

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DAIFUKU CO., LTD,
Petitioner,

v.

CLX ENGINEERING,
Patent Owner

IPR2024-
U.S. Patent 11,386,602

**DECLARATION OF JASON A. JANÉT, Ph.D.
IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW**

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. QUALIFICATIONS	2
III. MATERIALS CONSIDERED	17
IV. BACKGROUND OF THE ART	18
V. THE '602 PATENT	23
A. Overview of the '602 Patent and Prosecution History	23
B. Level of Ordinary Skill in the Art	28
VI. RELEVANT LEGAL STANDARDS	30
A. Obviousness	30
VII. CLAIM CONSTRUCTION	34
VIII. GROUND 1: CLAIMS 1-2, 4, 9-10, 12, 14, 15 AND 17 ARE RENDERED OBVIOUS BY CAVADA, ORITO AND SOMMER	34
A. Overview of Cavada	34
B. Overview of Orito	35
C. Overview of Sommer	37
D. Motivations to Combine Cavada, Orito and Sommer	39
1. The prior art included each claimed element	40
2. A POSITA would have combined elements by known methods and in combination, each element performs the same function as it does separately	40
3. A POSITA would have recognized the results of the combination were predictable	44
E. Disclosures for Claim 1	45
F. Disclosures for Claim 2	61
G. Disclosures for Claim 9	61
H. Disclosures for Claims 10 and 12	61
I. Disclosures for Claim 14	62

J.	Disclosures for Claims 15 and 17	62
IX.	GROUND 2: CLAIMS 3, 6, 11 AND 16 ARE RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER AND SCHMIRLER.....	62
A.	Overview of Schmirler	62
B.	Motivations to Combine Cavada, Orito, Sommer and Schmirler	62
C.	Disclosures for Claims 3, 6, 11 and 16	65
X.	GROUND 3: CLAIMS 5, 13 AND 18 ARE RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER AND KANG	66
A.	Overview of Kang	66
B.	Motivations to Combine Cavada, Orito, Sommer, and Kang	67
C.	Disclosures for Claims 5, 13 and 18	69
XI.	GROUND 4: CLAIM 7 IS RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER, SCHMIRLER, AND ANDERSON	69
A.	Overview of Anderson	69
B.	Motivations to Combine Cavada, Orito, Sommer, Schmirler and Anderson	69
C.	Disclosures for Claim 7	72
XII.	GROUND 5: CLAIM 8 IS RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER, AND ALURU	72
A.	Overview of Aluru.....	72
B.	Motivations to Combine Cavada, Orito, Sommer, and Aluru	73
C.	Disclosures for Claim 8.....	74
XIII.	AVAILABILITY FOR CROSS EXAMINATION.....	74
XIV.	RIGHT TO SUPPLEMENT	75
XV.	JURAT	75

I, Jason A. Janét, declare as follows:

I. INTRODUCTION

1. I have been asked to submit this declaration on behalf of DAIFUKU CO., LTD (“Petitioner”) in connection with a Petition for *inter partes* review of U.S. Patent 11,386,602 (the “’602 Patent”) (EX1001). Specifically, I have been retained as an independent expert consultant by Petitioner to provide my opinions on the technology claimed in, and the patentability or unpatentability of claims 1-18 of the ’602 Patent (the “challenged claims”). Although I am being compensated at my usual rate of \$450 per hour for the time I spend on this matter, no part of my compensation depends on the outcome of this proceeding, I have no financial interest in any of the parties, and I have no other interest in this proceeding.
2. I have reviewed, had input into, and endorse the discussions in the Petitioner’s Petition for *Inter Partes* Review for the ’602 Patent (the “Petition”), including the statements in the Petition regarding the ’602 Patent and its prosecution history, the scope of the claim, the prior art’s disclosure of the claim, and the statements throughout the Petition regarding the knowledge and understanding of a person of ordinary skill in the art (“POSITA”).

3. In addition to endorsing the Petition, this declaration is a statement of my opinions on issues related to the patentability of the challenged claims.

II. QUALIFICATIONS

4. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I have summarized below. I serve Applied Research Associates (“ARA”) as a Corporate Director and, previously, as Chief Technology Officer (“CTO”). I have also held the rank of Adjunct Associate Professor at Duke University and at North Carolina State University, two of the universities with which ARA maintains active working relationships.
5. I received a Bachelor of Science in Mechanical Engineering from the University of Virginia in 1990; a Master of Integrated Manufacturing Systems from the Integrated Manufacturing Systems Engineering Institute at North Carolina State University in 1994; and a Ph.D. in Electrical and Computer Engineering from North Carolina State University in 1998.
6. Since the 1980s, I have served in multiple capacities while designing, engineering, implementing and supporting fluid control and filtration systems. In the construction field, I implemented multiple gravity- and pump-driven flow control and sediment separation systems. While at Nekton (which was acquired by iRobot), I engineered and implemented multiple

flow control systems focused primarily on submersible robotics that operate on the water surface, at the air-water interface and below the water surface.

While launching Parata, a provider of pharmacy automation/robots for filling prescriptions, I implemented a HEPA-C filtered vacuum-driven method to fluidize oral solids within hopper heaps, and a compression-driven method to singulate oral solids from inside the hoppers to a vial outside the hoppers to dispense pills from a selection of up to 252 different oral solid medications residing within the robot. Parata's in-line compressed air lines comprised filtration elements to remove potentially contaminating lubricants from the venturi ejectors.

7. While at Transdigm/Avionic Instruments, I designed and implemented multiple flow control and filtration systems for cooling aviation/aerospace subsystems (power generation/conversion/distribution, autonomy modules, DAQ/DSP, etc.), as well as vortical-flow filterless vacuums and attractors that operate in gas and liquid domains. Regarding the latter, the Vortex Regenerative Air/Aqueous Movement ("VRAM") was developed and marketed under spin-out company "Vortex HC", in part for entraining and separating micron-level and larger particles; VRAM vacuums have been integrated by and co-developed with Black & Decker, Dyson, and others. The VRAM attractor provided suction- and magnet-like attraction for wall-

climbing mobile robots, attachment devices, non-dextrous gripping, hull-crawling submersible mobile robots, etc. VRAM attractors are used by companies including, but not limited to, GE-Hitachi Nuclear Energy, Teledyne SeaBotix, SeaRobotics, Oceaneering, Lockheed-Martin, BDT, Department of Defense (“DoD”)/IC customers, etc. While driving the Vortex HC spin-out, I spearheaded the development of the ARTEMIS-series of submersible autonomous underwater vehicles (“AUVs”), remotely operated vehicles (“ROVs”), unmanned surface vehicles (USVs) and unmanned underwater vehicles (“UUVs”) with filtration and flow control systems for vectored thrusters and high agility.

8. While at RxMedic, also a spin-out from Avionic Instruments/Transdigm, and also a provider of pharmacy automation/robots for prescription fulfillment, I developed and implemented in-line vacuum-driven HEPA-C filtration systems to simultaneously isolate fine particles from up to 256 different oral solid medications housed in and dispensed by the robot vacuum, and assist centrifugal singulation/dispensation of oral solids from hopper heaps. Customers of the RxMedic robotic system include, but are not limited to, WakeMed, HealthMart, Dunn Discount Drug, and dozens of other chain and independent pharmacies.

9. While at Delta Five, a provider of automated systems to the hospitality field, I developed and implemented flow control and filtration systems for room-cleaning robots (air, water, solvents/soaps, particles, etc.) and internet-of-things (IoT) sensors and traps. For the latter, I developed flow management for pheromone-infused and heated air to lure specific pests to intelligent traps.
10. In my current capacity at Applied Research Associates, I contribute to multiple portfolios including technologies that purify water for intravenous (IV) bags and general consumption, that physically and chemically refine and reuse fuels, and that model human physiology for medical training and treatment.
11. In general, I have been active in the intelligent electromechanical systems field for decades. My M.S. thesis, entitled *Global Motion Planning and Self-Referencing for Autonomous Mobile Robots*, leveraged graph theory, feedback and sensors to optimize mobile robot movement through, and perception of, environments. My Ph.D. dissertation, entitled *Pattern Analysis, Tracking and Control for Autonomous Vehicles*, leveraged multiple mobile robots, sensors, and neural networks to enhance simultaneous localization and mapping (SLAM), as well as the sharing of knowledge between multiple different mobile robots. I have authored

numerous publications and have co-authored a textbook entitled Computational Intelligence.

12. I have designed, built, and marketed robots, automated systems, toys, measuring systems and components thereof, including ground mobile robots, unmanned aerial vehicles (“UAVs”), unattended sensors, automated storage and retrieval systems (ASRS), submersible mobile robots, proof-of-concept extraterrestrial robots, manually manipulated (“twiddled”) submersible foils, wall-climbing mobile robots, corner-grip shelving systems, proximity and ranging systems, point-cloud systems, pattern analysis tools, and augmented reality systems.
13. I have taught the following courses: Introduction to Robotics and Automation (Duke and NCSU, 1996-2016); Introduction to Control Theory (Duke and NCSU, 1999-2014); Distributed Real-Time Controls (NCSU, 1994-1998); and myriad courses in Mechanical Engineering, Biomedical Engineering, Electrical/Computer Engineering, Industrial Engineering and Systems Engineering. I have also served on several M.S.- and Ph.D.-level graduate student committees and qualifying exams, served on the NCSU IMSEI Board, and participated in curriculum development for undergraduate and graduate-level programs, including the NCSU B.S.- and M.S.-level Mechatronics curricula.

14. I have also built, sponsored, and advised multiple champion student teams for international robot competitions including, but not limited to, the National Aeronautics and Space Administration (NASA)/American Society of Civil Engineers (ASCE) Extra-Terrestrial Robotics Competition, the Defense Advanced Research Projects Agency (DARPA) Grand Challenge, the Association for Uncrewed Vehicle Systems International (AUVSI)/ the Office of Naval Research (ONR) Autonomous Underwater Vehicle Competition, and the European Climbing and Walking Robots (CLAWAR) Wall-Climbing Robot competition.
15. I have initiated multiple unmanned systems projects at both academic and industry levels. Academic UAVs include, but are not limited to, Quadcopters with Hybrid Remote and Autonomous Control, Marsupial UAVs that Deploy and Recover Unmanned Ground Vehicles, and Wall-Climbing UAVs. Additionally, the AngelFish Cross-Domain Submersible UAV, a DARPA anti-submarine warfare (ASW) program that I launched at Teledyne, included a partnership with North Carolina State University. UUVs include, but are not limited to, the MicroHunter-class of very small underwater robots; the PilotFish, Gamera, Artemis and other holonomic robots; submersible crawlers that are used in nuclear reactors, and the little

benthic crawler (LBC¹) hull inspection system; and the hull bio-inspired underwater grooming (HULLBUG) hull cleaning system. Unmanned ground vehicles include, but are not limited to, the miniature PERRY, wall-climbers, and all-terrain and subterranean crawlers.

16. I have also supported multiple toy-focused ventures with companies including, but not limited to, Marvel, Hasbro, Twidco, Spin Master, Nottingham-Spirk, IDEO, ARA, and other firms. For Marvel, multiple Spiderman toys were conceived and developed and validated, including the Spiderman Wall-Climbing Car, the Corner-Climbing Spider, and the Inflatable Wall-Climbing Spiderman. For Hasbro, a proprietary corner-gripping technology was employed to place basketball goals in corners. For Twidco, a proprietary flapping foil technology was combined with multiple fish shapes (e.g., shark and clownfish) to enable users to create fishlike motion by “twiddling” a connecting cable from above. For Spin Master and multiple design firms, multiple wall-climbing toys were developed for small wall-climbing robot concepts, including simple radio control vehicles and the “Hangtime 540” Tony Hawk aerial skateboard toy. For ARA, augmented reality systems for indoor and outdoor games were developed.

¹ Little Benthic Crawler

17. In 1999, while I was employed by Nekton Research (“Nekton”), I captured and managed multiple programs sponsored by the DoD and private-sector companies that focused primarily on AUVs, ROVs, TwiddleFish toys, and indirect-fire projectiles. During my tenure, Nekton entered into a joint venture agreement with the founders of what eventually became known as Parata Systems—a pharmacy automation solutions company, which I supported launching.
18. After leaving Nekton in March 2002, I joined a then New Jersey-based company called Avionic Instruments, Inc. (“Avionic”). While at Avionic, I continued developing and marketing robots and supported engineering related to various design, manufacturing, quality and assembly issues on the core aerospace product lines. Avionic product lines include, but are not limited to, ducted fans, transformer-rectifier units (“TRU”), regulated TRU (RTRU), auxiliary power unit (“APU”) control systems, power distribution systems (PDUs), frequency converters, corner clamps, and VRAM attractors/thrusters. Customers included DoD, NASA, Boeing, Sikorsky, Augusta-Westland, Dassault, and Lockheed-Martin. During my tenure at Avionic, I supported multiple AS/RS integration efforts for handling

hundreds of SKU²s and tens of thousands of inventory components for applications including component-, assembly- and circuitboard-level material handling and quality assurance.

19. At Avionic, I was also tasked with ruggedizing, optimizing, and commercializing two emerging proprietary technologies: the “CFG” and “VRAM”. The CFG, short for Corner Friction Grip, was a proprietary technology based on non-marring and non-adhesive materials that provided optimal grip patterns on inside and outside corners. CFG formed the basis of a company called “Shelf Works Technologies,” which was spun out of Avionic Instruments in 2004, and whose products were sold in Home Depot, Bed Bath and Beyond, etc. CFG also formed the basis of multiple toys including a miniature basketball goal for Hasbro, and a corner-climbing Spiderman toy for Marvel.
20. The VRAM is a patented method for producing attraction forces between an object and a surface. VRAM is euphemistically referred to as a “tornado in a cup” and generally comprises both cylindrical and toroidal flow patterns that result in vacuum-like regions. The VRAM had several applications, including but not limited to: holding breaching charges and sensors against

² Stock-keeping unit

vertical or inverted surfaces; acting as an attractor for wall and ceiling climbing robots; acting as an attractor for submersible hull-crawling robots; filterless vacuuming (conceptually similar to the Dyson vacuum); and robotic pick-and-place end-effector (conceptually similar to a gripper) to move articles from one location (e.g., a conveyor) to another (e.g., a collator). The VRAM also formed the basis for multiple toys including: a wall-climbing car for Spin Master, IDEO and Nottingham-Spirk; a Spiderman car for Marvel; an inflatable wall-climbing Spiderman for Marvel; and the Tony Hawk Hangtime 540 aerial skateboard for IDEO.

21. My work with the filterless vacuum VRAM prompted me to explore a concept related to pharmacy automation, which ultimately led to a Ferris-wheel concept for rapidly dispensing pills. In mid-2003, my team conceived of two prescription pill counting mechanisms that actually benefited from centrifugal forces and optimally exploited gravity and vacuum: an inner ring with vacuum-based apertures and an inner-bowl with vacuum-based apertures. The inner-bowl with vacuum-based apertures was deemed most viable, was awarded two U.S. patents, and to this day forms the basis of the RxMedic ADS™ pharmacy robot. The VRAM formed the basis of Vortex HC technologies, many of which have been licensed out to entities including, but not limited to, Teledyne SeaBotix, SeaRobotics, and HDT.

Both RxMedic and Vortex HC were officially spun out of Avionic in July 2004, the date Avionic was acquired by Transdigm.

