 2014.
- 158) Invited keynote, Design Innovation Workshop, WeSchool, Mumbai India, *Where Big Data Meets People*, February 1, 2014.
- 159) Invited colloquium, CEA Saclay Nano-INNOV, Paris France, *Where Big Data Meets People*, December 13, 2013.
- 160) Invited talk, Energy Harvesting & Storage USA, Santa Clara, CA, *Where Big Data Meets People*, November 21, 2013.
- 161) Invited panelist and talk, MIT Energy Initiative's 2013 Fall Research Conference, Cambridge MA, 'Potential Impacts of Big Data' Session, *Where Big Data Meets People*, October 3, 2013.

- 162) Invited lecture, 2013 International Symposium on Creative New-Media Performance, Shanghai Theatre Academy, Shanghai China, *Redefining Presence, Documentary, and Music – Media Transformation in the Age of Ubiquitous Computing*, September 29, 2013.
- 163) Invited keynote lecture, IEEE Custom Integrated Circuits Conference (CICC) 2013, San Jose CA, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, September 24, 2013.
- 164) Invited presentation, World Economic Forum Summer Davos, Dalian, China, IdeasLab: Rethinking Education with the Massachusetts Institute of Technology, *Learning in the Age of the Augmented Human*, Dalian China, September 11, 2013.
- 165) Invited talk, Annual Workshop of the iPack Center at KTH, Stockholm, Sweden, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, August 30, 2013.
- 166) Invited talk, ‘Curious Minds’ Lecture Series, Steelcase Inc., Grand Rapids, Michigan, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, July 30, 2013.
- 167) Invited lecture, HCC Summer School, IRCAM Paris, France, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, July 19, 2013,
- 168) Invited lecture, The MITRE Institute, Bedford MA, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, June 18, 2013.
- 169) Invited talk, Nokia Research Center (NRC), Sunnyvale CA, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, June 7, 2013.
- 170) Invited conference keynote, Sensors Expo, Chicago, IL, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, June 5, 2013.
- 171) Invited keynote speaker, EU HCC (Human-Computer Confluence) Visions Meeting, Barcelona Spain, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, May 17, 2013.
- 172) Invited talk, 2013 Future of Health Technology Summit, Cambridge MA, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, May 6, 2013.
- 173) Invited talk, 2013 MIT ICT Conference, Cambridge MA, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, April 25, 2013.
- 174) Interview filmed for Physics World, *Networked Environments of the Future*, April 11, 2013, <http://physicsworld.com/cws/article/multimedia/2013/apr/11/networked-environments-of-the-future>.
- 175) Invited colloquium, Qualcomm San Diego, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, April 2, 2013.

Presentations by Joseph A. Paradiso (cont.)

- 176) Invited lecture, Wilfrid Laurier University, EMTM Executive Breakfast Series, Waterloo Ontario, *Our Electronic Nervous System*, March 5, 2013.
- 177) Invited talk, Deloitte, Washington D.C., *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, January 29, 2013.
- 178) Invited talk, CERTI Laboratories, Florianópolis, Brazil, *Connecting Deeply Embedded Sensing to People*, November 20, 2012.
- 179) Invited talk, Embraer S.A., São José dos Campos, Brazil, *Connecting Deeply Embedded Sensing to People*, November 19, 2012.
- 180) Invited talk, Energy Harvesting & Storage and Wireless Sensor Networks & RTLS USA 2012 Conference, Washington D.C., *Leveraging Embedded Sensing for Energy Management*, November 8, 2012.
- 181) Keynote address, Annual TI Fellows Meeting, University of Texas, Dallas TX, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, October 18, 2012.
- 182) Invited panelist and talk, MITEI Annual Fall Energy Research Conference, Cambridge MA, “Advanced Building Technology” Session, *New Paradigms in Energy Management*, October 5, 2012.
- 183) Invited panelist, talk, and workshop participant, EPRI National Energy Efficiency Technology Summit, Portland OR, *New Paradigms in Lighting Control & Energy Management*, Sept. 25-26, 2012.
- 184) Invited panelist and talk, World Economic Forum Summer Davos, Dalian, China, ‘Imagineering our Future’ Session, September 13, 2012.
- 185) Invited presentation, World Economic Forum Summer Davos, Dalian, China, IdeasLab - Creating Smart Environments with the Massachusetts Institute of Technology, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, Dalian China, September 11, 2012.
- 186) Invited participant and talk, Interaction Beyond the Desktop, Schloss Dagstuhl Leibniz-Zentrum für Informatik Workshop, Wadern Germany, *Interaction Beyond The Desktop*, August 26-31, 2012.
- 187) Invited talk, Wearable Technologies (WT) Conference 2012, San Francisco, CA, *Wearable Systems as a Link to Ubiquitous Sensing and Actuation*, July 24, 2012.
- 188) Invited talk, Google Future of Mobile Workshop, Google Research, Mountain View, CA, *Wearables to Anchor User Experience In Smart Environments*, May 23, 2012.
- 189) Invited talk, Nokia’s Lunch & Speaker Series, Nokia Labs, Cambridge MA, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, May 15, 2013.

- 190) Invited seminar, CREAT-ISS Summer School, McGill University, Montreal Canada, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, May 4, 2012.
- 191) Invited panelist and talk, "Future City - MITEI Forum #3 - Built Environment, Urban Systems, and Energy," Session on "Human Systems and Behavior," *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, Cambridge MA, April 30, 2012.
- 192) Invited talk and discussion, Together Festival 2012, MIT Museum, Cambridge MA, *Modular Synths, etc.*, April 7, 2012.
- 193) Invited keynote talk, Intel PCCG Tech Summit, Portland OR, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, April 12, 2012.
- 194) Invited keynote talk, Design Innovation Workshop, Apeejay Styra University, New Delhi, India, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, March 30, 2012.
- 195) Invited colloquium, Apeejay College Of Fine Arts, Jalandhar, India, *From Musical Controllers to...*, March 29, 2013.
- 196) Invited keynote talk, MIT Technology Review's EmTech India 2012, Bangalore, *Connecting with the Emerging Nervous System of Ubiquitous Sensing*, March 28, 2012.
- 197) Invited talk, SRC/NSF/SFI Forum on Integrated Sensors for Cybersystems (FISC-2030), Session on "Sensors for Physical World Interfaces: Application Landscape for Future Integrated Sensors," Carton House, Maynooth, Co. Kildare, Ireland, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, March 23, 2012.
- 198) Panelist and talk, MIT Council on the Arts Event: *Sound and Real-Time Systems*, Bartos Theater, MIT Cambridge, MA, February 15, 2012.
- 199) Special seminar, Media Lab 2012 Festival of Learning (January 28) and repeated upon student demand (February 13), Cambridge MA, *An Armchair Tour Through Frontier Physics*.
- 200) Special seminar, Media Lab 2012 Festival of Learning, Cambridge MA, *Extreme Rock from Japan*, January 27, 2013
- 201) Invited talk, *Research Visions*, and workshop, *Pervasive Sensing and Smart Energy* at the MIT Media Lab @Tokyo 2012 Symposium, Dentsu Hall, Tokyo Japan, January 17, 2012.
- 202) Invited talks in Japan: Nihon Unisys (NUL-G), Tokyo; DENSO HQ, Kariya; Sony Head Office, Shinagawa, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, January 16-19, 2012.
- 203) Invited talk, EU Future Emerging Technologies (FET) Human-Computer Confluence Consultation Workshop, Brussels Belgium, *Connecting to the Emerging Nervous System of Ubiquitous Sensing*, December 1, 2011.

- 204) Invited colloquium speaker, Tufts Music Dept., Medford MA, *Interaction in the Post-Convergence Age – From Electronic Music Controllers to Ubiquitous Dynamic Media*, November 14, 2011.
- 205) Invited talk, Tyndall Institute, Cork Ireland, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, October 28, 2011.
- 206) Invited 3-lecture seminar, Transitio Festival Workshops, Mexico City, *Musical Control and Interaction from 1900 to 2020*, October 3-6, 2011.
- 207) Invited art/technology talk, Transitio Festival Symposium, Mexico City, Lugar/Espacio/Interfaz Session, *Untitled*, October 3, 2010.
- 208) Invited talk, One-Handed Musical Instruments (OHMI) Launch Event, Ars Electronica Center, Linz Austria, *Towards OHMI Instruments*, September 4, 2011.
- 209) Invited talk, Schneider Electric Research Center, Grenoble France, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, July 1, 2011.
- 210) Invited talk, INRIA In-Tech Symposium on Intelligence ambiante : évolution ou révolution?, INRIA Grenoble, France, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, June 30, 2011.
- 211) Invited panelist and talk, MIT 150 Forum on Future Cities, *Changing Cities*, Cambridge MA April 12, 2011.
- 212) Invited talk, 2011 MIT Europe Conference – Innovation in a Networked World: Technology, People, and Places, Vienna Austria, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, March 24, 2011.
- 213) Event Co-Organizer and *Mammoth Modular Synthesizer* Music Installation, Music | Machines – 50 Years of Music and Technology @ MIT, Cambridge MA, February 5, 2011.
- 214) Invited keynote, Design Innovation India Workshop, College of Engineering, Pune India, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, January 28, 2011.
- 215) Cisco Distinguished Lecture, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, Cisco Headquarters, Milpitas CA, January 13, 2011.
- 216) Invited talk, MIT MTL/MITEI Workshop on Next Generation μ -Energy Systems, Cambridge MA, *Applications and Requirements of Self-Powered Systems*, December 3, 2010.
- 217) Invited talks in Japan: NEC Central Research Labs, Kawasaki; ALPS Tokyo; Fujitsu Laboratories, Tokyo; Toshiba Corporate Research and Development Center, Tokyo, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, November 29-December 2, 2010.

Presentations by Joseph A. Paradiso (cont.)