22. In late 2004, soon after Avionic was acquired, I, along with others from Avionic, secured funding to develop an alpha-level multi-dispenser pharmacy robotic system and develop the RxMedic business plan and raise multiple rounds of venture capital. In late 2006, RxMedic (called "APDS" until November 2006) was launched as a stand-alone, sole-focus venture. After the operational launch of RxMedic, I served as General Manager and eventually Chief Technical Officer. Through my roles at RxMedic, I oversaw the development of the RxMedic ADS robot, managed the intellectual property portfolio, coordinated sales and marketing, and provided strategic, fiscal, and operational leadership. The RxMedic ADS is an AS/RS that prepares prescriptions by the storage, retrieval and bundling of bottles/vials, labels, oral solid medications, caps and quality assurance imaging, generally within retail, hospital and mail-order settings. In May 2010, J.M. Smith Corporation acquired RxMedic, and to assist in the change of ownership, I served as a Director of Robotics until May 2011. During my tenure at RxMedic, under J.M. Smith's ownership, I supported the evaluation, development and integration of a high-volume AS/RS system at the Smith Drug wholesale distribution center in Spartanburg, South

Carolina. This AS/RS system comprised a broad spectrum of interoperating robotic systems including mobile, pick-and-place, conveyor and others.

23. Also in late 2004, after Avionic was acquired, I, along with others from Avionic, secured funding for Vortex HC through DoD contracts and robot sales, to continue developing the VRAM Mobile Robot Platform (VMRP – a wall-climbing robot), the ARTEMIS AUV (a holonomic submersible robot for counter-mine and counter-obstacle operations), the submersible crawler, the nuclear-grade boilerwater reactor (BWR) inspection robot, and other robot products centered around the VRAM. Some DoD programs were/are classified, for which I maintained a SECRET clearance at both the personal and facilities level, and served as the facilities security officer (FSO). In late 2006, corresponding to the full launch of RxMedic, Vortex HC technologies were largely licensed to Teledyne SeaBotix, SeaRobotics, and HDT. However, I have continued to support Vortex HC licensees and customers to-date.

24. After the sale of RxMedic, and after fulfilling my 12-month employment obligation, I joined Teledyne Technologies in Summer 2011. I served as the Senior Manager for the RTP³ division of Teledyne Scientific, and supported

³ Research Triangle Park, North Carolina

multiple DoD-sponsored robotic-focused programs. Some of these programs were/are classified, for which I maintained a personal SECRET clearance. Among these programs were cargo unmanned ground vehicles (CUGV); squad-level autonomous unmanned ground vehicles (UGV); AUVs; UUVs; a cross-domain autonomous vehicle capable of transitioning between air, surface, and underwater-domains; the EXtreme ACCuracy Tasked Ordnance (EXACTO) program for optically tracking and steering bullets to targets; and light detection and ranging (LIDAR) systems for UGVs, as well as the mapping of urban and subterranean environments (along with sister-company Optech); and technologies for AS/RS, industrial automation and inspection systems with/for strategic partner Rockwell Automation (previous owner of what became the Teledyne Scientific & Imaging business unit). Cross-domain vehicles that were evaluated, designed and prototyped included, but were not limited to, the AngelFish (later called "EagleRay") cross-domain submersible UAV for anti-submarine warfare, as well as a ball-shaped robot for beach, ground, and surf-zone countermine operations. Sensor design, refinement and signal processing was a major component of each program. Sensors employed include, but are not limited to, proximity sensors; ranging sensors; electro-optical imaging; LIDAR; long-, short- and mid-wave infrared (IR); inertial measurement units (IMU); optical flow; and

radio-frequency (RF). Additionally, control systems were designed, refined and integrated into the aforementioned systems. Most control systems were closed-loop, in that they utilized sensor-based feedback; others were open-loop, where states were estimated with little or no feedback.

25. In late 2013, Avionic, a Transdigm business unit at that point, requested that I return to turn around both a supply-chain issue and the Sikorsky S97 (“S97”) Raider/JMR helicopter programs. The S97 Raider was designed to be the fastest, most maneuverable helicopter, due to its coaxial, counter-rotating variable-pitch wings, and an aft-based push-propeller. Avionic also controlled two business units named Acme Aerospace (“Acme”) and Aerospace Cooling Solutions (“ACS”). Avionic, Acme and ACS supported the S97 program, which ultimately met milestones and continues to produce multiple successful demonstrations. In 2013, Transdigm expanded my role to include directorship of the Avionic, Acme and ACS revenue and engineering teams, and to report operational and financial status at six-week intervals.
26. Starting in 2011, I supported the launch of Lealear, a small private-equity backed concern focused on the automated storage and retrieval of laundry garments, primarily for retail dry cleaning operations. I played an

instrumental role in the intellectual property portfolio and the development of validating technology.

27. Starting in late 2014, as CEO of Delta Five, I led a private-equity backed, hospitality focused venture, coordinating the company's launch and strategic path including an early-stage pivot. Initially focused on back-end robotics, AS/RS and general automation, Delta Five augmented its focus to address the rampant bed bug problem—a top priority for hoteliers—with a novel unattended sensor and trap, called the Telemetered Pest Monitoring System (TPMS), which is based on computer vision, IoT, and software as a service (SaaS); it has proven capable of scaling to other pests. In addition to the TPMS, Delta Five developed a novel means to mass produce a natural, unscented aggregation pheromone that, in concert with placement and heat, lured invertebrates to the TPMS. After leading Delta Five and serving on its Board for four years, I resigned to join ARA, but continue serving Delta Five as a share-holder and transition agent.
28. In 2018, I joined ARA as CTO. My primary responsibilities include leading the commercialization and technology transition efforts, which require technical, business and corporate development, as well as the procurement of capital and managing matrixed rosters. Core technologies include, but are not limited to, energy, alternative fuels, biotechnology, robotics, autonomous

systems, artificial intelligence, machine learning, non-destructive inspection/evaluation, medical devices/systems, augmented reality, situational awareness, diversionary devices, advanced hearing protection, directed energy weapons, unattended sensors, risk analysis, etc. I currently hold a Top-Secret security clearance with Sensitive Compartmented Information (TS/SCI).

29. Additional details about my employment history, fields of expertise, and publications are included in my curriculum vitae, attached as Appendix A.

III. MATERIALS CONSIDERED

30. In forming my opinions expressed in this declaration, I have considered, among other things, the following documents. I understand the documents have been given the following exhibit numbers in this proceeding:

Exhibit	Description
1001	U.S. Patent 11,386,602 (the '602 Patent)
1002	Cavada et al., "A simulation approach to modelling baggage handling systems at an international airport," Simulation Modelling Practice and Theory, 75, 146-164 (2017) ("Cavada")
1003	International Publication WO 2019/077750 ("Orito")
1004	International Publication WO 2007/089362 ("Sommer")
1005	U.S. Patent Application Publication 2018/0130260 ("Schmirler")
1006	Korean Patent 101400169 ("Kang")
1007	U.S. Patent Application Publication 2009/0112541 ("Anderson")
1008	U.S. Patent Application Publication 2019/0266806 ("Aluru")
1009	Curriculum vitae of Dr. Hall-Ellis
1010	U.S. Patent Publication 2019/0266806 – Original Application 16/204883 dated November 29, 2018
1011	File History List of U.S. Patent Application Publication 2019/0266806 on U.S. Patent Center (obtained November 12, 2023)

1012	Declaration of Dr. Hall-Ellis
1014	A Non-final Office Action (August 25, 2021) of U.S. Patent Application 16/942,272
1015	A Final Office Action (December 15, 2021) of U.S. Patent Application 16/942,272
1016	Response to Final Office Action (February 23, 2022) of U.S. Patent Application 16/942,272
1017	Notice of Allowance (March 16, 2022) of U.S. Patent Application 16/942,272

31. In forming my opinions, I have also relied on my education and experience.

IV. BACKGROUND OF THE ART

32. Monitoring, control and visualization of material handling systems, including conveyor-based systems, pre-date 2019 by, in many cases, decades. My initial personal exposure to material handling systems with such features dates back to coursework in 1992, while pursuing my master's degree in Integrated Manufacturing Systems Engineering, while taking a course specifically entitled "Material Handling." Between 1995 and 1999, I developed and taught a course entitled "Distributed Controls," which was based on networked control architectures such as Supervisory Control and Data Acquisition (SCADA) and Echelon's LONWorks. In this course, I taught the fundamentals of and oversaw numerous material handling and automation projects that demonstrated the integration of sensor and actuator modules that control small- to large-scale processes, simulated the flow of

processes and handled materials, and allowed real-time and post-process visualization.

33. My professional experience also exposed me to conveyors with features such as monitoring and animation. For example, while employed by Avionic Instruments from 2002 to 2006, I implemented, used and supported the development of multiple material handling systems including, but not limited to: 1) printed circuit board (PCB) fabrication; 2) PCB population, soldering and quality assurance (QA); 3) electromechanical assembly and QA; and 4) finished goods storage and retrieval. When I returned to Avionic Instruments/Transdigm in 2013, I implemented, used and supported development of refined versions of these, with additional applications that included intelligent material handling systems for batteries, APU assemblies, engine starters, and other aerospace products. While at VortexHC (a spin-off from Avionic Instruments) from 2002 to 2009, I materially participated in the development, deployment and support of intelligent material handling and inspection systems for companies including GE-Hitachi Nuclear (GE-H), Areva and BDT; GE-H and Areva supported the operation of nuclear reactors worldwide, including the meticulous handling and custodianship of nuclear fuel; BDT operated automated handling of finished and packaged goods including sheet products and prescription medications. While at

RxMedic (also a spin-off from Avionic Instruments) from 2002 to 2011, I oversaw the development, operation and refinement of the SCADA-based Smith Drug wholesale fulfillment system, a \$3 billion/year operation comprised of conveyors, proximity sensors, ranging sensors, barcode scanners, imagers, LIDAR sensors, flow control actuators, and GUI-based visualization and simulation tools. While at Teledyne between 2011 and 2013, I supported development for Rockwell Automation (the previous owner of Teledyne Scientific and Imaging, and long-term strategic partner), vision-based material handling control, feedback and GUI-based visualization between 2011 and 2013, using technologies from sister business units such as Teledyne DALSA and Teledyne OpTech. While at DeltaFive from 2014 to 2018, I also participated in the use, development and refinement of intelligent material handling systems, primarily for laundry within the hospitality industry. In addition to conventional telemetry systems comprising external sensors such as barcode readers, proximity/ranging sensors, and computer vision, telemetry of each article was facilitated by RFID⁴ tags and readers.

⁴ Radio-frequency identification, conceived of in the 1970's, uses electromagnetic fields to automatically identify and track tags attached to objects.

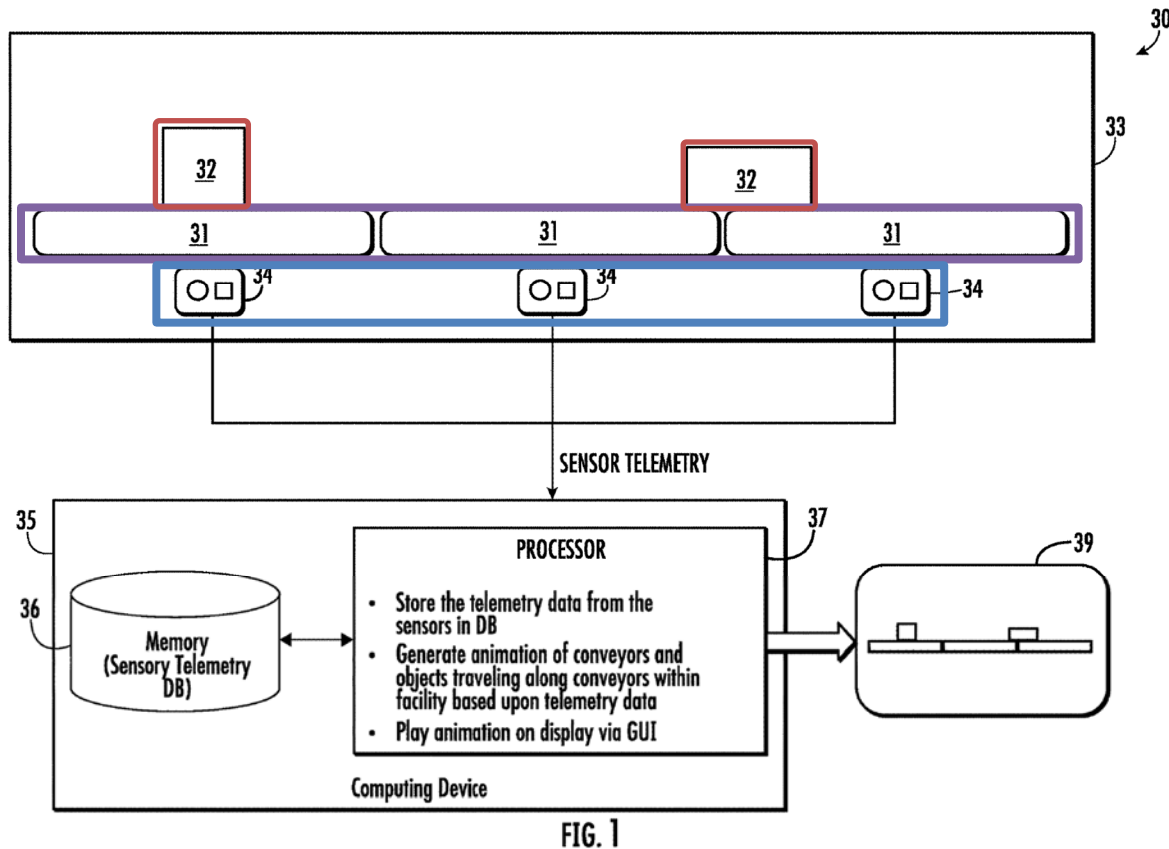
34. Each of these systems comprised monitoring, control and visualization through a SCADA or other distributed control system. These systems combine hardware and software to enable the automation of industrial processes by connecting sensors that monitor and control actuator subsystems to on-site or remote servers, and capture real-time Operational Technology (OT) data. These systems also display real-time and recorded data for real-time and/or future reference or report creation. Finally, these systems provide simulators that allow operators to verify, visualize and optimize material handling processes to optimize several critical metrics such as fault tolerance, time, motion, cost, diagnostics and prognostics.
35. SCADA companies that have existed long before the 2019 priority date include, but are not limited to: Schneider Electric, Siemens, Rockwell Automation, ABB, Mitsubishi, Honeywell, Echelon, General Electric, Emerson, Hitachi, Yokogawa, and others. Similarly, intelligent material handling companies, including several that have existed long before 2019, include, but are not limited to, Swisslog, Schaefer, Dematic, Murata, Knapp, MHS, DMW&H, Swiss Stöcklin Group, etc.
36. Augmented and virtual reality systems have also existed long before the 2019 priority date. Video overlayment was conceived of as far back as at the beginning of the 1900s and put to practice as far back as the late 1950s. The

head mounted display was invented in the late 1960s and the fully immersive virtual reality technology was invented in the 1970s. “Wearable computing” was realized in the early 1980s, from which augmented reality (AR)/virtual reality (VR) was realized in the early 1990s. AR and VR are not new technologies, pre-dating the ’602 Patent’s priority date by decades, and prolific in gaming, military operations and security. I taught courses at Duke between 1999 and 2021 that involved AR and VR, and my non-academic career has included actual AR and VR systems used in the field, including Teledyne’s virtual tracker and ARA’s “ARC4™” and “StrikeRing™” products. Teledyne’s virtual tracker, which was developed and released around 2012, fused video and other sensor data from multiple perspectives to provide a continuous means to track objects and events across a wide spatio-temporal perspective through fusion, video exportation and AR/VR displays. ARA’s ARC4 and StrikeRing products, which were disclosed in the mid-2010s, use on- and off-person sensors, including video, GPS and inertial measurement, generate video overlays to provide situational awareness to dismounts, and generate composite videos for observers. Finally, ARA’s Virtual Heroes Division has provided training AR/VR systems since the early 2010s.