- 218) Invited talk, The Second Cisco/Intel Home Services Research Summit, Milpitas, CA, *Context, Control, and Conservation in the age of Ubiquitous Dynamic Media*, November 16, 2010.
- 219) Invited talk, Qualcomm, San Diego CA, *Interacting with Rich Dynamic Media*, October 26, 2010.
- 220) Invited talk, Nokia Research Center (NRC) Hollywood Lab, Santa Monica CA, *Interacting with Rich Dynamic Media*, October 25, 2010.
- 221) Invited talk, Future of Retailing Symposium hosted by Best Buy, Richfield MN, *Physical Retail in the Age of Ubiquity*, September 14, 2010.
- 222) Invited talk, Nokia Research Center (NRC) Cambridge UK, *Interacting with Rich Dynamic Media*, August 25, 2010.
- 223) Invited talk, Microsoft Research (MSR) Cambridge UK, *Interacting with Rich Dynamic Media*, July 22, 2010.
- 224) Invited talk, Intel My Connected Continuum (MC²) Research Workshop, Santa Clara, CA, *Interacting with Rich Dynamic Media*, July 13, 2010.
- 225) Invited talk, NIH Workshop on Personal Motion Technologies for Healthy Independent Living, NIH Headquarters, Bethesda MD, *Personal Motion Technology Project Examples*, June 23, 2010.
- 226) Invited keynote lecture, Annual CIRMMT Symposium, Montreal Canada, *Interaction in the Post-Convergence Age - From Electronic Music Controllers to Ubiquitous Dynamic Media*, May 27, 2010.
- 227) Invited talk, SRC/ATIC Forum on Minimum-Energy Electronic Systems (MEES 2020), Abu Dhabi UAE, *Body Area Sensor Platforms for Diverse Applications*, May 23, 2010.
- 228) Invited colloquium speaker, Dartmouth College, Computer Science Dept., Hanover NH, *Living with Ubiquitous Sensing & Dynamic Responsive Media*, May 12, 2010.
- 229) Invited participant, O'Reilly Foo Camp East, Microsoft New England R&D Center (NERD), Cambridge MA, April 30-May 2, 2010.
- 230) Invited talk, Printed Electronics and Photovoltaics USA 2009, San Jose, CA, *Electronic Skins, Wearable Sensing, and Ubiquitous Media - Opportunities for Flexible Electronics*, December 2, 2009.
- 231) Invited panelist and talk, ACM Sensys 2009, Berkeley CA, "Sensor Networks: The Next 10 Years," *Sensor Networks as Extension of our Nervous System*, November 5, 2009.

- 232) Invited keynote lecture, IEEE International Workshop on Multimedia Signal Processing (MMSP 2009), Rio de Janeiro, Brazil, *Linking Virtual and Real Worlds Through Ubiquitous Sensor Networks*, October 5, 2009.
- 233) Invited talk, Intuit Future of Payments Workshop, MIT Cambridge MA, *“Transactions” in Ubiquitous Sensing & Media Environments*, September 17, 2009.
- 234) Invited talk, NSF Workshop on Human-Environment Mobile-Based Interactions (HEMI), MIT Cambridge MA, *From Sensing People to Sensing Nature: Lessons Learned from Pervasive Computing*, September 15, 2009.
- 235) Invited keynote, The 13'th International Symposium on Wearable Computing (ISWC 09), Linz, Austria, *A Decade of Exploration of Diverse Applications in Wearable Sensing*, September 5, 2009.
- 236) Invited talk, NEC Central Research Labs, Kawasaki Japan, *Wearable Wireless Sensing Platforms*, August 13, 2009.
- 237) Invited talk, LG Electronics Seocho R&D Center, *Sensor-based Interfaces and Virtual Reality*, August 11, 2009.
- 238) Invited talk, Samsung Advanced Institute of Technology (SAIT), Korea, *Beyond Mobility: Interaction, Interface, and Intention in the Age of Ubiquitous Sensing*, August 12, 2009.
- 239) Invited keynote in “Sharing.Experiences 2009: Life. Context. Choices (MIT Media Lab Workshop in Seoul),” Seoul Korea, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, August 10, 2009.
- 240) Invited talk and panelist at SIGGRAPH 2009, New Orleans, LA, *The Visual in New Interfaces for Musical Expression, The Visual in NIME – Some Issues in Musical Control*, August 4, 2009.
- 241) Invited workshop participant and speaker, UW/Microsoft Summer Institute 2009, Semihhmoor Resort, WA, *Wearable Dynamic Management of Distributed Domestic Utilities*, July 28, 2009.
- 242) Invited talk, IBM Almaden Research Center, San Jose CA, *Living with Ubiquitous Sensing and Dynamic Responsive Media*, July 17, 2009.
- 243) Invited colloquium speaker, EMERGE Lecture Series, New York City College of Technology, Brooklyn NY, *Sensor Networks for Linking Virtual and Real Worlds*, May 6, 2009.
- 244) Invited talk and panelist at BodyNets 2009 (BodyNets Hardware and Software Platforms Session), UCLA, *Wearable Wireless Sensing Platforms*, April 3, 2009.
- 245) Invited plenary talk, Smart Fabrics 2009, Rome Italy, *From Wearable Sensing to Sensate Media – New Substrates for Smart Environments*, March 12, 2009.

- 246) Invited talk, panelist, and juror, MIT/ML Exploring Permeable Building Event, *Permeable Buildings*, Cambridge MA, February 6, 2009.
- 247) Invited talk, IDEO Cambridge Studio, Cambridge, MA, *Sensor Networks for Linking Virtual and Real Worlds*, January 7, 2009.
- 248) Invited panelist, MIT/ILP Conference on Robots: Informing Future Design for Human-Machine Interaction, Cambridge MA, *How Can Ideas from Robotics Help Create More Intelligent “Things that Think?”*, December 2, 2008.
- 249) Invited keynote, Ambient Intelligence Conference (AMI-08), Nuremberg Germany, *Sensor Networks for Linking Virtual and Real Worlds*, November 21, 2008.
- 250) Invited keynote, FIATECH 2008 Member Meeting, Cambridge MA, *Sensor Networks for Linking Virtual and Real Worlds*, October 27, 2008.
- 251) Invited talks in Japan: NEC Central Research Labs, Kawasaki; Hitachi Central Research Laboratory (CRL), Kokubunji, Brother Industries, Nagoya; Toshiba, Kawasaki; Dai Nippon Printing (DNP) Tokyo, *Sensor Networks for Linking Virtual and Real Worlds*, September 22-26, 2008.
- 252) Invited talk, Intel Research (Roy Want Group), Santa Clara CA. *On-Body Wireless Sensing for Human-Computer Interfaces*, July 11, 2008.
- 253) Invited keynote lecture, 5th International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2008), Chinese University of Hong Kong, *On-Body Wireless Sensing for Human-Computer Interfaces*, June 1, 2008.
- 254) Invited talk, Center for Design Innovation, Winston-Salem NC, *Sensor Networks for Pervasive Computing (& Musical Interfaces!)*, May 6, 2008.
- 255) Invited talk, Microsoft Research (MSR), Redmond WA, *Sensor Networks for Linking Virtual and Real Worlds*, April 30, 2008.
- 256) Invited talk, Yale University School of Architecture, “Sustainable Architecture, Today and Tomorrow: Reframing the Discourse” Symposium, New Haven, CT, *Responsive Environments*, April 5, 2008.
- 257) Invited talk, Qualcomm, San Diego, CA, *Energy Harvesting for Mobile Computing*, March 26, 2008.
- 258) Invited talk, Nokia Research Center (NRC), Palo Alto CA, *Sensor Networks for Pervasive & Wearable Applications*, January 28, 2008.
- 259) Invited talk, Tokyo Denki University, Tokyo Japan, *Sensor Nets for Wearable and Pervasive Applications - A Decade of Exploration at the MIT Media Lab*, January 21, 2008.

- 260) Invited corporate talks in Japan: Hitachi Research Laboratory (HRL), Oomika; NEC Central Research Laboratories, Kawasaki; Alps Electric, Sendai; KKE, Tokyo: *Sensor Networks for Pervasive & Wearable Applications*, January 15,18,22, 2008.
- 261) Invited talk, MIT Media Lab Tokyo Event, Tokyo Japan, *Sensor Networks to Augment Human Perception*, January 17, 2008.
- 262) Invited talk, Yamaha Corporation, Hamamatsu Japan, *Sensor Networks for Pervasive Computing (&Musical Interfaces!)*, July 16, 2008.
- 263) Invited talk, “Nokia World,” Amsterdam, The Netherlands, *Smart Spaces*, December 5, 2007.
- 264) Invited talk, “IEEE Workshop on Wearable Technology in Medicine” at the “Center for Connected Health 2007 Symposium,” Harvard Medical School, Boston MA, *Body Sensor Networks in Medicine, Social Computing, and the Arts*, October 23, 2007.
- 265) Invited presentation, Motorola Innovation Conference, “People and Things to Things” Session, Schaumburg, IL, *Dual Reality – A New Initiative @ the MIT Media Laboratory*, September 12, 2007.
- 266) Invited lecture, Bavaria California Technology Center (BaCaTeC) Summer School, “Pervasive Healthcare systems,” Kloster Seeon, Germany, *On-Body Sensing & Related Applications at the MIT Media Lab*, August 1, 2008.
- 267) Invited talk, Sensormatic Corporation, Boca Raton, Florida, *Recent Developments & Ongoing Projects in Sensor Networks*, July 23, 2007.
- 268) Invited talk, Agilent Corporation, Santa Clara California, *Embedded Sensing for Ubiquitous and Pervasive Computing*, July 11, 2007.
- 269) Invited panelist, *Virtual Worlds Technology & Systems Design*, session at “IBM & MIT Present Virtual Worlds: Where Business, Society, Technology & Policy Converge,” Cambridge MA, June 15, 2007.
- 270) Invited keynote, BodyNets 2007, *A Decade of Body Sensor Networks in Medicine, Sports, Entertainment & the Arts*, Florence Italy, June 11, 2007.
- 271) Invited tutorial, Pervasive 2007 (The 5th International Conference on Pervasive Computing), Toronto, Ontario, *Designing and Building Ubiquitous Sensor Systems*, May 16, 2007.
- 272) Invited keynote speaker at the NSF Workshop on “Rising To The Challenge: Integrating Social Science Into NSF Environmental Observatories Symposium,” Washington DC, *Human Sensing*, January 25, 2007.

Presentations by Joseph A. Paradiso (cont.)