V. THE '602 PATENT

A. Overview of the '602 Patent and Prosecution History

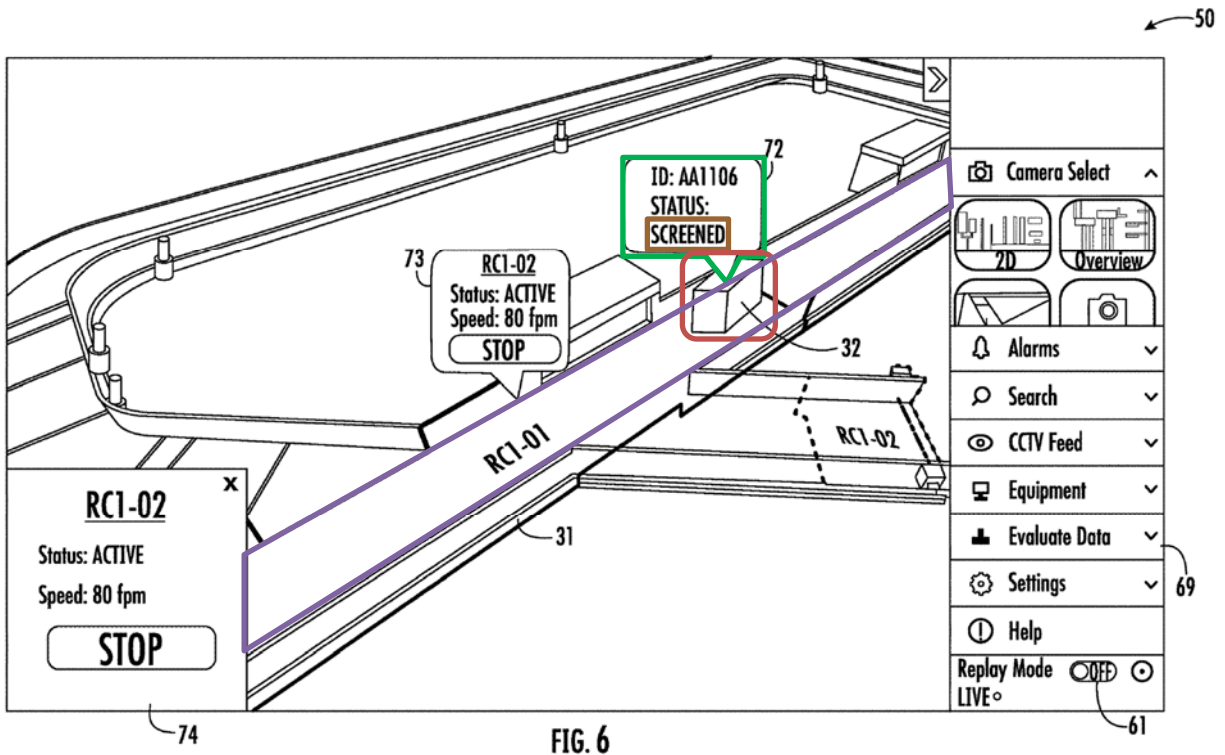
37. An overview of the '602 Patent, its prosecution history, and the prosecution history of patents and an application relating to the '602 Patent is provided in the Petition, which I have reviewed and adopt herein by reference. I further discuss the '602 Patent below.
38. The '602 Patent describes a system that includes “a plurality of conveyors configured to move objects throughout a facility.” EX1001, Abstract, 3:53-55. Annotated Figure 1, included below, shows an overview of the system. The “system” includes a plurality of sensors for collecting telemetry data associated with travel of the objects along the conveyors. *Id.*, 3:56-4:3. “At least some of the sensors” are configured to determine whether the objects have passed through a security screening. *Id.*, 5:64-6:2.



'602 Patent, Fig. 1 (annotated)

39. The “system” includes a computing device configured to store the telemetry data from the **sensors** in a database (*id.*, 4:4-19, 57-61) and generate an animation of the **conveyors** and the **objects** traveling along the **conveyors** within the facility based upon the telemetry data stored in the database (*id.*, 3:15-51, 4:4-14, 19-33, 6:3-18). The animation includes **status annotations** that follow at least some of the **objects** as they switch between different **conveyors** (*id.*, 5:60-6:18). The **status annotations** include **security status information** indicating whether **objects** have passed through security

screening. *Id.* The computing device is configured to play the animation on a display via a graphical user interface (GUI). *Id.*, 4:12-13, 19-33.



'602 Patent, Fig. 6 (annotated)

40. The '602 Patent's independent claims are directed to systems having a similar structure to that shown in Figures 1 and 6. I have included independent claims 1, 9, and 14 of the '602 Patent below, along with Figure 1 above, and color-coded claim elements that correspond to structural elements of the figure.

41. Claim 1:

A system comprising:

a plurality of continuous conveyors configured for moving objects throughout a facility;

a plurality of sensors positioned at different locations within the facility for collecting telemetry data associated with travel of the objects along the conveyors, at least some of the sensors being configured to determine whether the objects have passed through a security screening; and

a computing device configured to store the telemetry data from the sensors in a database, generate an animation of the conveyors and the objects traveling along the conveyors within the facility based upon the telemetry data stored in the database and including status annotations that follow at least some of the objects as they switch between different conveyors, the status annotations including security status information to indicate whether respective objects have passed through the security screening, and play the animation on a display via a graphical user interface (GUI).

42. Claim 9:

A computing device comprising:

a memory and a processor cooperating with the memory and configured to

store telemetry data from a plurality of sensors in a database in the memory, the sensors being positioned at different locations throughout a facility and being configured to collect telemetry data associated with travel

of **objects** along **conveyors** within the facility, at least some of the **sensors** being configured to determine whether the **objects** have passed through a security screening,

generate an animation of the **conveyors** and the **objects** traveling along the **conveyors** within the facility based upon the telemetry data stored in the database and including **status annotations** that follow at least some of the **objects** as they switch between different **conveyors**, the **status annotations** including **security status information** to indicate whether respective **objects** have passed through the security screening, and

play the animation on a display via a graphical user interface (GUI).

43. Claim 14:

A non-transitory computer-readable medium having computer-executable instructions for causing a computing device to perform steps comprising:

storing telemetry data from a plurality of **sensors** in a database, the **sensors** being positioned at different locations throughout a facility and being configured to collect telemetry data associated with travel of **objects** along **conveyors** within the facility, at least some of the **sensors** being configured to determine whether the **objects** have passed through a security screening;

generating an animation of the conveyors and the objects traveling along the conveyors within the facility based upon the telemetry data stored in the database and including status annotations that follow at least some of the objects as they switch between different conveyors, the status annotations including security status information to indicate whether respective objects have passed through the security screening; and playing the animation on a display via a graphical user interface (GUI).

B. Level of Ordinary Skill in the Art

44. I have been asked to provide an opinion about who a POSITA in the field of the '602 Patent would have been as of July 30, 2019. The '602 Patent relates to a system that stores telemetry data from sensors in a database, generates animation of the conveyors and the objects traveling along the conveyors based upon the telemetry data, and plays the animation on a display.

EX1001, Abstract.

45. I understand and have been informed that the factors I should consider in determining the ordinary level of skill in the art include: (i) the levels of education and experience of persons working in the field; (ii) the types of problems encountered in the field; and (iii) the sophistication of the technology. I understand that a POSITA is not a specific real individual, but

rather a hypothetical individual having the qualities reflected by the factors above. This hypothetical person has knowledge of all prior art in the relevant field as if it were arranged on a workshop wall and takes from each reference what it would teach to a person having the skills of a POSITA.

46. In my opinion, as of the claimed priority date of the '602 Patent, a POSITA would have had at least a bachelor's degree in Electrical or Computer Engineering or an equivalent field, and at least two years of academic or industry experience in automated handling and monitoring systems including sensors, telemetry, augmented reality, computer vision and security. More education can supplement practical experience and vice versa.
47. I base this opinion on the level of technical training I believe is required to reduce to practice the concepts described in the '602 Patent and the relevant prior art at and prior to the time of the '602 Patent application's claimed priority date, and on my own academic and employment experiences.
48. I understand that a POSITA is presumed to have knowledge of all relevant prior art. Therefore, a POSITA would have been familiar with each of the references discussed in this declaration. A POSITA would have reviewed the various materials I discuss herein at least because these prior-art references relate to sensor systems having sensors at a site or premises that generate

data, and the processing of generated data to determine conditions at the site or premises.

49. As of July 2019, I had more than ordinary skill in the field of the '602 Patent. But I am familiar with the skills and knowledge possessed by those I would have considered to be of ordinary skill in the art at this time because I considered the backgrounds of the engineers and technicians that worked under me during development of techniques used in automated handling systems. This would have included engineers with backgrounds relevant to the systems used in the '602 Patent.

VI. RELEVANT LEGAL STANDARDS

50. I have been informed by counsel for Petitioner that the following legal principles apply to an analysis of patentability based on 35 U.S.C. § 103 for obviousness. I have also been informed that, in an *inter partes* review proceeding such as this proceeding, a patent claim is unpatentable if it is shown by a preponderance of the evidence that the claim would have been rendered obvious by one or more properly combined prior-art patents or publications.

A. Obviousness

51. I have been told that under 35 U.S.C. § 103(a), “[a] patent may not be obtained through the invention is not identically disclosed or described as set

forth in 35 U.S.C. § 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

52. I understand that analysis of obviousness requires the following steps:
- (a) determine the scope and content of the prior art;
 - (b) ascertain the differences between the prior art and the claims at issue;
 - (c) resolve the level of ordinary skill in the pertinent art; and
 - (d) consider evidence of secondary indicia of non-obviousness (if available).
53. I have been told that the relevant time for considering whether a claim would have been obvious to a POSITA is the time of the alleged invention. I have been asked to assume a priority date for the challenged claims of July 30, 2019. My analyses set forth herein are from the perspective of a POSITA, as set forth above, as of this priority date.
54. In determining whether a prior-art reference could have been combined with another prior-art reference or other information known to a person having ordinary skill in the art, I have been told that the following principles may be considered:

- (a) a combination of familiar elements according to known methods is likely to be obvious if it yields predictable results;
- (b) the substitution of one known element for another is likely to be obvious if it yields predictable results;
- (c) the use of a known technique to improve similar items or methods in the same way is likely to be obvious if it yields predictable results;
- (d) the application of a known technique to a prior-art reference that is ready for improvement is likely obvious if it yields predictable results;
- (e) any need or problem known in the field and addressed by the reference can provide a reason for combining the elements in the manner claimed;
- (f) a person of ordinary skill often will be able to fit the teachings of multiple references together like a puzzle; and
- (g) the proper analysis of obviousness requires a determination of whether a POSITA would have a “reasonable expectation of success”—not “absolute predictability” of success—in achieving the claimed invention by combining prior-art references.

55. I have been told that whether a prior-art reference renders a patent claim unpatentable as obvious is determined from the perspective of a POSITA. Further, I have been told that while there is no requirement that the prior art

contain an express suggestion to combine known elements to achieve the claimed invention, a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually, as filtered through the knowledge of one skilled in the art. I have also been told that the inferences and creative steps a POSITA would employ are also relevant to the determination of obviousness.

56. I have been told that when a work is available in one field, design alternatives and other market forces can prompt variations of it, either in the same field or in another. If a POSITA can implement a predictable variation and would see the benefit of doing so, that variation is likely to be obvious. In many fields, there may be little discussion of obvious combinations, and in these fields market demand—not scientific literature—may drive design trends. When there is a design need or market pressure and there are a finite number of predictable solutions, a POSITA has good reason to pursue those known options.
57. I have been told that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also have been told that the “teaching, suggestion, or motivation” test can be a useful guide in establishing a rationale for combining elements of the prior art. This test poses the question of whether

there is an express or implied teaching, suggestion, or motivation to combine prior-art elements in a way that yields the claimed invention and avoids impermissible hindsight analysis.

VII. CLAIM CONSTRUCTION

58. I have applied the ordinary meaning of the claim terms in my analysis below as I understand them and as I believe a POSITA would have understood them as of the July 30, 2019 priority date, though I may respond if a different meaning or construction of any claim term is subsequently proposed.

VIII. GROUND 1: CLAIMS 1-2, 4, 9-10, 12, 14, 15 AND 17 ARE RENDERED OBVIOUS BY CAVADA, ORITO AND SOMMER

59. It is my opinion that Cavada in view of Orito and Sommer renders obvious claims 1-2, 4, 9-10, 12, 14, 15 and 17 of the '602 Patent. In addition to the opinions expressed in this declaration, I have reviewed, had input into, and endorse the discussion in the Petition regarding this ground.

60. I have been asked to assume that Cavada [EX1002], Orito and its translation [EX1003] and Sommer [EX1004] are prior art. I have done so.

A. Overview of Cavada

61. An overview of Cavada is provided in the Petition, which I have reviewed and with which I agree.

62. In my opinion, a POSITA would have considered Cavada because it is analogous to the '602 Patent. Cavada is from the same field of endeavor as the '602 Patent (a baggage handling system (“BHS”) including conveyors and sensors) and reasonably pertinent to the particular problem the '602 Patent was trying to solve (the BHS simulation performed by a computer to generate animation tracking the passage of baggage through security screening). [EX1001, 5:64-6:2, Abstract; EX1002, P149 and P153, FIG. 2]

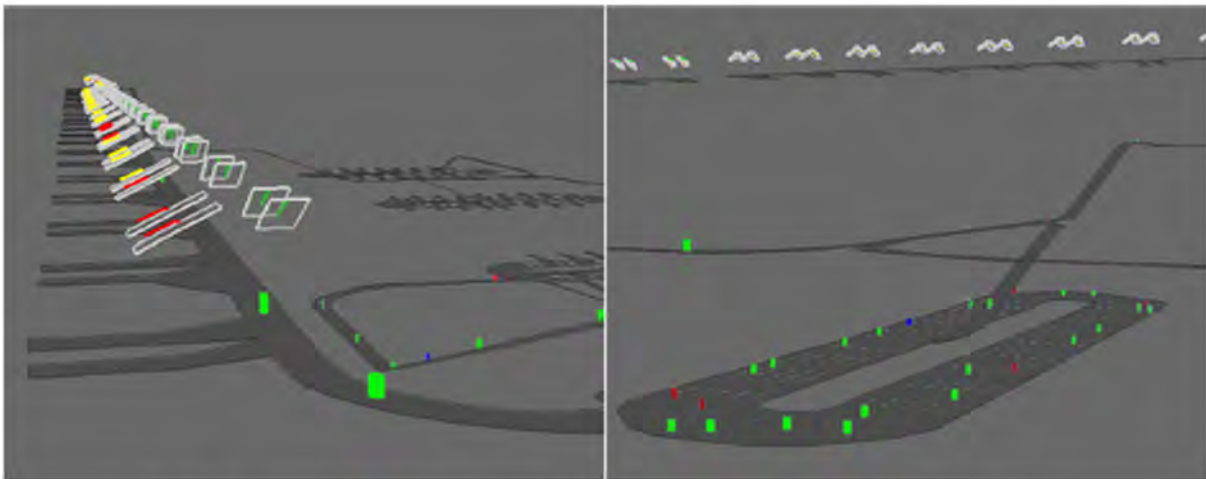


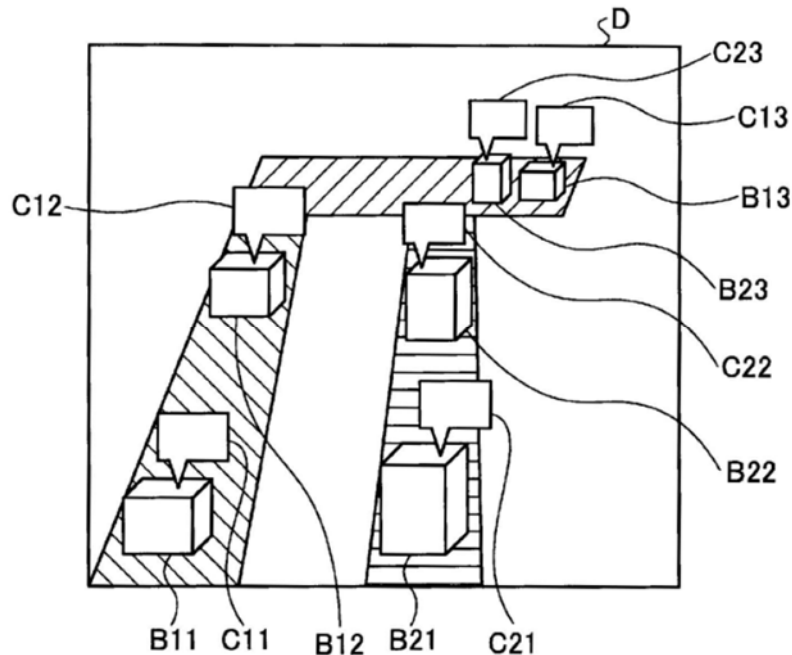
Fig. 2. Paramics 3D animation of the check-in counter area and one of the carousels.

EX1002, FIG. 2

B. Overview of Orito

63. An overview of Orito is provided in the Petition, which I have reviewed and with which I agree.
64. In my opinion, a POSITA would have considered Orito because it is analogous to the '602 Patent. Orito is from the same field of endeavor as the '602 Patent (material handling using a plurality of belt conveyors in a “belt

conveyor” system with sensors-based feedback to monitor and track objects moved by, for example, conveyors) and reasonably pertinent to the particular problem the ’602 Patent was trying to solve (collecting telemetry data associated with the travel of the objects along the conveyors *a la* a computing device that stores the telemetry data from the sensors). [EX1001, Abstract] Specifically, Orito’s stated objective is to “obtain a data processing device that can shorten the time required to check a subject to be monitored” [EX1003 ¶0006], where the monitored subject is, “for example, a product being conveyed on the belt conveyor.” [*Id.*, Abstract] Given that “animation” means to give the appearance of movement, a POSITA would also realize that Orito facilitates the generation of animation of objects traveling along the conveyors in that Orito’s “data processing unit...extracts, from images constituting video data, a plurality of feature images,” [*Id.*, ¶0007], which are then aggregated and shown in a synthesized image, and provisioned for event information annotations and playback. [*Id.*, ¶¶0031, 0059, 0066]



EX1003, FIG. 22

C. Overview of Sommer

65. An overview of Sommer is provided in the Petition, which I have reviewed and with which I agree.
66. In my opinion, a POSITA would have considered Sommer because it is analogous to the '602 Patent. Sommer is from the same field of endeavor as the '602 Patent, specifically a BHS. Sommer is also reasonably pertinent to the particular problem the '602 Patent was trying to solve, specifically tracking bags on a conveyor-based BHS comprising a plurality of sensors, and through animations on a graphical user interface. [EX1001, Abstract]
- Sommer discloses a system “that informs security personnel of the physical

location of articles whose x-ray images are displayed on the scanner monitor screen, that alerts the screener and/or other security personnel when an article is moving out of the confines of the scanner, and that can present photographs of the articles correlated with their x-ray images on the monitor screen to help in article identification” [EX1004, ¶0007], and “[t]he present invention uses an article tracking sensor system integrated with software and a computer system to present on a monitor screen visual information on the physical location of articles that are being passed through the scanner so that security personnel can accurately maintain custody of articles until cleared” [Id., ¶0010].

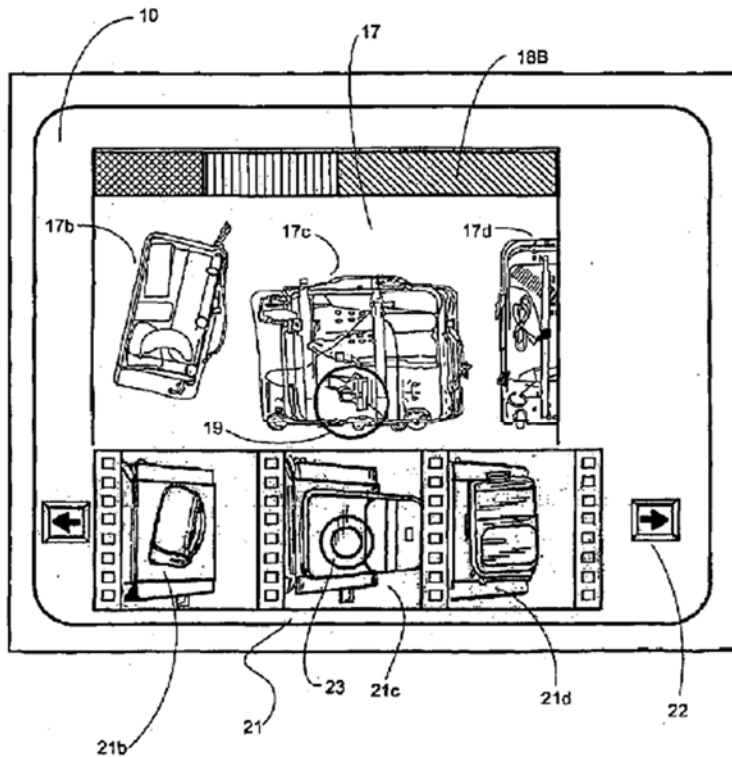


FIG. 13

EX1004, FIG. 13

D. Motivations to Combine Cavada, Orito and Sommer

67. A POSITA would have considered Cavada, Orito, and Sommer because they are analogous to the '602 Patent, as discussed previously.
68. In my opinion, a POSITA would have been motivated to combine Cavada, Orito and Sommer, with a reasonable expectation of success, such that the combination provides the elements claimed by the '602 Patent including a material handling system of conveyors, sensors, security zones, telemetry, tracking, visualization and status reporting, by employing decades-old

technology that is well known in the art, and doing so for a similarly well known application.

1. The prior art included each claimed element

69. The claim-by-claim analysis below shows that the combinations of Grounds 1 through 5 disclose all elements of each claim challenged in each ground.

See Sections VIII-XII, infra.

2. A POSITA would have combined elements by known methods and in combination, each element performs the same function as it does separately

70. I further note that a POSITA would have arrived at the claimed invention by a simple survey of pre-existing material handling technologies and applications thereof, starting with a specification which includes conveyor belt transportation, sensor-based trajectory tracking, zones, and the material handling standard metric set of time-motion-cost. My experiences with technologies and applications, described in Section IV above, represent how a POSITA would have had similar experiences and would have readily known methods that comprise an automated conveyor-based BHS, be it from pioneers like BNP Associates⁵, established BHS companies like BeumerGroup, Conveyor & Automation Technologies, Dalmecc, KieTek,

⁵ BNP invented automated airport BHS in 1971; see www.bnpassociates.com/services.html#baggage

Siemens, Hamer-Fischbein, Absolute GSE, Cage, Victor Ground Support, etc.⁶, or general material handling providers such as Swisslog, Wynright, Schaefer Systems, etc. Each element was well established in the art, even when accounting for the subtle differences in which elements were assembled or combined. Otherwise, there was nothing special about adding annotations, sensors, conveyors, or security applications.

71. As shown in the grounds of the Petition—which I have reviewed, Cavada discusses a simulation model of a BHS that is interoperable with airport operation systems, tracks the passage of bags through security screening zones, and employs conveyors, diverters, carousels and sensors. Orito describes a data processing apparatus that uses sensors to monitor objects moved by conveyor belt and provides video graphic displays with event information. Sommer’s disclosed system performs real-time tracking of airport passenger luggage as it is conveyed and passes in, through and out of security zones.
72. A POSITA would have combined Cavada, Orito, and Sommer’s teachings to meet the claimed elements by known methods due to the substantial overlap

⁶ <https://blog.technavio.org/blog/top-10-airport-baggage-handling-system-companies> (Aug 23, 2017)

of teachings, improvements provided by the combination, and nature of the technology.

- ***Substantial overlap between the references***

73. Described above, all three references disclose conveyor belt-based transportation of objects, sensor-based tracking of transported objects and graphical displays of status information to operators.

- ***A POSITA would have been motivated to combine the references due to the resulting improvement from incorporating Orito's and Sommer's concepts into Cavada's system***

74. On its own Cavada's disclosure substantially, if not fully, enables a POSITA to implement the system claimed in the '602 Patent. Cavada's system might have benefited from the event information, including zone passage, alarms and other sensor feedback taught by Orito. Cavada's system might also have benefited from including the overlaid event information in a synthesized image, taught by Orito. Cavada's system might have also benefited from the fusion of multiple tracked and annotated objects across multiple conveyors, as disclosed by Orito. Sommer's disclosures may have further benefited the Cavada-Orito combination by teaching real-time tracking of luggage conveyed through airport security zones and graphical displays of luggage locations and states on a monitor. This potentially unnecessary but

clarifying combination would have yielded a BHS comprising conveyors and security screening scanners, as well as animations for operators to monitor objects moving on conveyors as, and after, they pass through security screening devices.

75. Orito's and Sommer's disclosures would have complemented Cavada's already disclosed BHS, which localizes each bag, and utilizes a computing device and physics model to store telemetry data. [EX1002, P149, FIG. 2] Cavada further discloses generating an animation of the conveyors and the objects traveling along the conveyors within the facility based upon the telemetry data ("[I]n Fig. 2, two 3D animation snapshots of the simulation are shown, highlighting the counter area and one carrousel."). [EX1002, P149] The significant overlap and interoperability of Cavada, Orito and Sommer simplify their combination, which a POSITA would have handily and instinctively employed to arrive at a system claimed by the '602 Patent.

- ***The disclosed technology readily provided the combination to meet the claimed invention***

76. A POSITA would recognize the ease with which the substantially overlapping elements of Cavada, Orito and Sommer would be fused. For example, standard software translation and interfacing practices would have been employed. This is a common practice where, for example, embedded

subsystems (e.g., application-specific processors dedicated to perception, actuation, image processing, graphical user interfacing, etc.) are brought together with code-based device drivers and other interface modules. Given that all three references use software, it would have been a simple process to implement the system from a combination of Cavada, Orito, and Sommer. [EX1002, PP149, 163; EX1003, ¶0102, FIG. 23; EX1004, ¶¶0036, 0038] A POSITA would have known the process for adapting simulation software to a hardware-based system; for example, Cavada demonstrates such an adaptation of a simulation software for vehicle traffic into a BHS. [EX1002, PP149, 163] Thus, the combination, and derived benefits of combining Cavada's system with Orito and Sommer, would have only required routine software/firmware/application experience, which a POSITA would have.

3. A POSITA would have recognized the results of the combination were predictable

77. Emphasized earlier, a POSITA would have had a reasonable expectation of success by combining Cavada, Orito, and Sommer largely because the use of the referenced core technologies was well known and had yielded myriad successfully implemented material handling systems. If not entirely obvious to a POSITA, this combination would have only required animating object trajectories while moving on a set of conveyors as they pass through defined zones or locations. Cavada clearly discloses a BHS that monitors the state(s)

of a moving object passing through, for example, a security screening device, be it by tracking the baggage directly or by tracking the baggage from the motion of the conveyor transportation devices, even when multiple conveyors are employed. Again, this was generally well known. Cavada's system would have received added familiar clarity and enhancement with the teachings of Orito and Sommer for the reasons mentioned above.

Consequently, a POSITA would have not only known how to combine the teachings of these references, a POSITA would have an elevated reasonable expectation of success.

E. Disclosures for Claim 1

78. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claim 1.
79. In addition to the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious the elements of claim 1 – which I have reviewed, had input to, and endorse – I provide the following explanations for certain claim 1 limitations.

- a) *[1c] “a plurality of sensors positioned at different locations within the facility for collecting telemetry data associated with travel of the objects along the conveyors, at least some of the sensors being configured to determine whether the objects have passed through a security screening; and”*

80. A POSITA would recognize this claim element as a well known description of almost every conveyor-based material handling system across numerous industries and applications, including Cavada's baggage handling system. A POSITA would understand that Cavada's system knows the position of the bags its conveyors carry to and through scanners N2. [EX1002, FIG. 1] Additionally, Cavada describes a "tracking error" if the system has lost the bag's identification or the N2 security screening has flagged it as suspicious. [Id., P149] A POSITA would know that *tracking* is achieved through a plurality of sensors positioned at different locations for collecting telemetry data of the objects along the conveyors. Furthermore, Cavada explains that its "simulation for modelling the baggage moving processes at SCL was developed using the traffic microsimulation software package Quadstone Paramics v6 through its API (application programming interface) functionalities.⁷ ... In a microscopic vehicle traffic simulation, a fixed road network is coded with a set of zones representing the origins and destinations of trips made by the different entities travelling to their desired destinations. This dynamic is similar to a BHS, which is made up of bags that are transported by conveyors to a predefined destination. The

⁷ www.paramics-online.org

fundamental equivalences in our model are then: “vehicles” = “bags” and “streets” = “conveyors”. Also, the same mechanisms normally used by the simulator to assign vehicle destinations will be used here to assign those of the bags. The bags are created from the plugin (API) and not from an origin-destination matrix as often in microscopic traffic simulation applications. Once the bag was created starting from a specific zone (representing a specific counter entrance) it follows a fixed route towards a destination assigned also in the plugin corresponding the carrousel associated with the flight that bag belongs to.” [Id.] A POSITA would understand that the “origins and destinations”, “zones” and “a fixed route towards a destination” require sensors for collecting telemetry data and, thus, that Cavada discloses “at least some of the sensors being configured to determine whether the objects have passed through a security screening.”