- 273) Invited keynote speaker, Micro-Energy Harvesting Institute Inaugural Meeting, IMTEK (University of Freiberg, Germany), *Perspectives on Parasitic Power*, March 13, 2007.
- 274) Invited keynote speaker, T3Lab Symposium, University of Bologna, Italy, *Human-Centric Sensor Networks at the MIT Media Laboratory*, February 27, 2007.
- 275) Invited seminar, INnet08 - *Nuove Interazioni, Le Nuove Ricerche Interattive al Media Lab dell' MIT di Boston – The Responsive Environments Group*, Gallarate, Italy, February 2-3, 2007.
- 276) Invited keynote speaker at the NSF Center for Networked Embedded Sensing (CENS) Annual Meeting, UCLA, Westwood CA, *From Interactive Dancers to Digital Skins - Sensor networks at the MIT Media Lab*, October 27, 2006.
- 277) Invited talk, Power To Go - Fraunhofer Symposium Mikroenergietechnik, Berlin Germany, *International Trends in Micro Energy Technology*, October 10, 2006.
- 278) Invited talk, Motorola Energy Summit 2006, Motorola Research, Libertyville, IL, *Energy Harvesting for Mobile Computing*, September 6, 2006.
- 279) Invited keynote, 3rd IEEE-EMBS International Summer School and Symposium on Medical Devices and Biosensors, MIT Cambridge MA, *Body Sensor Networks in Medicine, Sports, and the Arts*, September 5, 2006.
- 280) Invited panelist and speaker, 2006 NDIA and ONR Naval S&T Partnership Conference, Washington DC, *Energy Sources and Power Management for Embedded Wireless Sensors*, August 2, 2006.
- 281) Invited speaker for special session “Beyond Low Power Design: Environmental Energy Harvesting,” IEEE Design Automation Conference (DAC 2006), San Francisco, CA, *Systems for Human Powered Mobile Computing*, July 26, 2006.
- 282) Invited talk, Sun Microsystems, Menlo Park, CA, *Wireless Sensing at the Frontiers of Pervasive and Social Computing*, July 25, 2006.
- 283) Invited talk, Workshop on Energy and Materials: Critical Issues for Wireless Sensor Networks, Dublin City University (DCU), *Energy Harvesting for Mobile Systems*, June 30, 2006.
- 284) Invited external speaker, Nokia Research Center Agenda 2013 and NVO Strategy Sharing event for Nokia Business and Horizontal Groups, Helsinki Finland, *Wireless Sensing at the Frontiers of Pervasive and Social Computing*, June 13, 2006.
- 285) Invited panel chair, “Applications: Beyond Dumb Data Collection,” and panelist/speaker *Some Evolving Sensor Net Applications*, EmNets 2006, Harvard University, Cambridge MA, May 31, 2006.
- 286) Invited speaker, NSTI Nanotech 2006 Conference, Boston MA, *Some Novel Applications for Wireless Inertial Sensors*, May 10, 2006.

- 287) Invited speaker, NEC Technology Forum, Tokyo Japan, *Wireless Sensing at the Frontiers of Pervasive and Social Computing*, March 13, 2006.
- 288) Invited speaker, Slumberger Research, Ridgefield, CT, *Embedded Sensing for Pervasive Computing*, February 28, 2006.
- 289) Invited speaker, Sensormatic/Tycho Corporation, Boca Raton, Florida, *Embedded Sensing for Pervasive Computing*, February 24, 2006.
- 290) Invited speaker, Motorola Research Media Lab Symposium, Schaumburg, IL, *Embedded Sensing for Pervasive Computing*, January 31, 2006.
- 291) Featured speaker, "Experience The Future!" Symposium, hosted by Moda Tecnologia, Milan Italy, *Sensor Technology Impacting Fashion & Retail*, January 24, 2006.
- 292) Invited participant, Second Meeting of the Nokia Academic Working group on Sensor Nets, San Diego, California – contribution: *Sensor Nets for Pervasive Computing*, November 1, 2005.
- 293) Invited talk at the 2005 Wireless Congress in Munich, Germany, *Wireless Technologies – The Future*, November 9, 2005.
- 294) Invited Talk presented at the 20 Jahre Fraunhofer IIS Symposium, Erlangen, Germany, *New Sensor Architectures for Things That Think*, July 1, 2005.
- 295) Invited Talk presented at the IEE International Seminar on Intelligent Building Environments (IBE 05), Colchester UK, *New Sensor Architectures for Responsive Environments*, May 28, 2005.
- 296) Invited talk at the National Sensor Center, Dublin City University (DCU), *Wireless Sensing for Interactive Media*, June 7, 2005.
- 297) Invited Keynote presented at the IEEE International Symposium on Collaborative Technology Systems (CTS 2005), St. Louis, MO, *Collaborative Interaction and Responsive Environments - Sensors That Enable Individuals and Instrument Multitudes*, May 19, 2005.
- 298) Invited participant in the *Nokia Workshop on Large-Scale Wireless Sensor Networks and their Applications*, Kuusamo, Finland; presentation: *Wireless Sensing for Interactive Media*, February 4-5, 2005.
- 299) Invited talk, MIT Center for eBusiness, Cambridge MA: *New Wrinkles on RFID at the MIT Media Laboratory*, November 17, 2004.
- 300) Invited talk, MIT SDM (System Design and Management) Conference on Innovative Product and System Development, Cambridge MA: *New Sensor Architectures for Responsive Environments*, October 22, 2004.
- 301) CS Colloquium, Purdue University, Advanced Computer Systems Laboratory: *New Sensor Architectures for Responsive Environments*, October 13, 2004.

- 302) Invited exhibition of the self-powered wireless switch at the ALPS Pavilion at the GM Techworld Exhibition, Detroit, Michigan, October 5, 2004.
- 303) Invited panelist and presenter at SIGGRAPH 2004 special session on *Computer Music*, Los Angeles, California: *New Paradigms for Musical Control*, August 10, 2004.
- 304) Invited brainstorming panelist for Caterpillar engine division, Peoria, IL, presentation: *Frontiers of Wireless Sensing*, July 7, 2004.
- 305) Invited all-day seminar at Media Lab Europe, Dublin: *Sensor Systems for Interactive Environments*, June 16, 2004.
- 306) Invited talk at the Changing Reality Workshop, Media Lab Europe, Dublin: *Embedded Sensing to Change Reality*, June 15, 2004.
- 307) Invited talk at Yamaha Research, Hamamatsu Japan: *New Paradigms for Musical Control*, June 4, 2004.
- 308) Invited talk at Brother Research, Nagoya Japan: *Sensor Architectures for Everywhere Interfaces*, June 2, 2004.
- 309) Invited talk at Ricoh Research Center, Tokyo Japan: *Sensor Architectures for Everywhere Interfaces*, June 1, 2004.
- 310) Invited talk at Fujitsu Research, Tokyo Japan: *Sensor Architectures for Everywhere Interfaces*, June 1, 2004.
- 311) Invited talk at Hitachi Research, Tokyo Japan: *Sensor Architectures for Everywhere Interfaces*, May 31, 2004.
- 312) Invited talk at Toshiba Research, Tokyo Japan: *Sensor Architectures for Everywhere Interfaces*, May 31, 2004.
- 313) Invited talk at the Acoustical Society of America's (ASA) 75'th Anniversary Meeting, New York City, *New Paradigms for Musical Control*, May 25, 2004.
- 314) Invited talk at ONE Telecommunications, Vienna, Austria: *Sensor Architectures for Everywhere Interfaces*, April 27, 2004.
- 315) Invited keynote talk at the Workshop on *Everywhere Interfaces*, hosted by the Johannes Kepler University of Linz, Austria (held in Vienna): *Sensor Architectures for Everywhere Interfaces*, April 26, 2004.
- 316) Invited talk at the TTI Vanguard *Powering the Future Workshop*, Montreal, Canada: *Energy Harvesting for Mobile Computing*, April 19, 2004.

Presentations by Joseph A. Paradiso (cont.)

- 317) Invited talk at BT Research, Adastral Park, Martlesham, Ipswich UK: *Sensor Systems for Responsive Environments*, April 8, 2004.
- 318) Invited keynote talk at the First International Workshop on Wearable and Implantable Body Sensor Networks, Imperial College, London: *Wearable Wireless Sensing for Interactive Media*, April 7, 2004.
- 319) Invited colloquium talk at the Institute for Neuroinformatics, ETH Zurich: *New Sensor Architectures for Responsive Environments*, March 5, 2004.
- 320) Invited talk at Motorola Headquarters, Sharnberg, IL: *Responsive Environments*, December 3, 2003.
- 321) Invited talk at Microsoft Research, Seattle Washington: *New Sensor Architectures for Responsive Environments*, December 2, 2003.
- 322) Invited panelist at the GM Driver/Vehicle Interaction Workshop, Detroit, Michigan, November 6, 2003.
- 323) Invited talk at the School of Engineering and Applied Science's Strategic Planning Workshop on Engineering, Humanities, and the Arts, Princeton University, Princeton NJ: *From Chaos to Convection and Tangibles to Toolkits – Interdisciplinary Perspectives from the MIT Media Lab*, November 3, 2003.
- 324) Invited talk in the *Engaging Characters* Panel hosted by the Art Interactive Gallery, Cambridge MA: *Expressive Interfaces – Examples & Directions*, October 3, 2003.
- 325) Invited presentation at the NSF Electrical and Communications Systems (ECS) Division Workshop on Wireless Networked Sensor and Actuator Systems and Grantees Meeting, UCLA, Los Angeles, CA: *Towards Sensate Media and Electronic Skins – Testbeds for Very High Density Sensor Networks*, September 8, 2003.
- 326) Invited talk at Saab Training Systems, Jonkoping, Sweden: *Sensor Technologies for Responsive Environments*, June 3, 2003
- 327) Invited keynote talk at the New Interfaces for Musical Expression (NIME 2003) Conference, McGill University, Montreal, Canada: *Expressive Interfaces – Examples & Directions*, May 22, 2003.
- 328) Invited talk at the Intel Research Lab, Seattle, Washington: *Sensate Media for Responsive Environments*, April 25, 2003.
- 329) Invited talk at Intel Research, Portland, Oregon: *Sensate Media for Responsive Environments*, April 24, 2003.
- 330) Invited talk at the *Extreme Communications* ILP event, MIT Wong Auditorium: *Communication and Sensing at the Extremities*, April 15, 2003.

Presentations by Joseph A. Paradiso (cont.)

- 331) Invited talk at the 7'th Annual Festival of Art and Technology (Video, Technology, and Performance), Brown University, Providence RI: *Expressive Interfaces – Some Recent Examples*, April 5, 2003.
- 332) Invited colloquium talk at the Sonic Arts Research Center (SARC), Queens University, Belfast, Northern Ireland: *Expressive Interfaces – Some Recent Examples*, February 13, 2003.
- 333) Invited talk at the Innovating Innovation Symposium at Media Lab Europe in Dublin: *From Chaos to Convection and Tangibles to Toolkits – How Innovation Happens at the MIT Media Lab*, February 11, 2002.
- 334) Invited talk at Motorola Labs, Plantation Florida: *Sensor Technologies for Responsive Environments*, January 24, 2003.
- 335) Invited talk at the final DARPA SensIT PI Meeting: *High-Density Wireless Sensing Projects*, Waltham, MA, November 8, 2002.
- 336) CS Colloquium at Tufts University, Medford MA: *Sensor Technologies for Responsive Environments*, November 6, 2002.
- 337) Invited talk at Saabtech Systems in Stockholm, Sweden: *Sensor Technologies for Responsive Environments*, July 5, 2002.
- 338) Invited panelist at the *Managing as Designing Workshop*, Weatherhead School of Management, Case Western Reserve University, Cleveland, Ohio: *From Trash Heaps to Toolkits and Chaos to Convention – Management and Innovation at Leading Edge Design Organizations and Idea Labs*, June 14-15, 2002.
- 339) Invited talk at CCRMA (Center for Computer Research in Music and Acoustics), Stanford University: *Expressive Interfaces – Some Recent Examples*, March 11, 2002.
- 340) Invited talk at the *FreeSpace Symposium* at Duke University: *Expressive Interfaces – Some Recent Examples*, February 22, 2002.
- 341) Invited talk at the *Extreme Interfaces Symposium* at Media Lab Europe in Dublin: *Sensing at the Extremes*, January 28, 2002.
- 342) Invited talk at the EU *This is Not a Computer Workshop* at the University of Limerick in Ireland: *Disappearing Computers or Mutating Machines?*, January 24, 2002.
- 343) Invited talk at Schott Glass, Mainz, Germany: *Sensor Technologies for Responsive Environments*, August 23, 2002.
- 344) Invited talk at StatOil Research, Trondheim, Norway: *Recent Research in Responsive Environments*, June 21, 2002.