81. A POSITA would have understood that Orito also discloses “at least some of the sensors being configured to determine whether the objects have passed through a security screening.” For example, Orito states that “[t]he sensing device also performs, for example, a visual inspection that inspects the appearance of the product or a position inspection that inspects whether a unit of the product is located in a desired position. The sensing device inspects the product, generates sensor information that is the result of the

inspection, and outputs the generated sensor information to the data processing device 1. The sensor information includes the test results and the time of the test.” [EX1003, ¶0020] A POSITA would understand that “inspection” is analogous to “security screening”; for example, the TSA uses “inspections” based on sensing technologies as part of their security screening process. Orito adds: “Below, device ID, alarm information, and sensor information are referred to as event information. The event information may also be, for example, information indicating the movement status of the product conveyed by the belt conveyor in the step of producing the product, information on the changeover operation, etc.” [*Id.*, ¶0021] where “alarm information” “includes the contents of the anomaly or fault and the time at which the anomaly or fault occurred.” [*Id.*, ¶0019]

82. Finally, Sommer describes sensors that may include “proximity” or “article location” types “to determine the presence and position of articles 4 as they approach, enter into, or are within the scanner 2”. [EX1004, ¶0037] Stated before, a POSITA would recognize the analogous nature of a scanner and security screening and determine that Orito discloses “at least some of the sensors being configured to determine whether the objects have passed through a security screening.”

b) [1d] “a computing device configured to:”

83. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious the elements of claim 1, and Cavada, Orito and Sommer disclose or render obvious the elements of limitation [1d].
84. A POSITA would understand that “a computing device” includes a device that performs calculations and interfaces with sensors, actuators, operators or other aspects of the system. A computing device would exist, for example, wherever the system makes adjustments, such as when “the counter stops checking new passengers until one of them has entered the collector”, “implements conveyor stoppages”, “[a] call is made to the bag redirection routine”, and so forth. [EX1002, P154] For these and other reasons, a POSITA would understand that Cavada discloses a computing device.
85. Orito also discloses a data processing device 1 that is a computer. [EX1003, ¶0102, FIGS. 1 and 23] Thus, even if one believes that Cavada does not disclose a computing device, a POSITA would agree that Orito does.

c) [1d1] “store the telemetry data from the sensors in a database,”

86. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious the

elements of claim 1, and Cavada, Orito and Sommer disclose or render obvious the elements of limitation [1d1].

87. Starting with Cavada, and referring to my prior explanation regarding claim element 1c, i.e., why a POSITA would know that Cavada discloses the use of sensors to collect telemetry data, a POSITA would also understand that telemetry data would be stored in a database to support the calculations pertaining to claim element 1d. A POSITA would understand that telemetry data is situation-dependent and dynamic; it is not predictable or rote. Thus, a database would be necessary to collect and hold, if only temporarily, variables and parameters that would feed equations within the computing device to adapt to changing conditions. That is, a POSITA would understand that Cavada discloses a computing device configured to “store the telemetry data from the sensors in a database.”
88. Similarly, Orito describes: “The data processing device 1 is equipped with an operation unit 11 that receives an operation of a user, an external device connection unit 12 to which the external device 2 is connected, and an imaging device connection unit 13 to which the imaging device 3 is connected. The data processing device 1 is equipped with a data processing unit 14 that extracts a feature image, which is an image of a portion where the subject to be monitored is displayed, from images constituting video

data, and a storage unit 15 that stores the video data and the feature images. The data processing device 1 is equipped with a display generation unit 16 that synthesizes a plurality of feature images extracted from each of the plurality of images constituting video data by the data processing unit 14 to produce a synthesized image, and a display unit 17 that displays the synthesized image generated by the display generation unit 16.” [EX1003, ¶¶0013-0015] A POSITA would understand that operations such as feature extraction, video data storage, display generation and synthesis in general require a database to store, even if temporarily, values that are used in the associated calculations. A POSITA would further know that telemetry data from the sensors would be stored in a database, given that the images displayed must represent the locations over time (i.e., the telemetry) of objects moving on the conveyors.

89. Orito reinforces this requirement with “the extraction unit 22 selects an image taken at the same time as the time the event information was acquired. That is, the extraction unit 22 searches the image based on the time at which the event information was acquired, and selects the image from the searched image. Further, when imaging is performed using a trigger signal transmitted from the imaging device connection unit 13, the extraction unit 22 may search for images based on the trigger signal and select an image from

among the searched images. The extraction unit 22 extracts the feature image a1, which is an image of the portion in which the subject to be monitored B1 is displayed, from the selected image A1, as shown in FIG. 4. Also, the extraction unit 22 outputs video data, feature images, and event information to the storage unit 15. The storage unit 15 stores video data, feature images, and event information in association with each other.” [Id., ¶0034]. Orito also ties this to telemetry with “[t]he event information may also be” the “device ID, the alarm information, and sensor information” from the sensing device. [Id., ¶0021]. A POSITA would know from this that Orito discloses storage of telemetry from the sensors in a database.

90. Sommer also discloses the storage of telemetry data from the sensors in a database through, for example, “as article 4d passes through x-ray scan zone 2z, x-ray image data of article 4d are generated. The x-ray image data are transferred from x-ray scanner 2 to computer system 8 over electronic connections, which may be wired, or wireless.” [EX1004, ¶0035] Given that the x-ray system has a dedicated location, the images extracted while an article passes through its field of view yield telemetry data. Sommer also describes ways in which telemetry precision may be enhanced by way of conveyor belt position encoders, cameras, RFID and proximity sensor(s). [Id., ¶0036] For this and other reasons, a POSITA would know that Sommer

discloses storage of telemetry from the sensors in a database.

d) [1d2] “generate an animation of the conveyors and the objects traveling along the conveyors within the facility based upon the telemetry data stored in the database and including status annotations that follow at least some of the objects as they switch between different conveyors, the status annotations including security status information to indicate whether respective objects have passed through the security screening, and”

91. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious the elements of claim 1, and Cavada, Orito and Sommer disclose or render obvious the elements of limitation [1d2].
92. A POSITA would understand that Cavada’s Figure 2, in which “two 3D animation snapshots of the simulation are shown, highlighting the counter area and one carrousel. The color of the bags represent different categories”, discloses “generate an animation of the conveyors and the objects traveling along the conveyors within the facility based upon the telemetry data stored in the database”. [EX1002, PP149-150, FIG. 2] Cavada clarifies that “[t]he physics behind the movement of bags can be represented very accurately and based on real distances, features that were very useful for modelling semiautomatic systems such as the one coded in this work. Indicators

associated with the use of capacity in carrousel are also easy to obtain from the available API functions.” [*Id.*, P149]

93. Cavada further discloses “the status annotations including security status information to indicate whether respective objects have passed through the security screening.” For example, in Table 1 (*Bag Categories*), Cavada discloses four types of bags (“Properly injected”, “Soft ... items”, “Bags with wheels” and “Large items”) according to their respective frequency and severity of the incidents, and used the color of the bags to portray these different categories. [*Id.*, P153, FIG. 2, Table 1] Cavada also demonstrates that status may also be annotated by location with, for example, the vectoring and consolidation of bags that exhibit some irregularity (i.e., “if either the system has lost the bag’s identification (a tracking error) or the N2 security screening has flagged it as suspicious. In the latter case, it is checked by a more powerful scanner (N3). Once it has cleared all security checks it is returned to carrousel M9.” [*Id.*, P149] Color- or location-coding demonstrates to a POSITA that Cavada discloses the limitation “the status annotations including security status information to indicate whether respective objects have passed through the security screening.”
94. A POSITA would have also understood that Orito discloses “an animation of the conveyors and the objects traveling along the conveyors within the

facility ... including status annotations that follow at least some of the objects as they switch between different conveyors.” For example, Orito describes: “For example, if the instruction information is ‘adding the event information image to the top of the subject to be monitored,’ the addition unit 25 adds the event information image C above of the subject to be monitored B, as shown in FIG. 8. Note that the location where the event information image is added is not limited to above the subject to be monitored, but may be on the right side of the subject to be monitored, the left side of the subject to be monitored, or the below the subject to be monitored, or it may be superimposed on the front of the subject to be monitored. FIG. 8 also illustrates an event information image that includes an event ID and time information, but an example may include other information. The user may also operate the operation unit 11 to optionally select information included in the event information image.” [EX1003, ¶0067] A POSITA would recognize that the overlaid “event information” constitutes an annotation (e.g., a balloon with text), with confirmation from Orito’s Figures 8, 15-17 and 22. These annotations travel in the video, accompanying the “monitored [objects] B11, B12, and B13 being conveyed from the belt conveyor X1 to the belt conveyor X2”. [*Id.*, ¶0089, FIGS. 16 and 22]

95. Orito further discloses “the status annotations including security status information to indicate whether respective objects have passed through the security screening.” For example, as previously discussed, A POSITA would understand that “inspection” includes, or at a minimum is analogous to “security screening” and that “[t]he alarm information includes the contents of the anomaly or fault and the time at which the anomaly or fault occurred.” [*Id.*, ¶0019]
96. Even if Cavada and/or Orito alone did not disclose the limitation “the status annotations including security status information to indicate whether respective objects have passed through the security screening,” Sommer focuses significantly on security⁸, and describes article location indicators in, for example, FIG. 4’s component 18A, that are animations overlaid on the video that travel with the objects on the operator’s graphic display. [EX1004, FIG. 4] Sommer pictorially displays article location information with various variable icons, sliders or other dynamic measurement annotations. For example, Sommer discloses: “It is helpful in maintaining control of articles 4 as they pass through scanner system 1 for security personnel to know at any given time the location within scanner system 1 of

⁸ Sommer mentions “security” 43 times, “secure” 21 times and “checkpoint” twice.

each articles 4 whose x-ray image 17 is displayed on display screen 10. The present invention provides this article location information visually through display of the information or representations of the information on the display screen 10 or other display screens along with display of x-ray images 17. For purposes of presenting location information, three regions are defined in which articles 4 can be located while there [sic] x-ray images 17 are displayed on display screen 10. These are scanning region 11, article removal region 12, and cleared article access region 13.” [*Id.*, ¶0039] Sommer describes a color code, shading code, pattern code, or other visually distinct annotative sub-images with, “The shadings of the article location indicators 18A indicate the locations within the system of the articles 4 corresponding to the x-ray images 17 and provide more information than do article location indicators 18 (FIG. 3).” [*Id.*, ¶0043] Sommer also describes notifications such “ESCAPED BAG”, which is a status annotation indicating that the bag missed the security screening. [*Id.*, ¶0049, FIG. 11] Thus, a POSITA would have understood that Sommer discloses “status annotations that follow at least some of the objects ..., the status annotations including security status information to indicate whether respective objects have passed through the security screening.”

97. Ultimately, a POSITA would have understood that Cavada, Orito and Sommer describe the limitation [1d2], “[the computing device configured to:] generate an animation of the conveyors and the objects traveling along the conveyors within the facility based upon the telemetry data stored in the database and including status annotations that follow at least some of the objects as they switch between different conveyors, the status annotations including security status information to indicate whether respective objects have passed through the security screening.”

e) [1d3] “play the animation on a display via a graphical user interface (GUI).”

98. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious the elements of claim 1, and Cavada, Orito and Sommer disclose or render obvious the elements of limitation [1d3].

99. Cavada discloses 3D animation snapshots of the simulation highlighting the counter area and one carrousel. [EX1002, P149, FIG. 2] A POSITA would recognize that these animation snapshots are displayed to a user via a GUI. First, geographical reference points are pictorialized to help a user ascertain fixed locations with, for example, “In Fig. 2, two 3D animation snapshots of the simulation are shown, **highlighting the counter area and one carrousel.**” [*Id.*, P149 (emphasis added)] Second, objects of interest are

color coded to help an operator see their respective status with, for example, “The color of the bags represent different categories described later in Section 4.1.4.” [*Id.*] A POSITA would recognize these visual elements as integral to a GUI display, and not simply for a simple electronic record.

100. Even if Cavada needs support for “play[ing] the animation on a display via a graphical user interface (GUI),” Orito describes: “The display generation unit 16 generates a synthesized image D by combining feature image a11, feature image a12, feature image a13, feature image a21, feature image a22, feature image a23, and an image displaying a background of the subject to be monitored. The synthesized image D includes subject to be monitored B11 with added event information image C11, subject to be monitored B12 with added event information image C12, subject to be monitored B13 with added event information image C13, subject to be monitored B21 with added event information image C21, subject to be monitored B22 with added event information image C22, and subject to be monitored B23 with added event information image C23, as shown in FIG. 22.” [EX1003, ¶0095, FIG. 22] A POSITA would understand that not only does Orito describe images, Orito also explains that they are “monitored” and, thus, displayed on a GUI.

101. Orito further describes a display screen showing event information image associated with a monitored object may be displayed as pop-up when a pointing device, such as a mouse, is operated to have a cursor overlaid on a corresponding feature image of the monitored object in the display screen. A purpose to this display includes “making it easier to **grasp** the situation”. [*Id.*, ¶ 0101 (emphasis added)] To “grasp the situation” from a synthesized “image”, a POSITA would have therefore understood that Orito describes “(a computer device that is configured to) play the animation, as a sequence of composite images on a display via a graphical user interface (GUI).”
102. Sommer also describes graphical article location indicators or icons (e.g., 18A in FIG. 4) that change according to the articles’ changing physical locations, represented by animations overlaid on the video that follow the objects, as if dragged or pushed by the moving article. [EX1004, FIG. 4] Sommer pictorially describes article location information through visible displays “of the information or representations of the information on the display screen 10 or other display screens along with display of x-ray images 17.” [*Id.*, ¶0039] Tied back to the purpose, “As an article is transported through an x-ray scanner, an x-ray image of the article is generated and displayed on a **visual monitor** in order for a screener to examine the x-ray image for potential prohibited items, contraband, or the like.” [*Id.*, ¶0005]

(emphasis added)], a POSITA would have understood that Sommer discloses “(a computer device that is configured to) play the animation, as a sequence of composite images on a display via a graphical user interface (GUI).”

103. Thus, a POSITA would have therefore understood that Cavada, Orito and Sommer describe the limitation [1d3].

F. Disclosures for Claim 2

104. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claim 2.

G. Disclosures for Claim 4

105. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claim 4.

H. Disclosures for Claim 9

106. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claim 9.

I. Disclosures for Claims 10 and 12

107. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claims 10 and 12.

J. Disclosures for Claim 14

108. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claim 14.

K. Disclosures for Claims 15 and 17

109. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito and Sommer render obvious claims 15 and 17.

IX. GROUND 2: CLAIMS 3, 6, 11 AND 16 ARE RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER AND SCHMIRLER

A. Overview of Schmirler

110. An overview of Schmirler is provided in the Petition, which I have reviewed and with which I agree.

B. Motivations to Combine Cavada, Orito, Sommer and Schmirler

111. A POSITA would have been motivated to combine Cavada, Orito, and Sommer for the reasons I discussed in Section VIII.D. A POSITA would have been further motivated to combine Cavada, Orito, and Sommer's combined system with Schmirler.

112. Schmirler discloses the use of AR and VR to provide a user with an enhanced perspective of the environment, including the flow of components moving through a facility. [EX1005, Abstract; FIG. 4; FIG. 11] A POSITA would understand that AR provides the user with the near real-time quasi-

transparent view of a real environment on a display, overlaid (i.e., superimposed) with computer-generated images that represent relevant information such as object identity, status, messages, calls to action and other data within a composite view. A POSITA would understand that VR provides the user with a fully animated (non-transparent) three-dimensional image that includes a computer-generated simulation of the “environment”, which is artificial and can be interacted with in a seemingly real way by a person using special electronic equipment, such as light-tight headgear with an internal screen and/or gloves fitted with sensors.

113. Schmirler’s VR/AR presentation system renders live and historical industrial data about objects within an industrial facility, including telemetry and status of articles on conveyors, based on sensors distributed throughout the industrial environment and worn by the user. [*Id.*, ¶0062, ¶0076, ¶0090; ¶0117] Like most AR/VR systems, Schmirler’s system uses a database that records the spatio-temporal relationships between tracked items, and the relationships with identity tags and classifications. The user experiences a realistic first-person presentation of the industrial facility floor comprising components and machines, with which the user may interact, if only virtually. [*Id.*, ¶0134; ¶0173] The monitoring aspect of Schmirler’s system can identify a maintenance issue based on analysis of real-time system data

generated by the automation system, and responsively guide a technician about how to interact with devices with graphical overlays that include operational or status data indicators for devices within the user's field of view. [*Id.*, FIG. 17; ¶0052] Such guidance includes graphical or text-based indicators that direct a user to a location of an asset, including conveyors, vats, control cabinets and/or industrial devices within a plant environment, current or historical alarms or faults, and indicators for assisting a user in diagnosing and addressing an identified problem with an industrial system or device. [*Id.*, ¶0089] Schmirler's system can also render human icons that represent human operators in the field of view. [*Id.*, ¶0090] Similarly, Schmirler's system provides information about workpieces and parts on conveyors. [*Id.*, ¶0157]

114. A POSITA would agree that Schmirler's material handling system is analogous art to the '602 Patent, is from the same field of endeavor as the '602 Patent (systems including conveyor), and is reasonably pertinent to the particular problems the '602 Patent tried to solve. All four references are directed to a visualization system, indicating a status of an object traveling along one or more conveyors inside a facility, collected by distributed sensors. As complement to Cavada, Orito, and Sommer, Schmirler discloses producing and displaying 3D virtual representations of a facility comprising

multiple conveyors transporting objects and using sensors to collect the status of the objects traveling along the conveyors.

115. Because myriad material handling systems with AR/VR user interfaces for training, operation, prognostics, diagnostics and other purposes have preceded the '602 Patent, a POSITA would have recognized the results of combining Cavada, Orito, Sommer, and Schmirler were predictable and there would have been a reasonable expectation of success in making the combination.

C. Disclosures for Claims 3, 6, 11 and 16

116. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito, Sommer and Schmirler render obvious claims 3, 6, 11 and 16. As to claims 3, 11, and 16, it would have been obvious to a POSITA to modify the COS combined system by incorporating the method and system for identifying a maintenance issue based on the analysis of real-time system data generated by the automation system and providing a user interface for displaying information, such as superimposing graphics on a user's view of his or her environment, to guide the user to the source of the issue and/or rendering information including current or historical alarms or faults for industrial machines that are monitored, to describe a computing device that is further configured to

detect errors based upon the sensor telemetry data, and in response generate the animation for corresponding locations at which detected errors occur within the facility. As to claim 6, it would have been obvious to a POSITA to modify the COS combined system by incorporating the method and system for displaying information on a virtual representation of a conveyor as an industrial asset. A POSITA would have found it obvious, and had a reasonable expectation of success, to modify the display of information on a virtual representation of a conveyor as an industrial asset as provided by Schmirler, with the additional technique of displaying a name on the industrial asset as part of the displayed information provided by Schmirler, combining prior art elements according to known electronic interfacing and programming techniques to yield predictable results of displaying the name of a conveyor to identify the industrial asset to the user, as used for other types of virtualized industrial assets, and providing an improved system and method for visualizing industrial equipment by more clearly identifying the equipment to a user.

X. GROUND 3: CLAIMS 5, 13 AND 18 ARE RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER AND KANG

A. Overview of Kang

117. An overview of Kang is provided in the Petition, which I have reviewed and with which I agree. Kang discusses a 3D VR system that generates 3D

virtual reality images of security zones. EX1006-Kang, Abstract and claim 1.

118. Kang discloses the use of a 3D VR system that converts 2D images captured by a plurality of cameras, such as closed-circuit television (CCTV) cameras, into a 3D VR experience.
119. Kang is analogous art to the '602 Patent; it is from the same field of endeavor as the '602 Patent (facility monitoring systems) and reasonably pertinent to the particular problems the '602 Patent was trying to solve including, but not limited to, facility monitoring that produces and employs visual representations of security zones *a la* cameras distributed throughout a facility.

B. Motivations to Combine Cavada, Orito, Sommer, and Kang

120. A POSITA would have been motivated to combine Cavada, Orito, and Sommer for the reasons I discussed in Section VIII.D. A POSITA would have been further motivated to combine Cavada, Orito, and Sommer's combined system with Kang. All references are directed to a visualization system monitoring inside a facility. Kang discloses generating 3D virtual representations of the facility using multiple cameras to monitor areas, such as security zones or "patrol route", in the facility. [EX1006, Claim 1]

121. Because myriad facility monitoring systems with CCTV cameras and VR user interfaces for virtually moving through the facility, and other purposes, have preceded the '602 Patent, a POSITA would have recognized the results of combining Cavada, Orito, Sommer, and Kang were predictable and there would have been a reasonable expectation of success in making the combination. It would have been obvious to a POSITA, before the effective filing date of the claimed invention and with a reasonable expectation of success, to modify the previously combined system by incorporating a plurality of CCTV cameras to capture video images in a facility to provide VR presentations, including virtual first-person movement through the facility, as disclosed by Kang, using well known electronic interfacing and programming techniques. This modification simply substitutes one known type of camera for monitoring a facility to produce playback video images in a user display for another known type of camera for monitoring a facility, to obtain predictable results of utilizing CCTV cameras as the cameras for gathering video data from a facility used for playback to a user on a computer device. [EX1015 PP26-27] In fact, for more than 65 years, CCTV cameras, which were first introduced in the 1940s, were the dominant type

of camera used. Digital cameras are a relatively recent technology, with CCD⁹ cameras emerging in the 1970s and IP cameras in the 1990s.

C. Disclosures for Claims 5, 13 and 18

122. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito, Sommer and Kang render obvious claims 5, 13 and 18.

XI. GROUND 4: CLAIM 7 IS RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER, SCHMIRLER, AND ANDERSON

A. Overview of Anderson

123. An overview of Anderson is provided in the Petition, which I have reviewed and with which I agree.

B. Motivations to Combine Cavada, Orito, Sommer, Schmirler and Anderson

124. A POSITA would have been motivated to combine Cavada, Orito, Sommer and Schmirler for the reasons I discussed in Section IX.B. A POSITA would have been further motivated to combine Cavada, Orito, Sommer and Schmirler's combined system with Anderson. Anderson discusses VR displays and user interfaces that enable users to operate within simulated environments from particular perspectives. "For example, a virtual reality display platform 110 and/or virtual reality user interaction devices 112 may

⁹ Charge-coupled device (CCD), a high-speed semiconductor used chiefly in image detection

allow users to experience rapid ‘fly-through’ motions through the simulated environment or to experience the simulation from the perspective of a given participant. The data may be integrated into a virtual reality simulation that represents the physical space, coupled with avatars (if desired) representing study participants as they move and interact with objects ... and regions of frequent contact can be highlighted with brightness, color, labels, etc., in the virtual reality simulation.” [EX1007, ¶ 0028]

125. Anderson describes a VR simulation generator that renders a physical environment with content recorded from all events and actions of simulation participants as recorded by data acquisition systems and displayed in VR platforms including animation or a simulated video sequence. [*Id.*, ¶0035] Anderson’s simulation may allow for customized (e.g., variable speed) replay of observed events, and through which the disclosed simulations may be used to identify “hot spots” or trouble areas. [*Id.*, ¶¶0042-0043] While Anderson’s simulated environment is presented as a single (still or static) frame of animation, the simulated environment may be a part of or included as an animated visual sequence with avatars that represent participants interacting with the environment over time. [*Id.*, ¶ 0047, FIG. 5B]
126. Anderson is analogous art to the ’602 Patent; it is from the same field of endeavor as the ’602 Patent (facility monitoring systems using VR with

animation) and reasonably pertinent to the particular problems the '602 Patent was trying to solve (Anderson: a VR system that provides animated visualization for an environment and interactions therewith). See Section V.A. All references are directed to a visualization system for monitoring the interior of a facility. Anderson discloses generating VR representations of the facility, including allowing a user to perform customized replay(s) of observed events.

127. A POSITA would have recognized the results of combining Cavada, Orito, Sommer, Schmirler and Anderson were predictable and there would have had a reasonable expectation of success in making the combination. Discussed before, this is largely due to the myriad successful VR visualization systems integral to tracking and control systems, be it for purposes of training, monitoring, prognostics, diagnostics, etc.
128. It would have been obvious to a POSITA, before the effective filing date of the '602 Patent and with a reasonable expectation of success, to modify the aforementioned combined system by incorporating the technique of Schmirler for providing a user interface to display information related to the operation of equipment monitored and recorded for playback by a series of cameras in a facility to obtain virtual reality presentation and the technique of Anderson allowing customized playback of event animations, using

known electronic interfacing and programming techniques. [EX1007, ¶¶0035, 0042] The modification results in an improved user interface for reviewing historical events of a facility by allowing the user greater control over the viewing of the animated events, for easier use and greater customization based on user preference.

C. Disclosures for Claim 7

129. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito, Sommer, Schmirler and Anderson render obvious claim 7.

XII. GROUND 5: CLAIM 8 IS RENDERED OBVIOUS BY CAVADA, ORITO, SOMMER, AND ALURU

A. Overview of Aluru

130. An overview of Aluru (EX1008) is provided in the Petition, which I have reviewed and with which I agree.
131. I have reviewed Aluru (EX1008) which was published after the July 30, 2019 priority date as well as the non-provisional application 16/204,883 that led to the Aluru publication that was filed on November 29, 2018, prior to the July 30, 2019 priority date (EX1010) and the history of patent prosecution transactions for Aluru (EX1011). Based on my review of these references, and the discussion of Aluru in the Petition, I conclude that no new matter was added between the non-provisional application (EX1010)

and the published Aluru application (EX1008). No amendments to the specification, drawings, or claims were made between the non-provisional application's filing date and the publication (as reflected in EX1011), and after a comparison, I conclude that the contents of EX1008 and EX1010 are substantially the same and that EX1008 does not include any substantive new matter compared to EX1010.

B. Motivations to Combine Cavada, Orito, Sommer, and Aluru

132. In my opinion, a POSITA would have been motivated to combine Cavada, Orito, Sommer, and Aluru. Aluru discusses techniques in which one or more computing devices may create the virtual representation of the user based on an image. [EX1008, Abstract]

133. Aluru discloses a system that exports animations in a video format. “Renderer application 54 may generate the result, for export (e.g., outputting), in any of the standard 3D object formats (e.g., .obj, .ply, .stl, .fbx., .glts, etc.).” [*Id.*, ¶0117] Specifically, echoing the Petition, Aluru discloses the creation of “non-static virtual representations (e.g., virtual representations that can move and be animated).” [*Id.*, ¶0139] “Processing circuitry 44 may be configured to generate ‘pre-rigged’ high-polygon 3D virtual representations for various reasons such as advertising products, product recommendations, and virtual reality (VR) headset based

experiences.” [Id.] “The promotional videos may be created after putting the virtual representation in any 3D environment with any apparel or accessory combination and applying a motion capture animation sequence.”

[Id.] “The animation may be sequenced in true life-size 3D and dynamic motion-based videos can be created using camera views in the true life-size 3D environment[,]” where “[t]he animations may also be exported as 360-degree videos for viewing via a virtual reality headset to experience a life-size immersive experience.” [Id.]

134. Aluru is analogous art to the ’602 Patent; it is from the same field of endeavor as the ’602 Patent (systems using 3D virtual reality including animation that can be exported in a video format) and reasonably pertinent to the particular problems the ’602 Patent was trying to solve (Aluru: a virtual reality system that includes animation of an environment). See Section V.A.

C. Disclosures for Claim 8

135. I have reviewed, had input into, and endorse the explanation provided in the Petition regarding how Cavada, Orito, Sommer, and Aluru render obvious claim 8.

XIII. AVAILABILITY FOR CROSS EXAMINATION

136. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

XIV. RIGHT TO SUPPLEMENT

137. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner raises and to take into account new information as it becomes available to me.

XV. JURAT

138. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing 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. *See* 18 U.S.C. § 1001.

Dated: January 17, 2024



Dr. Jason A. Janét

APPENDIX A

Jason A. Janét, Ph.D.

1420 Lillington Drive, Suite 205

Raleigh, NC 27607

Mobile: (919) 225-1724

E-mail: jasonajanet@gmail.com

Education

- Ph.D. Electrical & Computer Engineering, North Carolina State University, 1998
- M.S. Integrated Manufacturing Systems Engineering, North Carolina State University, 1994
- B.S. Mechanical Engineering, University of Virginia, 1990

Employment History

Applied Research Associates (ARA): 2018 - present

- **Corporate Director of IP and Product Commercialization (IP to Product—IP2P) | CTO-SSM:** Corporate/Business development, Intellectual Property Portfolio Build-out/Protection, and IP Transition to Product. Evaluate, quantify, present and recommend portfolios of IP, product lines and ventures on the basis of competitive landscapes, addressable markets, sales strategy, resource availability and technology readiness. Design, propose and mentor organizational structure(s), including cross-department and cross-sector relationships. Relevant technologies include medical technologies, augmented reality, non-GPS, synthetic environments, computer vision, machine intelligence, IoT sensors, robotics, automation, security, photogrammetry, weapons systems, unmanned systems, SaaS, BioTech, and precision agriculture for multiple market domains. Clearance Level: TOP SECRET & SCI.

DeltaFive: 2014 - 2018

- **CEO & Co-Founder:** Lead corporate, business, IP and technical development for spinout focused on IoT sensors, computer vision, machine intelligence, mobile robots, SaaS, and Lure Formulation for hospitality, pest, IT, and security markets. Strategic and tactical direction for sales, marketing and client services teams.
- **Inventor:** Three awarded patents (USPTO) and patents pending.
- **Board of Directors:** Serve on and report to Board of Directors, and chair the Technical Advisory Board.
- See www.deltafive.com, <https://jgc.outgrow.us/deltafive> or www.youtube.com/watch?v=LoQe6_Lxprs.