Presentations by Joseph A. Paradiso (cont.)

- 345) Invited talk at the 2002 ILP *Bringing MIT to Europe* Conference in Vienna, Austria: *Recent Research in Responsive Environments*, June 19, 2002.
- 346) Invited talk on energy storage and power harvesting for the Portable Power Group at the Gillette Advanced Technology Center in Needham MA, November 30, 2001.
- 347) Invited presentation at the *Redesigning the Future Symposium* in Tokyo: *Responsive Environments*, November 9, 2001.
- 348) Invited talk on Musical Interfaces at the American Composers Orchestra Conference, New York, NY: *Interfaces for Musical Performances and Interaction*, October 12, 2001.
- 349) Invited lecture/demonstration of the *Expressive Footwear* System, Ars Electronica Festival, Linz Austria, September 4, 2001.
- 350) Invited research seminar at the Music Technology Group, Universitat Pompeu Fabra, Barcelona Spain: *From Hypercellos to Expressive Footwear - New Musical Interfaces at the MIT Media Lab*, June 18, 2001.
- 351) Invited talk at the IBM Academy of Technology, 2001 Make IT Easy Conference, IBM Almaden Research Lab, CA: *Modern Sensor Technologies for Interactive Environments*, June 6, 2001.
- 352) Featured speaker, IEEE Signal Processing Society New England monthly meeting: *Sensor Technology and Signal Processing for Responsive Environments*, May 22, 2001.
- 353) Invited talk, MIT Industrial Liaison Program (ILP), 2001 MIT Research Director's Conference: *Wireless Applications at the MIT Media Lab*, April 19, 2001.
- 354) Invited talk at the Third Wave of Connectivity Conference, IBM Academy of Technology, IBM T.J. Watson Research Center, Yorktown Heights NY, *Challenges and applications for sensor technology in pervasive networks*, April 18, 2001.
- 355) Demonstration of *Musical Trinkets* system at the Experience Music Center, Seattle WA, April 2, 2001.
- 356) Invited Lecture/Demonstration of *Expressive Footwear* System, Boston Museum of Science, March 4, 2001.
- 357) Invited lecture/demonstration of the *Expressive Footwear* System at the ISEA 2000 Conference in Paris, France, December 10, 2000.
- 358) Invited talk, Immersive Media Group, IBM T.J. Watson Research Center, Hawthorne NY: *New Sensor Systems for Responsive Environments at the MIT Media Lab*, November 8, 2000.
- 359) Invited talk at Laboratorio di Informatica Musicale, University of Genoa, Italy, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, October 17, 2000.

- 360) Invited seminar at MediaLabEurope, Dublin: *New Sensor Systems for Responsive Environments at the MIT Media Lab*, September 18, 2000.
- 361) Invited talk at USIX usability conference, Helsinki Finland, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, September 4, 2000.
- 362) Invited *Things That Think* seminar at Westvaco Corporation Research Center, Columbia MD, August 11, 2000.
- 363) Invited talk: *Computation, Communication, and Sensing: Issues and Applications* and panelist for the Comm'n Sense: Wireless Sensor Networks session of ACM MOBICOM 2000, Boston MA, August 8, 2000.
- 364) Invited research seminar at the National Microelectronics Research Center (NMRC) in Cork, Ireland: *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, July 18, 2000.
- 365) Invited demonstrations of the *Expressive Footwear* system, Discover Awards Expo, EPCOT Center, Disney World, Orlando FL, June 22-23, 2000.
- 366) Invited presentation at the DARPA Energy Harvesting Review, Washington DC, *Parasitic Power Harvesting at the MIT Media Lab*, April 13, 2000.
- 367) Invited talk (*Renewable Energy Sources for the Future of Mobile and Embedded Computing*) and panel at the Renewable Computing Session of the Intel Computing Continuum Conference, San Francisco CA, March 16, 2000.
- 368) Colloquium speaker, NASA Goddard Spaceflight Center, Greenbelt MD, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, March 6, 2000.
- 369) Invited talk (*Responsive Environments*), panel, and research demonstrations at the Human Centered Innovation Conference, Intel Research Laboratory, Portland OR, January 21, 2000.
- 370) Invited moderator of Embedded Devices and Bluetooth Technology sessions at the Bluetooth Developer's Symposium, Los Angeles CA, December 8, 1999.
- 371) Invited presentation (*Laser Tracking for Interactive Surfaces*) and demonstration of *LaserWho* installation at Opera Totale 4, Venice-Mestre, Italy, November 19, 1999.
- 372) Keynote address at the CASCON conference, hosted by IBM and the NRC (National Research Council of Canada), Toronto, Ontario, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, November 9, 1999.
- 373) Invited lecture (*From Musical Chairs to Magic Carpets: Art meets Science at the MIT Media Laboratory*) and panel at Chautauqua Seminar on High-Performance Computing and the Arts, Boston University, September 16, 1999.
- 374) Invited seminar at the Intel Research Laboratory, Jones Farm, Hillsboro OR, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, July 28, 1999.

Presentations by Joseph A. Paradiso (cont.)

- 375) Invited Presenter/participant at *Microsoft/UW Workshop on Invisible Computing*, Seattle and Semi-Ah-Moo, WA, July 19-23, 1999.
- 376) Invited talk at HP Research Laboratory, Palo Alto CA, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, June 3, 1999.
- 377) Invited seminar on musical interfaces for the Performing Arts Electrocuted Workshop, University of Limerick, Ireland, May 25, 1999.
- 378) Invited talk (*Significant Recent Developments Concerning Mobile Computing*) and panel on Pervasive Computing at ACM SIGPLAN (Federated Computing Conference), May 3, 1999.
- 379) Featured presenter at the MIT Enterprise Forum, Geneva Switzerland, *New Sensor Applications for Interactive Environments at the MIT Media Lab*, April 16, 1999.
- 380) Invited panelist (*The Future of Play*) and *Expressive Footwear* demonstrations at Tokyo Toy Fair, Tokyo Japan, March 18, 1999.
- 381) Featured speaker at the British Telecom Global Information Exchange seminar in NYC, *The Revolution in Information Infrastructure*, February 11, 1999.
- 382) Guest Lecture and *Expressive Footwear* Demonstration at Cornell University Arts Department, Ithaca NY, December 2, 1998.
- 383) Invited performance with *Expressive Footwear* at the Toshiba Wearable Computing Fashion Show, NIKOGRAPH 1998, Tokyo Japan, November 25, 1998.
- 384) Session organizer, Hardware Connectivity Roundtable at the *Things That Link Workshop*, Helsinki Finland, August 24, 1998.
- 385) Keynote address, Unisys Technology Conference, Chantilly VA, *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Lab*, August 10, 1998.
- 386) Invited talk, IBM Academy Topical Conference on Pervasive Computing, IBM T.J. Watson Research Laboratory, Yorktown Heights NY, *Things That Think*, June 22, 1998.
- 387) Invited talk at IBM Almaden Research Lab, *Musical Chairs and Magic Carpets: New Sensor Applications for Interactive Environments at the MIT Media Lab*, May 15, 1998.
- 388) Invited talk at Xerox PARC, Palo Alto CA, *Musical Chairs and Magic Carpets: New Sensor Applications for Interactive Environments at the MIT Media Lab*, May 14, 1998.
- 389) Invited talk at Interval Research, Palo Alto, CA, *Musical Chairs and Magic Carpets: New Sensor Applications for Interactive Environments at the MIT Media Lab*, May 13, 1998.
- 390) Invited talk at Creative Technology Research Laboratory, Scott's Valley, CA, *Musical Chairs and Magic Carpets: New Sensor Applications for Interactive Environments at the MIT Media Lab*, May 11, 1998.

- 391) Featured presenter, IMAPS (International Microelectronics and Packaging Society) New England Annual Meeting, *Musical Chairs and Magic Carpets: New Sensor Applications for Interactive Environments at the MIT Media Lab*, December 5, 1997.
- 392) Featured seminar at the British Telecom Global Executive Forum in Southampton, UK, *The Changing Face of Technology for Information and Communications*, July 17-18, 1997.
- 393) Featured presenter at the British Telecom Global Information Exchange seminar in Southampton, UK, *The Changing Face of Technology for Information and Communications*, July 16, 1997.
- 394) Invited talk at Nortel Research, Ottawa Canada, *Musical Chairs and Magic Carpets: New Sensor Applications for Interactive Environments at the MIT Media Lab*, June 2, 1997.
- 395) Invited presentation at the XWIT (Cross-Industry Working Group on Information Technology) Wireless and Nomadic Technologies and Applications Symposium, Schaumburg IL, *Personal Area Networks and Passive Wireless Tags*, May 7, 1997.
- 396) Featured presenter at the British Telecom Global Information Exchange seminar in Cape Town, South Africa, *The Changing Face of Technology for Information and Communications*, April 30, 1997.
- 397) Featured seminar at the British Telecom Global Executive Forum in Cape Town, South Africa: *The Changing Face of Technology for Information and Communications*, April 28 and May 2, 1997.
- 398) Featured speaker at the IEEE New England Aerospace and Electronics Colloquium *Musical Chairs and Magic Carpets: Things That Think at the MIT Media Laboratory*, April 16, 1997.
- 399) Invited talk and panelist in the Computerized Live Performance Session at the 6'th Biennial Symposium on Arts and Technology, Connecticut College, New London CT, March 1, 1997.
- 400) "Hypersymposium" panel on the future of electronic musical instruments at the *Now You See It* Festival at Southbank, London, March 9, 1996.
- 401) Invited talk at the Lawrence Livermore National Laboratory, *Computers, Communication, and Entertainment; Art Meets Science at the MIT Media Laboratory*, January 12, 1996.
- 402) MIT/Draper Guidance, Navigation, and Control (GN&C) Colloquium, *A Highly Adaptable Method of Managing Jets and Aerosurfaces for Control of Aerospace Vehicles*, Spring 1990.
- 403) NASA/JSC research seminar, *A Global Approach to Attitude Control with Non-Linear Actuators*, March 22, 1990.
- 404) NASA/JSC research seminar, *Application of Search Techniques to Control of Spacecraft with Single-Gimbaled CMGs*, January 25, 1989.

Presentations by Joseph A. Paradiso (cont.)

- 405) Carnegie Mellon University, Invited Physics Dept. Lecture, *Development and Applications of the Central Detector at L3*, February 1984.
- 406) Northeastern University, Invited Physics Dept. Lecture, *Development and Applications of the Central Detector at L3*, February 1984.
- 407) MIT High-Energy Physics LNS Colloquium, *Massive μ^+ μ^- Production at the ISR*, October 1981.
- 408) Princeton University, Invited Physics Dept. Lecture, *Massive μ^+ μ^- Production at the ISR*, September 1981.
- 409) Tufts University, Invited Physics Dept. Lecture, *Massive μ^+ μ^- Production at the ISR*, September 1981.

22. Record of Research Funding for Joseph A. Paradiso

Title	Company/Entity	Dates	Amount/YR
Media Lab Consortia (MLC) ²	Industry Consortium	1/15-present	~\$6-30M/yr
Developing jam_bots: Real-Time Collaborative Agents for Live Human-AI Musical Improvisation ²	MIT Generative AI Impact Consortium (MGAIC)	6/25-5/26	\$150K
Redefining Virtuosity ²	MIT GenAI Grant	2/24-1/25	\$70K
Modernizing photovoltaic textiles for scalability and wearable applications*	MIT Portugal Program	6/23-8/24	\$120K
Scalable Virtual Substrates for Deep Real-World Engagement*	Translucia	5/23-4/25	\$150K
Sensor-Based Systems for Exploration*	National Geographic Society	10/22-present	\$20K/yr
Soft artificial intelligent tactile sensing arrays for interactive surfaces and human-robot interaction*	Amazon Science Hub	7/22-1/24	\$70K
MIT x Smart Living Lab*	MIT MISTI Switzerland Grant	7/22-1/25	\$25K
Phase III Continuation Funding: Space Health Integrated Program (SHIP) at the MIT Space Exploration Initiative*	Baylor College of Medicine	10/21-10/22	\$200K
Autonomous Robot Swarms for Lunar Orbit Servicing and Space Asset Assembly*	NASA	12/20-3/22	\$650K
Active Deployment of First Aerospace Electronic Textile*	Center for the Advancement of Science in Space (Space Station National Laboratory)	11/20	\$4.5K
Ocean Cultures*	National Geographic Society	10/20	\$10K
Space Health Integrated Program (SHIP)*	Baylor College of Medicine	10/20	\$350K
COVID-19: RAPID: Wireless Positioning for Mitigating COVID19 Surface Transmissions ²	NSF	6/20	\$100K
SpaceSkin: Aerospace Grade Electronic Textile for Hypervelocity Impact Characterization*	ULVAC-Hayashi MISTI Seed Fund (MIT)	1/20	\$24K
Tech Solutions for Fisheries*	Northrop Grumman	12/19	\$20K
MIT-Portugal Research Seeds (Oceans)*	Portuguese Science and Technology Foundation	3/19	\$90K
Digital Airflow Simulation*	Ferrero Group	1/19	\$32K

Theses Supervised by Joseph A. Paradiso

SenseTime: Mediated Atmospheres*	MIT Sensetime AI	9/18	\$100K
SIG: Mediated Atmospheres*	Bose Corporation	9/17	\$180K
SIG: Space Initiative*	Industry Consortium	8/17 – 8/20	\$237K
ML Elements - Responsive Environments*	Emerson Collective	7/17-3/21	\$331K
Low-power wireless sensor system for environmental monitoring*	EDF	1/16-1/17	\$50K
Wearable Sensory Augmentation*	Qualcomm	4/15	\$50K
CHAIN-API RESTful Sensor Framework*	EMC, Inc.	1/15-12/15	\$75K
Things That Think ^{1,2}	Industry Consortium	1/95-1/15	~\$6M/yr
Intelligent Multimodal Sensor Networks for Computing*	Cisco, Inc.	12/13	\$100K
Center for Terrestrial Sensing ²	Saudi Aramco	11/13-11/16	\$1M/yr
Glass Research Fund*	Google, Inc.	10/13	\$14K
2013 Alumni Class Fund Award ²	MIT	7/13	\$24K
Emerging Technologies in Location & Context-Aware Computing*	Intel Corp.	6/11-present	\$180K
Research in Wearable Wireless Sensing*	Nokia Corp.	6/09	\$25K
High Dynamic Range Wireless Wearable Sensing & Analysis for Athletes*	Boston Red Sox	11/07-2/10	\$170K
Towards Sensate Media and Electronic Skins: Testbeds for Very High Density Sensor Networks*	NSF	11/02-11/05	\$100K/yr
Detecting Activity in Homes with Ubiquitous Sensing to Support Aging in Place ²	NSF	7/03-7/05	\$160K/yr
Portable Gait Evaluation & Biofeedback Intervention Tool ²	CIMIT	8/01-8/02	\$25K/yr
Embedded Sensor Packs (ESP) in the Field ²	DARPA	1/99-1/01	\$1M/yr
New Sensors for Telecommunications*	Nortel Networks	1/98 - 1/01	\$125K/yr
Precision Alignment for the GEM Detector*	DOE (SSC Lab)	1/93 - 6/94	~\$150K
Fractal-based Image Processing ²	Draper Lab (IR&D)	7/89 - 7/90	~\$75K
Advanced Spacecraft Control*	NASA/JSC (RTOP)	1/89 - 1/91	~\$150K
Hybrid Control for Aerospace Vehicles*	Draper Lab (IR&D)	7/86 - 11/88	~\$150K

ROLES:

* - Principal Investigator (PI)

¹ - Co-Director, 2001-2005, 2007-2013

² - Co-PI

23. Theses Supervised by Joseph A. Paradiso

Summary			
Degree	Total	Completed	In Progress
S.B.	13	13	0
Diplom Theses			
As Advisor	2	2	0
M.Eng.			
As Advisor	23	23	0
S.M.			
As Advisor	45	43	2
As Reader	116	116	0
Ph. D.			
As Advisor	32	29	3
As Reader	45	45	0

S.B. Theses

As Advisor:

1. Ananya Nandy, "Fabrication process and electromechanical characterization of a sliding connector system for modular stretchable electronics," 6/19 (Mechanical Engineering).
2. Paele M. Powell, "Design and Fabrication of Injection-Molded and 3D-Printed Battery Clips for "Chibitronics" Circuit Sticker Workbook," 6/15 (Mechanical Engineering).
3. Ezequiel (Zeke) Schmois, "Doppel 2.0: Optimization of a Multimodal Sensor Network," 12/13 (EECS).
4. Ashley K. Turza, "Dense, Low-Power Environmental Monitoring for Smart Energy Profiling," 6/10 (Mechanical Engineering).
5. Adam N. McCaughan, "Soundscape: A Novel Instrument for Tangible and Intuitive Sound Synthesis," 8/08 (EECS).
6. Roshni Cooper, "Initial Implementation of the μ Tags Localization Transponders," 5/07 (EECS).
7. Matthew Moskwa, "A Base Station for Data Collection for Sensor-Equipped Active RFID Tags," 2/07 (EECS).
8. Cameron Lewis, "Prototyping and Expanding a Tool Set for a Ubiquitous Sensor Infrastructure," 12/06 (EECS).
9. Mateusz Malinowski, "Optical Wakeup of Micropower Tags for Object Location and Identification," 5/04 (EECS).
10. Joshua Randall, "Real-time Lighting System for Large Group Interaction," 5/02 (EECS).

11. Manu Seth, "Improvements to the Power Conditioning Circuitry for a Self-Powered Wireless Switch," 6/02 (EECS).
12. Jeffrey Y. Hayashida, "Unobtrusive Integration of Magnetic Generator Systems into Common Footwear," 6/00 (Mechanical Engineering).
13. Clyde J. Kendall, "Parasitic Power Collection in Shoe-Mounted Devices," 6/98 (Physics).

Diplom Theses

As Research Advisor:

1. Nan Zhao, "Smart Solid-State Lighting Control," 9/10 (Diplom – RWTH Aachen, Lehrstuhl Für Medizinische Informationstechnik).
2. Clemens Satzger, "Fusion of Six-Dimensional Sensor Data Using Physics Engines," 1/10 (Diplom – TU München, Institute for Media Technology).

M.Eng. Theses

As Advisor:

1. Benton B. Wilson, "LightShow: Abstract Representations of Music Lighting in Python," 9/22 (EECS).
2. Anthony Roman, "Interactive Audience-Controlled Live Storytelling Technologies," 5/22 (EECS).
3. Evan Lynch, "SensorChimes: Musical Mapping for Sensor Networks toward Augmented Acoustic Ecosystems," 2/16 (EECS).
4. David Way, "EMGRIE: Ergonomic Microgesture Recognition and Interaction Evaluation, A Case Study," 1/14 (EECS).
5. Nicholas D. Joliat, "DoppelLab: Spatialized Data Sonification in a 3D Virtual Environment," 2/13 (EECS).
6. Rachel M. Bainbridge, "HCI Gesture Tracking Using Wearable Passive Tags," 9/10 (EECS).
7. Berham F.T. Mistree, "A Flexible High-Density Sensor Network," 9/08 (EECS).
8. Robert N. Jacobs, "A Wireless Sensor-based Mobile Music Environment Compiled from a Graphical Language," 9/07 (EECS).
9. Mateusz K. Malinowski, "Micropower Active Tags for Shipment Monitoring and Identification," 2/07 (EECS).
10. Daniel Sang Kim, "Sensor Network Localization Based on Natural Phenomena," 8/06 (EECS).
11. Michael J. Broxton, "Localization and Sensing Applications in the Pushpin Computing Network," 2/05 (EECS).
12. Stephen D. Lovell, "A System for Real-Time Gesture Recognition and Classification of Coordinated Motion," 1/05 (EEES).
13. Che King Leo, "Contact and Free-Gesture Tracking for Large Interactive Surfaces," 6/02 (EECS).