Transdigm [TDG] (Avionic Instruments | Acme Aerospace | Aerospace Cooling Solutions): 2002 – 2004, 2013 - 2014

- **VP/Director of Development (2002-2004), VP/Director of Sales, Program Management (2013-2014).** See www.transdigm.com, www.avionicinstruments.com, www.acme-aero.com, or www.aerospacecoolingsolutions.com.
 - Manage multiple product lines and cross-functional teams including product line managers (PLMs), account managers, inside sales, international sales, marketing, repair, engineers, technicians, distributors, legal, IP and rep organizations. (270 employees)
 - P&L, strategy, reporting, and forecasting for ~\$105M/yr, 50% EBITDA, and 10% YOY growth.
 - Product lines comprised ~600 SKUs for advanced aerospace systems.
 - Epicor ERP for standard resource planning, including inventory optimization and workflow.
 - Change-Agent: Sikorsky S97/JMR programs and supply chain for Aerospace Cooling Solutions.
 - Incubation, launch, growth and exits for **ShelfWorks**, **VortexHC** and **RxMedic** (below).
- **Programs:**
 - **S97 Raider Light Tactical Helicopter** – Autonomy, power distribution and electrical system (PDES) for the Sikorsky S97 LTH, including FAA-compliant software development per DO-178B. (2013 – 2014) See <http://www.youtube.com/watch?v=qy-Xb3X-bC0>.
 - **Joint Multi-Role (JMR) Helicopter** – Leveraging S97, JMR employs a scaled-up level of autonomy/PDES for Sikorsky-Boeing team, under U.S. Army funding. (2014)
 - **Blue Fans** – Aerospace Cooling Solutions supply chain optimization. (2013 – 2014)
 - **DARPA Distributed Micro-Robotics** – PI/PM for “Mobile Robots that Climb Vertical and Inverted Surfaces.” sponsored by DARPA – MTO. Develop mobile robots that climb walls and ceilings for surveillance, reconnaissance and breaching. Collaborated with Lockheed-Martin for automatic target recognition and Picatinny Arsenal for *Lamprey* SLAM holder. (2002 – 2004)

Teledyne Technologies [TDY]: 2011 - 2013

- **Senior Manager**

- o Lead cross-functional teams of scientists and engineers in CONUS
 - o M&A due-diligence, identification and recommendation (SeaBotix & BlueView)
 - o Lead contingents of cross-division teams to secure ~\$352M in funding over 24 months.
 - o Plan and execute CRAD, business development and coordinate with strategic business units
- **ONR/USMC Cargo UGV** – PM for ONR/USMC-sponsored Cargo Unmanned Ground Vehicle (CUGV) Program subcontract (2011-2012). Manage team of engineers and scientists, in coordination with contract prime (Oshkosh) for unmanned combat vehicle control, perception and navigation. Multi-sensor suite included EO/IR Vision, LIDAR, IMU, and GPS.
- **Army LTL** – PM for Army-sponsored Lighten-the-Load (LTL) Program subcontract (2012-2013). Manage team to develop perception system comprised of stereo EO and stereo LWIR cameras to find and track leader(s), perform optical odometry, detect and map obstacles, and enhance SIGINT. Interface with sensors (LIDAR, IMU, GPS), autonomy for ATV-sized unmanned ground vehicles.
- **NASA ESP** – PM for RTP-based tasks for NASA Engineering Services and Prototyping demonstration (2012-2013). Provide Teledyne Engineering Services (lead), SAIC, Oceaneering, and Schafer with robot prototype and vision-based perception to detect, classify and track targets.
- **DARPA EXACTO** – PM for NC-based tasks for DARPA TTO Extreme Accuracy Tasked Ordnance (EXACTO) Program (2012-2013). Program developed first ever guided, small-caliber bullet with MEMS-based actuation, optical bullet tracking, optical target tracking, and bullet guidance to greatly improve accuracy and extend the day and nighttime range over current state-of-the-art sniper systems.
- **DARPA AngelFish/EagleRay** – PI/PM and inventor of the AngelFish Cross-Domain Submersible UAV, a man-portable, floodable airframe with tilt-thrusters capable of operating in and deliberately transitioning between the air, surface and underwater. Designed for optimal balance between hydro-/fluid-dynamics, materials, guidance/navigation/control, power conversion/storage, and perception for wing-in-ground flight.
- **Army PIRST** – Propose and capture the Pursuant In-stride Reconnaissance, Surveillance & Targeting (PIRST) program. By Army Night Vision & Electronics Sensors Directorate (NVESD) in 2013.

RxMedic Systems: 2003 – 2011 (*spinout from Avionic Instruments*)

- **Co-Founder/General Manager/Board Member** (2004-2007), **CTO** (2007-2010), and **Director of Robotic/Automated Systems** post-acquisition by JM Smith (2010-2011).
 - o Manage launch from **Avionic Instruments** (2004)
 - o Build and lead nationwide growth of cross-functional teams to 75+ employees
 - o Direct product development, manufacturing, field support, sales and marketing
 - o Manage IP Portfolio & Legal: Patents include USPTO# 7,726,514 and 8,091,733
 - o Oversee P&L, accounting, raising of capital, and accounts receivable
- **RxMedic ADS:** Invent, develop, market and support automated pharmacy dispensation and packaging systems for retail, hospital, mail order and industrial fulfillment organizations.
- **RxMedic ACS:** Integrate, refine, market and support automated pharmacy-counting systems for retail and hospital fulfillment organizations.
- Co-negotiated the acquisition of RxMedic Systems by JM Smith, Inc. in May of 2010, established RxMedic as a division, and coordinated 12-month transition. Supported evaluation and integration of automated systems for JM Smith business units including Smith Drug.

Vortex HC: 2002 - 2009 (*spinout from Avionic Instruments*)

- **Vice President** (2004-2006), and **Facilities Security Officer (FSO)** (2005-2006)
 - o Manage spin-out from **Avionic Instruments** (2004)
 - o Lead cross-functional teams for product development, manufacturing, support, sales and marketing
 - o Manage business and corporate strategy, execution, licensing, and ITAR/EAR-compliance
 - o Support domestic and international legal and IP portfolio management, P&L, AP/AR
- **DARPA ARTEMIS** – PI and PM for “Vortex-Based AUVs for Counter-Mine and Counter-Obstacle Operations” sponsored by DARPA – ATO. Managed development of holonomic AUVs for landing on mines and performing soft-kill neutralization. Integrated CFD, rugged materials, MEMS-sensors for guidance, navigation and control. Collaborated with UT-ARL for development of circular synthetic aperture sonar and Teledyne RD Instruments for DVL. Developed high-precision acoustic underwater tracking system.
- **Products:** Managed development, manufacturing, world-wide marketing, and support of the following to military, law-enforcement, security, rescue, nuclear and entertainment customers:
 - o VMRP Wall-Climbing Robot – Man-portable mobile robots that climb walls and ceilings.
 - o Submersible Attractor – Rad-hardened attractor for nuclear energy market, BWR inspection
 - o Submersible VMRP Robot – Man-portable underwater robots for bulkheads and tank interiors.

- o Lamprey SLAM Holder – Surface-agnostic instant placement mechanism for Picatinny Arsenal’s Selectable Land- and Anti-personnel Mine (SLAM) breaching charge.
- **Licensing:** As part of exit strategy, instituted licensing and transition of VRAM technologies:
 - o SeaBotix LBC – Little Benthic Crawler Remotely Operated Vehicle (ROV).
 - o SeaRobotics HullBUG – Autonomous hull-grooming robot.
 - o BDT – Attractors for high-speed, high-efficiency, low-overhead paper & fabric handling.
 - o TMI – Attractors for inspection of nuclear boiler water reactor (BWR) facilities
- **ONR & NAVSEA HullBUG VRAM** – PI/Consultant for “Attractor Design for the Hull Biomimetic Underwater Grooming (HullBUG) Technology” and “HullBUG VRAM Design Optimization”. (2006–2009).

ShelfWorks Technologies: 2002 – 2006 (*spinout from Avionic Instruments*)

- **Charter Officer** (2004-2006).
 - o Supported launch from **Avionic Instruments** (2002-2004)
 - o Direct military product development, support commercial product development, sales & marketing
 - Bed, Bath & Beyond
 - Home Depot
 - o Support IP Portfolio & Legal

Nekton Research (iRobot [IRBT]): 1998 - 2002

- **Vice President of R&D** (1998-2000) and **Director of Business Development** (2000-2002).
 - **Lead:** Cross-functional teams in marine-focused product/business development, production, deployment.
 - **IP Portfolio:** Co-inventor on USPTO# 6,378,801 (2002)
 - **Spinout:** Support incubation/launch of Parata Systems, a pharmacy automation company (1999-2002)
 - **M&A:** Provided early-stage due-diligence and introductions for acquisition by iRobot (2006)
- **Principal Investigator and Program Manager:**
 - **DARPA LSALS-SP3** – PI/PM for “3D Plume Tracing using Ranger™ MicroAUVs,” sponsored by DARPA – MTO. Joint effort with Sandia National Labs, and Woods Hole Oceanographic Institute. Developed multiple collaborative MicroAUVs that search for and localize plume sources and aircraft blackbox, to rescue and/or recover humans and assets.
 - **DARPA Distributed Micro-Robotics** – PI/PM for “Swimming Arrays for Anti-Submarine Warfare”, sponsored by DARPA – ATO. Joint effort with Draper Labs, Johns Hopkins University Applied Physics Lab, and Solers. Mobile acoustic array formations of multiple MicroAUVs. In contrast to towed arrays (e.g., TB-29), *Swimming Arrays* decouple tactical maneuvers from sensing maneuvers; enable protracted sensing, strong source direction discrimination, forward end-fire view, and dynamic array beamforming.
 - **DARPA Distributed Micro-AUVs** – PI/PM for “Aquatic Microbots”, sponsored by DARPA – MTO. Under *Distributed Robotics* program, design, build and demonstrate ultra-small AUVs, called “MicroHunters™”, which maneuver in 3D using only one moving part. Resulting navigation, called “Helical Klinotaxis” was validated on three different platforms and demonstrated to DARPA. Co-inventor on patent “3D Orientation for Aquatic Robots Using Helical Klinotaxis”, USPTO in April 2002.
 - **Forensics ROV** – PM and inventor of porthole-size ROV to perform forensic analyses of sunken assets. Based on a diametrically-opposed, large-diameter, low-velocity, vector thrusters, provide underwater telepresence to search for remains, assets and root-cause indicators. Unique design minimized silt disturbance, and maximized options for ingress and egress. (Private customer)
 - **Deepwater Towfish** – 6500m depth-rated towfish to carry sensor suite for applications in energy sector, telecommunications sector, sub-bottom profiling, and terrain mapping. (Private customer – EdgeTech)
 - **DARPA APLA/MGM** – PI/PM for “MicroHunter Guidance and Control of 60mm Mortars”, sponsored by DARPA – ATO. Under *Anti-Personnel Landmine Alternative/Minimally Guided Munitions* (APLA/MGM) program, collaborate with Battelle Memorial Institute to demonstrate feasibility, integrate microelectronic GNC sensors and actuators, and validate performance of single-actuator control force producer and guidance algorithm for indirect-fire munitions. Performance exceeded specifications.

Parata Systems: 1999 – 2002 (*spinout from Nekton Research serving as VP of Eng and Dir of BD*)

- o Supported incubation and launch from **Nekton Research** (1999-2002)
- o Robotic System for Retail & Mass-Fulfillment Pharmacy
- o Technical & Business Development of Alpha- and Beta-level Products
- o Supported initial IP Portfolio

Duke University, Pratt School of Engineering: 1999 - 2021

- **Adjunct Associate Professor** (2005-2021) and **Adjunct Assistant Professor** (1999-2005).
 - Courses Taught Include:
 - Entrepreneurship & Tech Transition (Special Topics)
 - Robotics & Automation (MAE 442, ECE 383, ECE 142/442)
 - Control Theory (ECE 141/441)
- **MS Committee Member:** Serve on graduate student committees and advise research.
- **Advisor** and sponsor for Duke's Wall-Climbing Robot Team, which earned 1st place in the 2004 and 2005 International Climbing and Walking Robot (CLAWAR) Competitions in Madrid, Spain and London, England. Sponsored by the LORD Corporation and VortexHC.
- **Advisor** for Duke's DARPA Grand Challenge Team, in support of the Carnegie Mellon Red Team(s), which earned 2nd and 3rd places. Perception included RADAR, LIDAR, IMUs and GPS.
- **Advisor** and sponsor for Duke's Autonomous Underwater Vehicle (AUV) team, which earned finalist standings five times in the AUVSI/ONR International Autonomous Underwater Vehicle Competition. Participated in multiple annual competitions since 2001, with the following rankings: 2nd in 2006, 4th in 2005, 5th in 2004, 3rd in 2003, 4th in 2002, and 7th in 2001. Sponsored by LORD, VortexHC, and SeaBotix.

North Carolina State University, School of Engineering: 1992 - 2021

- **Adjunct Assoc Professor** (2009-2020), **Board Integrated Manufacturing Systems Engineering Institute** (1998 – 2020), **Adjunct Asst Professor** (2000-2009), **Instructor** (1996-1999), **Researcher** (1992-1996).
 - Teaching Experience:
 - Robotics & Automation (ECE 444, ECE 591)
 - Control Theory (ECE 435)
 - Distributed (Non-Deterministic, Network- & Statistics-based) Controls (ECE 492Z)
 - **MS Committee Member:** Serve on graduate student committees, sponsor, and advise research.
 - **Advisor & Corporate Sponsor** for NCSU's Autonomous Underwater Vehicle (AUV) team, which began participating in the AUVSI/ONR International AUV Competition. Participated in 2005 and 2006.
- **NASA-HELIOS** – PM for development and demonstration of semi-autonomous robotic system for lunar habitation and transport. Under NASA's Exploration Office, and funding from United Technologies, Caterpillar, and North Carolina Space Grant Consortium. Managed team of 40+ people to build and competitively demonstrate lunar exploration and habitation mission including deployment of lunar lander, UGV, and personnel habitat modules. Mission was demonstrated in full and earned first place and NASA's *1998 Extra Terrestrial Award*. January 1996 to April 1998.
- **DARPA/ONR Outdoor Landmark Recognition** – Researcher for "Outdoor Landmark Recognition Using Hybrid Fractal Vision System and Neural Networks", by DARPA and ONR. Validate new approach to detecting and recognizing outdoor landmarks using the Region-Feature Neural Network. (1993–1996)
- **Other Systems:** Bipedal robot (*Jenner*), a hexapod colony, an autonomous mobile robot (*Lazarus*), home automation & security based on decentralized control networks.

TMI Robotics: 1998 - 2013

- **President**
 - **Robotic & Automation Systems:** Submersible Robotic Hull Crawlers & Attractors for *General Electric*, *Hitachi*, *Framatome/Areva*, *SeaRobotics*, *SeaBotix*, etc. (2009-2018); wall-climbing robots for *SignalScape* (2009-2013); Pioneer mobile robot end-effector and bipedal robot for *Adept MobileRobots* (1998-2004); decentralized fuel pump control systems for *Gilbarco* (1998); Autonomous Following Golf Caddy for *Caddy Master* (1998-1999); Universal rotary actuator system for *Real World Interface (RWI)* and *iRobot (IS Robotics)* (1998-2000), etc.
 - **Artificial Intelligence Software and Textbook:** "Computational Intelligence: Supervised and Unsupervised Learning with Neural Networks", J.A. Janét and J.C. Sutton III. Copyright © 1998-2013. ISBN #0-9678493-0-6. Textbook included a time-limited single-user license for neural network software by TMI Robotics, Inc. Software included data, the Region-Feature Neural Network and the Hyper-Ellipsoid Clustering Neural Network for pattern analysis and machine intelligence. End-users/clients include *NCSU*, *National Technological University (NTU)* and *Video Based Engineering Education (VBEE)*, *IBM*, etc.