14. Laurel P. Smith, "Development of an Improved Swept RF Tagging System and its Musical Applications," 1/02 (EECS).
15. Leila M. Hasan, "Visual Frets for a Free-Gesture Musical Interface," 6/01 (EECS).
16. Nisha Checka, "A System for Tracking and Characterizing Acoustic Impacts on Large Interactive Surfaces," 5/01 (EECS).
17. Zoe C. Teegarden, "Embedded Low-Power Wireless Sensor System: Design of a Software Radio Base Station," 4/01 (EECS).
18. Christopher T. Yang, "New Laser Range Finder Designs For Tracking Hands Atop Large Interactive Surfaces," 3/01 (EECS).
19. Kai-Yuh E. Hsiao, "Fast Multi-Axis Tracking of Magnetically Resonant Passive Tags: Methods and Applications," 2/01 (EECS).
20. Ara N. Knaian, "A Wireless Sensor Network for Smart Roadbeds and Intelligent Transportation Systems," 6/00 (EECS).
21. Phillip J. Rowe, "Characterization of a Wideband Monopulse Piezoelectric Direction Finder," 6/99 (EECS).
22. Eric Hu, "Applications of Expressive Footwear," 4/99 (EECS).
23. Joshua Strickon, "Design and HCI Applications of a Low-Cost Scanning Laser Rangefinder," 1/99 (EECS).

S.M. Theses

As Advisor:

1. Perry Naseck, "Systems of Visualization for Musical Futures," expected 9/25 (MAS).
2. Nathan Perry, "Interstice: firmware-extensible pervasive embedded networks," expected 5/25 (MAS).
3. Samantha Chin, "Towards Perceptual Augmentation," 9/24 (MAS).
4. Severin Meyer, "Design and Control of Intelligent Electromagnetic Footwear for Space Applications," 8/24 (ETH Zürich).
5. Fangzheng Liu, "LunarWSN: A Wireless Sensor Network for In-Situ Lunar Water Ice Detection," 9/21 (MAS).
6. Jonathan Michael Feldman, "The Augmented Geometrically Spaced Transform: Applications of the Single Channel Frequency Estimator," 1/21 (MAS).
7. Elena Chong Loo Kodama, "R.E.I.N.A. Towards Pervasive Interface Agents that Transcend the Physical-Digital Worlds," 9/20 (MAS).
8. Patrick Chwalek, "Captivates: A Smart Eyewear Platform for Ambulatory Physiological Measurement Capture," 9/20 (MAS).
9. Océane Elia Boulais, "Emerging Computational Methodologies for Transparency in Fisheries," 9/20 (MAS).
10. Charlene Xia, "A low-cost modular underwater acoustic communication system," 9/20 (MAS).
11. Junsu Jang, "Marine snow tracking stereo imaging system," 9/20 (MAS).

12. Tyler J. Schoeppner, "Large Interactive Laser Light-Field Installation (LILLI)," 9/20 (MAS).
13. Carlos Nunez Lopez, "A modular and stretchable electronic system for on-body health monitoring applications," 9/19 (MAS).
14. Ezinne Uzo-Okoro, "Characterization of On-Orbit Robotic Assembly of Small Satellites," 5/20 (MAS).
15. Don Derek Haddad, "Resynthesizing Reality: Driving Vivid Virtual Environments from Sensor Networks," 2/18 (MAS).
16. Sara Ramsen, "Visualizing Models Driven by Real-Time, Sensor-Based Data: A New Way to Experience the Inner Workings of Ecosystems," 6/17 (MIT IDM Program).
17. Irmandy Wicaksono, "Design and Implementation of Multi-sensory Fabric for Deformable Musical Interface," 12/16 (EE Dept., ETH Zurich).
18. Daniel Manesh, "Exquisite Score – A System for Collaborative Musical Composition," 6/16 (MIT EECS).
19. David Ramsay, "LearnAir: Toward Intelligent, Personal Air Quality Monitoring," 8/16 (MAS).
20. Asaph Azaria, "Intelligent Ambiance: Digitally mediated workspace atmosphere, augmenting experiences, and supporting wellbeing," 8/16 (MAS).
21. Juliana Cherston, "Auditory Display For Maximizing Engagement and Attentive Capacity," 8/16 (MAS)
22. Vasant Ramasubramanian, "QuadraSense: Immersive UAV-based Cross-Reality Navigation of Environmental Sensor Networks," 8/15 (MAS).
23. Spencer Russell, "Auditory Augmented Reality in Expansive Spaces," 8/15 (MAS).
24. Pragun Goyal, "CAD Enabling Smart Handtools," 5/14 (MAS).
25. Sara Pfenninger, "A People-Tracking System Utilizing Particle Filters in a Non-Overlapping Sensor Network," 10/13 (EE Dept., ETH Zurich).
26. Brian D. Mayton, "WristQue: A Personal Sensor Wristband for Smart Infrastructure and Control," 2/13 (MAS).
27. Gershon Dublon, "Beyond the Lens: Communicating Context through Sensing, Video and Visualization," 9/11 (MAS).
28. Laurel S. Pardue, "Expressive Re-Performance," 9/11 (MAS).
29. Alexander J. Reben, "Interactive Physical Agents for Story Gathering," 6/10 (MAS).
30. Matthew Aldrich, "Dynamic Solid State Lighting," 6/10, (MAS).
31. Nan-Wei Gong, "Configurable Dynamic Privacy for Pervasive Sensor Networks," 9/09 (MAS).
32. Michael T. Lapinski, "A Wearable, Wireless Sensor System for Sports Medicine," 9/08 (MAS).
33. Manas Mittal, "Ubicorder: A Mobile Interface to Sensor Networks," 9/08 (MAS).
34. Jason M. LaPenta, "Real-time 3-d Localization using Radar and Passive Surface Acoustic Wave Transponders," 8/07 (MAS).

35. Ryan P. Aylward, "Senseble: A Wireless Inertial Sensor System for Interactive Dance and Collective Motion Analysis," 9/06 (MAS).
36. Gerardo Barroeta Pérez, "S.N.A.K.E.: A Dynamically Reconfigurable Artificial Sensate Skin," 9/06 (MAS).
37. Mathew J. Laibowitz, "Parasitic Mobility for Sensate Media," 8/04 (MAS).
38. David J. Merrill, "FlexiGesture: An sensor-rich real-time adaptive gesture and affordance learning platform for electronic music control," 6/04 (MAS).
39. Hongshen Ma, "Capacitive Displacement Sensing for the Nanogate," 2/04 (MAS).
40. Mark C. Feldmeier, "Large Group Musical Interaction using Disposable Wireless Motion Sensors," 9/02 (MAS).
41. Joshua H. Lifton, "A Platform for Distributed Embedded Ubiquitous Computing," 9/02, (MAS).
42. Ari Y. Benbasat, "Design of a Compact Inertial Measurement Unit and an Associated Analysis, Gesture Recognition and User Feedback Framework," 9/00 (MAS).
43. Ari T. Adler, "A Cost-Effective Portable Telemedicine Kit for Use in Developing Countries," 6/00 (Mechanical Engineering).
44. Nathan Shenck, "A Demonstration of Useful Electric Energy Generation from Piezoceramics in a Shoe," 5/99 (EECS).
45. Nazareth Sarkis Bedrossian, "Steering Law Design for Redundant Single Gimbaled Control Moment Gyro Systems," 8/87 (MIT Mechanical Engineering).

S.M. Theses

As Reader:

1. Lin, Tsung-Han, "Multi-bounce Returns for Specular Surface Mapping from Consumer-grade Flash LiDAR," 9/24 (MAS).
2. Kyuho Jang, "CircTrack: wearable real-time circulating cell monitoring device," 6/24 (MAS).
3. Maxwell K. Addae, "VocalCords: Exploring Tactile Interaction and Performance with the Singing Voice," 9/23.
4. Junqing Qiao, "EMG methods for prosthesis ankle-subtalar free-space control," 2/23 (MAS).
5. Waleed Akbar, "Battery-Free Wireless Imaging of Underwater Environments," 9/22 (MAS).
6. Justin Browning Christensen, "Distributed Displays for Discrete Integrated Circuit Electronics," 9/21 (MAS).
7. Christina Meyer, "Design and Efficacy of a Variable Thickness Transtibial Prosthetic Liner," 9/21 (MAS).
8. Zach Fredin, "Assembling Integrated Electronics," 9/21 (MAS).
9. Sohan Savio Dsouza, "Crowdsourcing Moral Psychology," 2/21 (MAS).

10. Manushaqe Muco, "Connecting Symbols to Primitive Percepts using Expectation as Feedback," 9/20 (MAS).
11. Ravi Tejwani, "Migratable AI," 9/20 (MAS).
12. Nikhil Singh, "Sifting Sound: Interactive Extraction, Exploration, and Expressive Recombination of Large and Heterogeneous Audio Collections," 9/20 (MAS).
13. Abhinandan Jain, "Body Driven Cognition: Writing To The Body To Influence the Mind," 9/20 (MAS).
14. Junshan Leng, "RF-Guided Exploration for Robotic Manipulation," 9/20 (MAS).
15. João Henrique Santos Wilbert, "Vibroacoustic Materials: Leveraging Material Vibration to Sense Interaction," 9/20 (MAS).
16. Tomohiro Maeda, "Computational Imaging with Scattered Photons to See inside the Body," 6/20 (MAS).
17. Tomás Alfonso Vega Gálvez, "μJawstures: Jaw-teeth microgestures for discreet hands-and-eyes-free mobile device interaction," 9/19 (MAS).
18. Seong Ho Yeon, "Design of an advanced sEMG processor for wearable robotics applications," 8/19 (MAS).
19. Britney Johnson, "Kicks x Cliques: Exploring the Intersection of Sneaker Culture and Mental Health in the Black Community," 8/19 (MAS).
20. Zhihong Luo, "3D Backscatter Localization for Fine-Grained Robotics," 6/19 (MAS).
21. Hane Lee, "Freedom Simulator," 6/19 (MAS).
22. Jiamin Sun, "Human Intent Prediction for Adaptive Lighting Based on a Limited Data Scenario," 2/19 (MIT Architecture and EECS).
23. Ali Shtarbanov, "AirTap: A Multimodal Interactive Interface Platform with Free-Space Cutaneous Haptic Feedback via Toroidal Air-Vortices," 2/18 (MAS).
24. Levi Cai, "On-site Autonomous Fabrication at Architectural Scales," 6/18 (MAS).
25. Pedro Antonio Colón-Hernández, "Hover: A wearable object identification system for audio augmented reality interactions," 6/18 (MAS).
26. Thomas Sanchez Lengeling, "Panoptic," 9/17 (MAS).
27. Penny Webb, "Chemical Inflation for Assisted Assembly," 9/17 (MAS).
28. Nicole L'Huillier, "Spaces That Perform Themselves," 8/17 (MAS).
29. Daniel John Fitzgerald, "Spatial Material Interfaces," 6/17 (MAS).
30. Brian Tice, "Sonic Artifacts," 6/17 (MAS).
31. Caroline Jaffe, "Motivating urban cycling through a blockchain-based financial incentives system," 6/17 (MAS).
32. Ariel C. Ekblaw, "MedRec: Blockchain for Medical Data Access, Permission Management and Trend Analysis," 2/17 (MAS).
33. Luke Vink, "Materiality in 'Suspense'", 8/16 (MAS).
34. Tal Achituv, "Assisted Self-Expression in Paint," 5/16 (MAS).

35. Sarah Platte, "The Maestro Myth – Exploring the Impact of Conducting Gestures on the Musician's Body and the Sounding Result," 5/16 (MAS).
36. Cameron Taylor, "Transverse Flux Motor Optimization for Utilization in Bionic Joints," 5/16 (MAS).
37. Tome Basheer, "Exoskin: Pneumatically Augmenting Inelastic Materials for Texture Changing Interfaces," 9/15 (MAS).
38. Jean-Francois Duval, "FlexSEA : flexible, scalable electronics architecture for wearable robotic applications," 5/15 (MAS).
39. Guy Satat, "Imaging Through Scattering," 5/15 (MAS).
40. Felix Heibeck, "Augmented Material Interfaces: Exploring bidirectional microinteractions enabled by radical elements," 5/15 (MAS).
41. Charles Holbrow, "Hypercompression: Stochastic Musical Processing," 5/15 (MAS).
42. Daniel Goodman, "Aware surfaces: large-scale, surface-based sensing for new modes of data collection, analysis, and human interaction," 5/15 (MAS).
43. Kamal Farah, "Soft Exchange: Interaction Design with Biological Interfaces," 5/15 (MAS).
44. Benjamin A. Bloomberg, "Hyperproduction: An Audio-Centric Framework For The Abstract Modeling Of Live Performance To Guide Audience Attention And Perspective Using Connected Real-Time Systems," 8/14 (MAS).
45. William K. Langford, "Electronic Digital Materials," 9/14 (MAS).
46. Jared Laucks, "Custom Mechanisms for Tunable Material Deposition," 6/14 (MAS).
47. Robert Michael Hemsley, "Flow: A Framework for Reality-Based Interfaces," 2/14 (MAS).
48. Kshitij Marwah, "Tensor Photography: Exploring Space of 4D Modulations Inside Traditional Camera Designs," 9/13 (MAS).
49. Samuel Jacoby, "Drawing the Electric," 6/13 (MAS).
50. Nikhil Naik, "Multibounce Light Transport Analysis using Ultrafast Imaging for Material Acquisition," 5/12 (MAS).
51. Praveen Subramani, "taking charge: Optimizing Urban Charging Infrastructure for Shared Electric Vehicles," 9/12 (MAS).
52. Andrew Matthew Bardagjy, "Low dimensionality spectral sensing for low cost material discrimination and identification," 5/12 (MAS).
53. Akito van Troyer, "Hyperaudience Designing Performance Systems for Audience Inclusion," 8/12 (MAS).
54. David Allen Hill, "Effects of a Powered Ankle Prosthesis on Shock Absorption and Residual Limb/Socket Interface Pressure," 6/12 (MAS).
55. Nikhil Naik, "Multibounce Light Transport Analysis using Ultrafast Imaging for Material Acquisition," 5/12 (MAS).
56. David Cranor, "ProtoTouch: A System For Prototyping Ubiquitous Computing Environments Mediated By Touch," 9/11 (MAS).

57. Matthew Donahoe, "OnTheRun: A Location-based Exercise Game," 9/11 (MAS).
58. Roarke Horstmeyer, "Towards a Unified Treatment of 3D Display using Partially Coherent Light," 9/11 (MAS).
59. Jinha Lee, "ZeroN: Mid-Air Tangible Interaction Enabled by Computer Controlled Magnetic Levitation," 2/11 (MAS).
60. Natan Linder, "LuminAR: A Compact and Kinetic Projected Augmented Reality Interface," 9/11 (MAS).
61. David Y. Robert, "Imaginative Play with Blended Reality Characters," 6/11 (MAS).
62. Edward (Ned) E. Burns, "End-User Modification and Correction of Home Activity Recognition," 9/10 (MIT Architecture Dept.).
63. Andrea Colaço, "Back Talk: An Auditory Environment for Remote Co-Presence in Television Viewing," 9/10 (MAS).
64. Sheng-Ying Pao, "Connected Strangers: Manipulating Social Perceptions To Study Trust," 5/10 (MAS).
65. Andrew A. Cavatora, "Nervebox: The First General Platform for Electromechanical Musical Instruments," 6/10 (MAS).
66. Noah Feehan, "Syncwalk - A Framework for Geospatial Audio Composition," 6/10 (MAS).
67. Elly N. Jessop, "A Gestural Media Framework: Tools for Expressive Gesture Recognition and Mapping in Rehearsal and Performance," 6/10 (MAS).
68. Sigurður ÖrnAdalgeirsson, "MeBot: A Robotic Platform for Socially Embodied Telepresence," 9/09 (MAS).
69. Matthew W. Hirsch, "BiDi Screen: Depth and Lighting Aware Interactive Display," 9/09 (MAS).
70. Ana Luisa Santos, "uCom: Spatial Displays for Visual Awareness of Remote Locations," 9/09 (MAS).
71. Amit Zoran, "Chameleon Guitar: Physical Heart in a Digital Instrument," 6/09 (MAS).
72. Matthew T. Farrell, "Angular momentum in turns and abrupt starts : strategies for bipedal balance control," 6/09 (MAS).
73. Jun K. Lee, "Affordable Avatar Control System for Personal Robots," 2/09 (MAS).
74. Sanghoon Lee, "Infocfield: An Aura Recognizing Digital Information of Everyday Environments," 2/09 (MAS).
75. Marcelo Coelho, "Materials of Interaction," 9/08 (MAS).
76. Brandon T. Taylor, "Graspables: Grasp Recognition as a User Interface," 9/08 (MAS).
77. Avrum Douglas Hollinger, "Design of fMRI-Compatible Electronic Musical Interfaces," 9/08, (McGill University, Department of Music).
78. Benjamin Aisen, "An Inertial Measurement-Based Gait Detection System for Active Leg Prostheses," 9/07 (MAS).
79. Steven Pliam, "The Chandelier: Toward a Digitally Conceived Physical Performance Object," 9/07 (MAS).

80. Arnan Sipitakiat, "Giving the head a hand : constructing a microworld to build relationships with ideas in balance control," 9/07 (MAS).
81. Daniel O. Olguin, "Sociometric Badges: Wearable Technology for Measuring Human Behavior," 6/07 (MAS).
82. Michael A. Fabio, "The Chandelier: An Exploration in Robotic Musical Instrument Design," 6/07 (MAS).
83. Patrik Künzler, "Humanseat: semi-wearable seating concepts for vehicle control, medical, and wellbeing applications," 6/07 (MAS).
84. Wen Dong, "Influence Modeling of Complex Stochastic Processes," 9/06 (MAS).
85. Bo Morgan, "Learning Commonsense Human-language Descriptions from Temporal and Spatial Sensor-network Data," 9/06 (MAS).
86. Enrico Costanza, "Subtle, Intimate Interfaces for Mobile Human Computer Interaction," 9/06 (MAS).
87. Ernesto Carlos Martinez Villalpando, "Estimation of Ground Reaction Force and Zero Moment Point on a Powered Ankle-Foot Prosthesis," 9/06 (MAS).
88. Sajid H. Sadi, "subTextile: A Construction Kit for Behavioral Textiles," 9/06 (MAS).
89. Gauri Nanda, "Accessorizing with Networks: The Possibilities of Building with Computational Textiles," 9/05 (MAS)
90. David Sachs, "A Forearm Controller and Tactile Display," 9/05 (MAS).
91. John Harrison, "SoundBlocks and SoundScratch: Tangible and Virtual Digital Sound Programming and Manipulation for Children," 9/05 (MAS).
92. Simon Karl Josef Schiessl, "Acoustic Chase: Designing an interactive audio environment to simulate human body movement," 6/04 (MAS).
93. Walter Daniel Stiehl, "Sensitive Skins and Somatic Processing for Affective and Sociable Robots based upon a Somatic Alphabet Approach," 5/05 (MAS).
94. Akshay Mohan, "Health Technology: Design of Bandage-Sized Wireless Sensors and Effect of Ambient Displays on Social Support and Diabetes Management," 9/04 (MAS).
95. Gian Pangaro, "The Actuated Workbench," 6/03 (MAS).
96. Simon Greenwold, "Spatial Computing," 5/03 (MAS).
97. Emmanuel Munguia Tapia, "Activity Recognition in the Home Setting Using Simple and Ubiquitous Sensors," 9/03 (MAS).
98. Megan Galbriath, "Embedded Systems for Computational Garment Design," 6/03 (MAS).
99. Parul Vora, "SIMULACRUM: Situated Memory for Architectural Space," 8/03 (MAS).
100. Deva Seetharamakrishnan, "C@T – A Language for Programming Massively Distributed Systems," 9/02 (MAS).
101. Roberto Mario Aimi, "New Expressive Percussion Instrument," 9/02 (MAS).
102. Nikita Pashenkov, "Optical Turntable as an Interface for Musical Performance," 5/02 (MAS).

103. Jorge Martinez Arazia, "Wireless transmission of power for sensors in context aware spaces," 6/02 (MAS).
104. Joshua Weaver, "A wearable health monitor to aid Parkinson Disease treatment," 6/03 (MAS).
105. Ricardo Garcia, "Automatic Generation of Sound Synthesis Techniques," 9/01 (MAS).
106. Diana Young, "New Frontiers of Expression Through Real-Time Dynamics Measurement of Violin Bows," 9/01 (MAS).
107. Tristan Jehan, "Perceptual Synthesis Engine: An Audio-Driven Timbre Generator," 9/01.
108. Wei Chai, "Melody Retrieval on the Web," 9/01 (MAS).
109. Wendy G. Ju, "The Design of Active Workspaces," 9/01 (MAS).
110. Jay-Chol Lee, "HandSCAPE: A Design of a Computational Measuring System," 6/01 (MAS).
111. Daniel J. Overhault, "The Emonator: A Novel Musical Interface," 9/00 (MAS).
112. Edward V. Hammond, "Multi-Modal-Mixing," 6/00 (MAS).
113. Matthew V. Lau. "The Snap! Toolkit: A Model for Pluggable Monitoring," 6/00 (MAS).
114. Craig A. Wisneski, "The Design of Personal Ambient Displays," 6/99 (MAS).
115. Tom White, "Introducing Liquid Haptics in High Bandwidth Human Computer Interface," 1/98 (MAS).
116. Andrew Choon-ki Hong, "Non-Linear Analysis of Cello Pitch and Timbre," 9/92 (MAS).