Other Professional Highlights:

- **Intellectual Property Litigation Expert Witness:** Provided reports, descriptive imagery and testimony for litigation regarding intellectual property, contracts and trade secrets. Cases are listed below, clients in **bold**:
 - **Becton Dickinson v JFCRx** (pre-lit)
 - Juul v **NJOY** – (2023-pres) [ITC] and [District Court of DE]
 - Textron v **DJI** – (2023-pres) [Case No. 2:22-cv-351-RWS-RSP (E.D. Tex)]
 - Solmetex v. **Dental Recycling** (2023-pres) [Pre-IPR: USPTO]
 - **Daifuku** v. ControlLogix [Pre-IPR: USPTO]
 - Autonomous Devices v **Tesla** (2023-pres) [C.A. No. 22-1466 (MN), District Court of DE]
 - **Tesla** v Autonomous Devices (2023-pres) [USPTO PTAB (IPR)] x 7
 - Autonomous Devices v **Tesla** (2023-pres) [Case No. 1:22-cv-01466, District Court of DE]
 - **Ouster** v. Hesai et al, Lidar Systems [337-TA-3675, U.S. International Trade Commission]
 - **Ouster** v. Hesai Group et al, [No. 1:23-cv-00406], District Court of DE]
 - **Boston Dynamics** v Ghost Robotics (2023-pres) [1:22-cv-01483-MN, District Court of DE]
 - Vivint v **SkyBell** Technologies (2022-pres) [2:21-cv-09472, Central Dist of DC]
 - Moog v **SkyRyse** (2022-pres) [1:22-cv-00187, Wester Dist of NY]
 - Velodyne v **Ouster** (2022-pres) [337-TA-1322, U.S. International Trade Commission]
 - **IQRIS** v Point Blank (2022-2023) [21-CV-61976-BB, Southern District of FL]
 - **Opex** v HC Robotics/Invata (2022) [337-TA-1293, U.S. International Trade Commission]
 - **iAqua** v Cayago (2022) [Reexam-EPR814 of 90/014,995 USPTO]
 - Cayago v **iAqua** (2022) [21-CV-61035, Southern District of FL]
 - Cayago v **iAqua** (2022) [Civil No. 21-1212, Puerto Rico]
 - Bacon Sons v **Perception Robotics** (2021-2022) [Case No: 30-2018-01000372, Orange Co, CA]
 - **AutoStore** v Ocado (2021-2023) [IPR2022-00443 USPTO]
 - **AutoStore** v Ocado (2021-2022) [IPR2022-00673 USPTO] (pre-institution)
 - **AutoStore** v Ocado (2021-2022) [IPR2021-00274 USPTO]
 - **AutoStore** v Ocado (2021-2022) [IPR2021-00311 USPTO]
 - **AutoStore** v Ocado (2021-2022) [IPR2021-00398 USPTO] (pre-lit)
 - **AutoStore** v Ocado (2021-2022) [IPR2021-00412 USPTO] (pre-lit)
 - **AutoStore** v Ocado (2021-2022) [PGR2021-00038 USPTO] (pre-lit)
 - **AutoStore** v Ocado (2021-2022) [HP-2020-000035, United Kingdom]
 - **AutoStore** v Ocado (2021-2022) [Spain – Pre-lit]
 - **AutoStore** v Ocado (2021-2022) [Case No. 2:20-cv-494, Eastern District of VA]
 - Ocado v **AutoStore** (2021-2022) [1-21-cv-00041, USDC - DNH]
 - Ocado v **AutoStore** (2021-2022) [1-21-cv-00806, USDC - DNH]
 - **iRobot** v SharkNinja (2021-2022) [337-TA-1252, U.S. International Trade Commission]
 - **Airborne Systems** v Wamore – Steerable parachute systems (2019-pres) [Arbitration – NJ]
 - **AutoStore** v Ocado (2020-2021) [337-TA-1228, U.S. International Trade Commission]
 - Interactive Play Devices v **Spin Master** (2020-2021) [Civil Action File No. 6:20-cv-00066, W.D. TX]
 - **DJI** v Autel – (2017-2021) RC UAV Systems [C.A. No. 16-706-LPS-CJB, District Court of DE]
 - Velodyne v **RoboSense** (2019-2020) [337-TA-1173, U.S. International Trade Commission]
 - Odyssey Marketing v **Spin Master** (2018) Unmanned Air Vehicles [IPR, USPTO]
 - Mattel v **Spin Master** (2018) Transformable Devices [IPR2018-01672, USPTO]
 - Mattel v **Spin Master** (2018) Transformable Devices [IPR2018-01673, USPTO]
 - Mattel v **Spin Master** (2018) Transformable Devices [IPR2018-01674, USPTO]
 - MPV v **DJI** – (2018) [Case No. 2:18-cv-02210-RGK-AGR, Central District Court of CA]
 - **Samsung** v Cywee – (2017) IMU Pose & AR [Case No. 2:2017cv00140, Eastern District of TX]
 - **DJI** v Autel – (2017-2018) [2:17-cv-00776-RAJ, Western District of WA]
 - Synergy Drone v **DJI**– (2017-2018) [Case No. 1:17-cv-00242, TX Western District Court]
 - **iRobot** v Bissell – (2017-2018) [337-TA-1057, U.S. International Trade Commission]
 - **Hayward Industries** – (2015-2016) Evaluate IP and Enabling Technologies for Submersible Systems
 - Choirock v **Spin Master** (2016-2018) Transformable Devices [Case No. IPR2017-00030, USPTO]
 - **Spin Master** v Sphero, Inc. (2016-2017) [Case No. IPR2017-01272, USPTO]
 - Sphero, Inc. v **Spin Master Ltd.** (2017) [New York Southern District Court, Case No. 1:17-cv-05428]
 - Razor/Chen/Inventist v **Jetson Electric Bikes** (2016-2017) [337-TA-1000, U.S. Int. Trade Commission]
 - Razor/Chen/Inventist v **Powerboard** (2016-2017) [337-TA-1000, U.S. International Trade Commission]

- Segway/DEKA/Ninebot v **Jetson** (2016-2017) [337-TA-1007, U.S. Int. Trade Commission]
- Segway/DEKA/Ninebot v **Powerboard** (2016-2017) [337-TA-1007, U.S. Int. Trade Commission]
- Segway/DEKA/Ninebot v **Jetson** (2016-2017) [337-TA-1021, U.S. Int. Trade Commission]
- Segway/DEKA/Ninebot v **Powerboard** (2016-2017) [337-TA-1021, U.S. Int. Trade Commission]
- **DJI** v Yuneec [No. 5:16-cv-595, U.S. District Court, Central District of CA]
- Rehco LLC v **Spin Master Ltd.** (2015-2020) [No. 1:2013cv02245, Northern District of IL]
- Segway/DEKA v **Ninebot** [Inv. No. 337-TA-935, U.S. International Trade Commission]
- Segway v **Shenzhen Inmotion** – [Inv. No. 337-TA-935, U.S. International Trade Commission]
- ScriptPro v **Innovation** – Pharmacy Automation (2015) [2:06-cv-2468-CM-JPO U.S. Dist Court, KS]
- ScriptPro v **Innovation** – Pharmacy Automation (2011-2015) [06-2468-CM U.S. District Court, KS]
- Spinmaster v **YourStoreOnline** – Wall-Climbers (2009-2010) [CV 09-5803 CAS]
- SpinMaster v **YourStoreOnline** – RC Helicopters (2009-2010) [CV 09-2121 CAS]
- **Patent Inventorship:** Other patents pending
 - 6,378,801: Devices and methods for orienting and steering in three-dimensional space.
 - 7,726,514: Automated article dispensation mechanism.
 - 8,091,733: Automated article dispensation mechanism.
 - 8,751,035: Automated laundry drop-off and retrieval system.
 - 9,664,813: Automated Insect Monitoring
 - 9,999,211: Automated Insect Monitoring (Removable Chambers with Transparent Sides for Inspection)
 - 9,999,212: Automated Insect Monitoring (Signal Processing to Detect and Recognize Invasive Pest)
 - 11,382,324: Insect Traps and Monitoring System (IoT Monitoring System with Detect/Classify Ability)
- **Board of Directors/Advisors Experience:** Provide strategic technology, business and corporate expertise.
 - **Delta Five** – Distributed unattended sensors, automation, SaaS and IoT.
 - **Panacea BioMatx Inc** - Automated customized medications and nutraceuticals. (www.panacea.me)
 - **Lealear** – Automated storage and retrieval systems.
 - **RxMedic** – Automation for preparing prescription orders in retail, government, and hospital pharmacies.
 - **VortexHC** – Non-dexterous gripping, robot climbers (air and underwater), and 6DOF holonomic AUVs.
 - **NCSU Integrated Manufacturing Systems Engineering Institute** – Multi-disciplinary graduate school

Selected Publications (of ~40)

- IoT Solutions Enabling Hotelier's to Monitor for Bed Bugs, www.deltafive.com/wp-content/uploads/2018/06/DeltaFive_BedBugAwarenessWeek2018_PressRelease.pdf, June 2018.
- New York City Challenged by Bed Bugs, www.newswire.com/news/new-york-city-challenged-by-bed-bugs-delta-five-offers-green-solution-20043137, November 2017.
- On the Heels of the Largest Bed Bug Lawsuit Judgement, Delta-Five Has a Proven Green Solution for Hotels, www.newswire.com/news/on-the-heels-of-the-largest-bed-bug-lawsuit-judgement-delta-five-has-a-19990567, October 2017.
- Hoteliers Find Delta Five's Innovative Bed Bug Solution Catches Bugs Faster and More Consistently, www.newswire.com/news/hoteliers-find-delta-fives-innovative-bed-bug-solution-catches-bugs-19940513, September 2017.
- As Hoteliers Look to Combat Bed Bug Rise Delta Five Offers Researched Solution, www.newswire.com/news/as-hoteliers-look-to-combat-bed-bug-rise-delta-five-offers-researched-19846348, August 2017.
- Green Approach to Prevention and Early Detection, www.eprnews.com/delta-five-highlights-green-approach-to-prevention-and-early-detection-during-bed-bug-awareness-week-138925/, June 2017
- Delta Five Raises the Bar in Battle Against Bed Bugs, www.newswire.com/news/delta-five-raises-the-bar-in-battle-against-bed-bugs-19547330, May 2017.
- Automated Bed Bug and Insect Monitoring System, www.newswire.com/news/delta-five-launches-automated-bed-bug-and-insect-19224593, April 2017.
- “Think It, Build It, Win It: Vision-Based Robot Design Secures Teledyne a \$350M NASA Engineering Contract” H. Neale. *NASA Tech Briefs* 2013/2014.
- “Automation is Changing Pharmacy: How Reducing Repetition Behind the Counter Improves Over the Counter Care” J. Janét. October 2010. *Insight Magazine*.
- “Automate Your Profits” J. Janét. October 2009. *Insight Magazine*.

- DTIC #ABV 299170 (NATICK/TR-04/013L): “Vortex Regenerative Air Movement: Attraction and Attachment on Vertical and Inverted Surfaces— A Simple Method for Static and Mobile Robots for Climbing Walls and Ceilings” J. Janét, D. Reinfeld, B. Wiedeman. October 2003. (Contract No. DAAD16-00-C-9259; US Army Soldier Systems Command, Natick, MA)
- DTIC #AD B267 288 (NATICK/TR-01/009L): “MicroHunter Control Applications for Elimination of Anti-Personnel Landmines: Low-Cost, Minimally Guided Munitions – A Simple Method for Controlling the Trajectory of Spinning Projectiles” M. Kemp, J. Janét, and C. Pell. May 2001. (Contract No. DAAN02-98-C-4030; US Army Soldier Systems Command, Natick, MA)
- “Development of a Micro Autonomous Underwater Vehicle for Complex 3-D Sensing”, *IEEE/MTS Oceans 2001 Conference*; Honolulu, HI; Nov 2001; B. Hobson, B. Schulz, J. Janet, R. Moody, C. Pell, and H. Pinnix.
- “MicroAUVs I: Platform Design and Multi-Agent System Deployment”, *Unmanned Untethered Submersible Technology (UUST)*; August 2001; Durham, NH; B. Schulz, B. Hobson, J. Janét, M. Kemp, R. Moody, C. Pell, H. Pinnix, J. Pollard, and H. Crenshaw.
- “Assessing the Performance of Oscillating Fin Thruster Vehicles”, *Unmanned Untethered Submersible Technology (UUST)*; August 2001; Durham, NH; M. Kemp, B. Hobson, J. Janét, C. Pell, and E. Tytell.
- “Using Control Networks to Control Multiple Autonomous Mobile Robots: Biped, a Hexapod Colony, and a Complex Autonomous Mobile Robot”, *IEEE Int’l Conf. on Robotics & Automation*; Detroit, MI; May 1998; J. Janet, B. Wiseman, R. Michelli, S. Scoggins, and A. Walker.
- “Autonomous Mobile Robot Global Self-Localization Using Kohonen and Region-Feature Neural Networks”, *Jnl of Robotic Systems*; Vol. 14, No.4, 1997; J. Janet, R. Gutierrez, T. Chase, M. White, J. Sutton.
- “Combining Self-Organizing Geometric Certainty Maps with the Unscented Kalman Filter”, *Proc. of IEEE Int’l Conf. on Robotics & Automation*; Leuven, Belgium; May 1998; J. Janét, J. Brickley, M. Kay, M. White, and J. Sutton.
- “Modeling of Sonar Sensors for Localization of Autonomous Mobile Robots”, *IEEE Transactions on Industrial Electronics*; October 1998; R. Gutierrez, J. Janet, and R. Luo.
- “Autonomous Mobile Robot Global Motion Planning and Geometric Beacon Collection Using Traversability Vectors”, *IEEE Trans on Robotics & Automation*; Vol.13, No.1, 1997, Pages:132–140; J. Janét, M. Kay, and R. Luo.

Skills Brief

- *Executive Leadership.* Provided fiscal, strategic, IP and operational leadership in application and development of heavily engineered systems for software, robotics and automation, medical, pharmacy, maritime, aviation, government, military, law enforcement, security, entertainment, hospitality, analytics, pattern analysis, and energy markets. Demonstrated ability to develop and implement business plans, integrate emerging technologies, raise capital, be an effective change agent, and transition product and client service concepts to commercial viability. Effective collaborator with companies, academic institutions, military, government and foreign entities. Experienced with legal aspects of launch, operations, equity, M&A, intellectual property & litigation. Successful manager of sales, marketing and finance including, ROI tool development, market research, prospecting, sales presentations, competitive analysis, brand development, multi-media advertising, contract negotiation, deal closure, A/P and A/R.
- *Board Member.* Effective strategic contributor and communicator on behalf of corporations (Delta Five, RxMedic, Panacea Biomatix, Lealear, and VortexHC) and an academic institution (NCSU IMSEI).
- *Engineering and Product Development.* Demonstrated ability to develop and deploy hardware and software products, including automated retrieval systems, fixed-base robots, medical systems, mobile robots, autonomous and remote-control unmanned ground robots, wall-climbing robots, hull inspection & cleaning robots, nuclear vessel inspection robots, autonomous underwater vehicles, non-destructive inspection robots, retail automation, and mine neutralization robots.

Additional

- **Security Clearance.** Personal clearance level – TOP SECRET & SCI. Facilities Security Officer (FSO) for Vortex HC. Coordinated processing of SECRET level Facility Clearances (FCL) and Personnel Clearances (PCL).
- **Institute of Electrical & Electronic Engineers (IEEE):** Robotics, Controls & Pattern Analysis.

- **Autonomous Unmanned Vehicle Systems International (AUVSI)**
- **American Society for Engineering Education (ASEE)**
- **American Society of Mechanical Engineers (ASME)**
- **PADI SCUBA:** Professional diver for underwater mobile robots, hull inspection, underwater video, counter-mine, ASW, etc.
- **Commercial Driver's License:** Class-A CDL, base registrations in North Carolina (and Virginia).
- **USPA Skydiving:** (1991 – 1997) USPA Jumpmaster certification in 1996. D-license with 400 jumps including instruction, tandem master training support, demonstrations, accuracy, and freefall relative work (RW). National collegiate RW championship team in 1994 (Richmond, IN). Carolina Sky Sports Accuracy Champion in 1993 (Louisburg, NC).
- **Pyrotechnician:** Class-A/B levels.
- **Master Mason:** Foundation of ~20 years of construction experience, primarily with ornamental stone, brick, and concrete. Experience initially gained as a youth within family-owned and operated business (Dogwood Quarries) in DC-metropolitan area; summers and school breaks from 1981 until 1997. Since 1998, all work has been *pro bono* including for Habitat for Humanity.

Computer Tools

Proficient: SalesForce, PowerPoint, Excel, Word, Project, MATLAB

Prior experience: Epicor ERP, QuickBooks, AutoCAD, SolidWorks, OrCAD, LabView, C/C++, Assembly