Doctoral Theses

As Advisor:

1. Madelyn Hoying, "Detecting Tight Junction-Mediated Epithelial Barrier Dysfunction in Altered Gravity Environments," Expected Fall 2025 (MIT HST Program).
2. Patrick Chwalek, "From Humans to Canids to Bees: Cross-Contextual Exploration in Environmental Sensing and Ecological Research," Expected 9/25 (MAS).
3. Ali Shtarbanov, "Modular Development Platforms and Creative Ecosystems: Design & Deployment for Wide Impact Across Fields," Expected 5/25 (MAS).
4. Irmandy Wicacksono, "Textile Macroelectronics: Architecting Sensate and Computational Fabrics across Scales," 9/24 (MAS).
6. Don Derek Haddad, "Responsive Space Environments: New Paradigms in Blending Virtual and Physical Exploration through Human-Robot Operations," 9/23 (MAS).
7. David Bradford Ramsay, "Designing for Deep Engagement," 9/23 (MAS).
8. Deborah Anne Najjar, "CRISPR Biosensors for Resource-limited Nucleic Acid Detection," 9/22 (MAS).
9. Juliana Mae Cherston, "The Well-Dressed Spacecraft: Textiles for Cosmic Dust Metrology," 9/22 (MAS).
10. Caroline Adair Jaffee, "An Environmental and Economic Systems Analysis of Land Use Decisions in the Massachusetts Cranberry Industry," 9/22 (MAS).

11. Ishwarya Ananthabhotla, "Cognitive Audio: Enabling Auditory Interfaces with an Understanding of How We Hear," 2/22 (MAS).
12. Ariel Ekblaw, "Self-Aware Self-Assembly for Space Architecture: Growth Paradigms for In-Space Manufacturing," 9/20 (MAS).
13. Brian D. Mayton, "Sensor Networks for Experience and Ecology," September 2020 (MAS).
14. Spencer Russell, "Resynthesizing Volumetric Soundscapes: low-rank subspace methods for soundfield estimation and reconstruction," May 2020 (MAS).
15. Artem Dementyev, "Dynamic wearable technology: designing and deploying small climbing robots for sensing and actuation on the human body," 9/19 (MAS).
16. Gershon Dublon, "Sensor(y) Landscapes: Technologies for New Perceptual Sensibilities," 6/18 (MAS).
17. Nan Zhao, "Mediated Atmospheres Context-aware Adaptive Lighting and Multimodal Media Environments," 9/17 (MAS).
18. Jie Qi, "Paper Curiosities: Circuits on Paper for Learning and Self-Expression," 8/16 (MAS)
19. Nan-Wei Gong, "Design and Applications of Inkjet-Printed Flexible Sensate Surfaces," 8/13 (MAS).
20. Michael T. Lapinski, "A Platform for High-Speed Biomechanical Data Analysis using Wearable Wireless Sensors," 8/13 (MAS).
21. Amit Zoran, "Hybrid re-Assemblage: Bridging Traditional Craft and Digital Design," 8/13 (MAS).
22. Bo Morgan, "A Substrate for Accountable Layered Systems," 8/13 (MAS).
23. Mathew Laibowitz, "Creating Cohesive Video with the Narrative-Informed use of Ubiquitous Wearable and Imaging Sensor Networks," 1/10 (MAS).
24. Mark C. Feldmeier, "Personalized Building Comfort Control," 9/09 (MAS).
25. Joshua H. Lifton, "Dual Reality: An Emerging Medium," 9/07 (MAS).
26. Ari Y. Benbasat, "Techniques for Real-time Adaptive Low-Power Sensor Systems," February 2007 (MAS).
27. Stacy J Morris, "A Shoe-Integrated Sensor System for Wireless Gait Analysis and Real-Time Therapeutic Feedback," June 2004 (MIT Mechanical Engineering - HST).
28. John Edward Dzielski, "A Feedback Linearization Approach to Spacecraft Control Using Momentum Exchange Devices," April 1988 (MIT Mechanical Engineering).

Doctoral Theses

As Reader:

1. Ferrous Ward, "Enhancing Space Exploration Missions with Virtual Reality: Decision support for Mission Operations and Planetary Science," 5/24 (MIT Aero/Astro).
2. Seong Ho Yeon, "Enhancing Muscle Sensing Modalities for Advanced Bionics," 5/24 (PhD).

3. Akshay Kothakonda, "Engineering Mechanical Counter Pressure Spacesuits and Compression Garments: Active Pressurization and Design for Mobility," 2/24 (MIT Aero/Astro).
4. Cody Alison Paige, "Enabling a permanent human presence beyond low Earth orbit: wearable radiation protection and enhanced science through virtual reality," 9/23 (MIT Aero/Astro).
5. Nicolas Alexander Lee, "Endless Ecosystems: Designing a World Without Waste," 6/23 (MAS).
6. Guillermo Román Bernal Cubias, "Into the Wild: Deploying Brain and Physiological Sensing in Natural Environments to Enhance Wake and Sleep Cognitive Behavioral Studies," 5/23 (MAS).
7. Nivedita Arora, "Sustainable Interactive Wireless Stickers - From Materials to Devices to Applications," 1/23 (Georgia Tech, CS Department).
8. Michael Haslgrübler, "Skill Interpretation for Industrial Production," 9/22 (Johannes Kepler Universität [JKU], Linz Austria, Informatik [CS] Department).
9. Ken Nakagaki, "Shells and Stages for Actuated TUIs: Reconfiguring and Orchestrating Dynamic Physical Interaction," 9/21 (MAS).
10. Aswin Karthik Ramachandran Venkatapathy, "An Approach towards Decentralization of Systems Communication in Industry 4.0," 5/21 (TU Dortmund [Germany], Mechanical Engineering Dept.).
11. Youngbin Sun, "Enhancing Internet of Things Experience in Augmented Reality Environments," 5/20 (MIT Mechanical Engineering).
12. Benjamin Arthur Philips Bloomberg, "Making Musical Magic Live: Inventing modern production technology for human-centric music performance," 2/20 (MAS).
13. Matthew Everett Lawson, "Biologically encoded augmented reality: multiplexing perceptual bandwidths," 9/20 (MAS).
14. Cameron Roy Taylor, "Magnetomicrometry : tissue length tracking via implanted magnetic beads," 5/20 (MAS).
15. Sang-won Leigh, "Robotic Symbionts: Exploring Integrated Human-Machine Action and Expression," 9/18 (MAS).
16. Guy Satat, "All Photons Imaging – Time-Resolved Computational Imaging Through Scattering," 2/18 (MAS).
17. Markus Kayser, "Towards Swarm-based Design: Distributed and Materially-tunable Digital Fabrication Across Scales," 2/18 (MAS).
18. Natan Linder "Rapid Development and Real World Deployments of Projected Augmented Reality Applications," 9/17 (MAS).
19. Akito van Troyer, "Score Instruments: Interaction Design for Abstract Musical Decision Making," 9/16 (MAS).
20. Jacob Bernstein, "Scalable Neural Recording: Electrophysiology System Development and Validation," 8/16 (MAS).
21. Clément Duhart, "Toward Organic Ambient Intelligences – EMMA," 6/16 (Normandie Université [l'Université du Havre], France).

22. Arthur Joseph Petron, "Prosthetic socket design : from a multi-indenter device for in vivo biomechanical tissue measurement to a quasi-passive transtibial socket interface," 2/16 (MAS).
23. Roy Shilkrot, "Digital digits: Designing Assistive Augmentation Devices," 6/15 (MAS).
24. Sean Follmer, "Dynamic Physical Affordances for Shape Changing and Deformable User Interfaces," 1/15 (MAS).
25. Santiago E.A. Bernate, "Digital Synesthesia: Using Mobile Technology to Interact With Our World," 1/15 (MAS).
26. Andrea Colaço, "Compact and Low-Power Computational 3D Sensors for Gestural Input," 6/14 (MAS).
27. Andrew O. Payne, "Personalized Intelligent Comfort Control for Office Spaces," 5/14 (Harvard Graduate School of Design).
28. Wu-Hsi Li, "Loco-Radio - Designing High-Density Augmented Reality Audio Browsers," 2/14 (MAS).
29. Matthew T. Farrell, "Pattern Classification of Terrain During Amputee Walking," 5/13 (MAS).
30. Noah Vawter, "Exertion Instruments," 6/11 (MAS).
31. Fulu Li, "Community Computation," 6/09 (MAS).
32. David J. Merrill, "Interaction with Embodied Media," 6/09 (MAS).
33. Emmanuel Munguia Tapia, "Using Machine Learning for Real-Time Activity Recognition and Estimation of Energy Expenditure," 6/08 (MAS).
34. Eric Wade, "Analysis and Design of a Wearable Health-Monitoring Network using DC Powerline Communication and Conductive Textiles," 1/07 (MIT Mechanical Engineering Department).
35. Diana Young, "A System for Understanding Violin Bowing Technique Through Measurement of Physical Dynamics", 1/07 (MAS).
36. Roberto Aimi, "Not another controller: hybrid percussion instruments using real acoustic systems to drive digital ones," 10/06 (MAS).
37. Dean Christakos, "Distributed-in/Distribution-out Sensor Networks: A New Framework to Analyze Distributed Phenomena," 2/06 (MAS)
38. Ali Mazalek, "Media Tables: An extensible method for developing multi-user media interaction platforms for shared spaces," 9/05 (MAS).
39. Aggelos Bletsas, "Intelligent Antenna Sharing in Cooperative Diversity Wireless Networks," 6/05 (MAS).
40. Susan Baldwin, "Development of Low Cost, Low Power Optical Sensing Devices Based on Coupled LED's for Colorimetric Analysis," 6/05 (Chemistry Dept., Dublin City University).
41. Kynan Eng, "Designing Neuromorphic Interactive Spaces, 6/04 (ETH Zürich, EE Dept.).
42. Gil Weinburg, "Interconnected Musical Networks - Bringing Expression and Thoughtfulness to Collaborative Group Playing," 8/03 (MAS).

- 43. Ernest Rehmi Post, "Inertial Measurement via Dynamics of Trapped Particles," 8/03 (MAS).
- 44. Dorothy Shamonsky, "The Mixing of Two Worlds -- Smart Clay -- Using Ubiquitous Computing to Add Intelligence to a Physical Medium," 6/03 (MIT Architecture)
- 45. Mathew Reynolds, "Low-Frequency Indoor Radiolocation," February 2/03 (MAS).
- 46. Brian Clarkson, "Life Patterns: structure from wearable sensors," 9/02 (MAS).
- 47. Gregory Errol Chamitoff, "Robust Intelligent Flight Control for Hypersonic Vehicles," 2/92 (MIT Aero/Astro)