UNITED STATES PATENT AND TRADEMARK OFFICE

_____

BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

COLLEGE PRODUCTS, INC
Petitioner,

v.

INTIRION CORPORATION
Patent Owner

_____

Inter Partes Review IPR2023___, IPR2023-____, IPR2023

Declaration of
Mark N. Horenstein in Support of the

Petitions for *Inter Partes* Review of:

U.S. Patent No. 9,791,206;
U.S. Patent No. 10,495,374; and
U.S. Patent No. 11,274,876

Table of Contents

I. ‘INTRODUCTION 17

II. BACKGROUND & QUALIFICATIONS 18

III. BASES FOR OPINIONS EXPRESSED 22

IV. UNDERSTANDING OF LEGAL STANDARDS 23

A. Patentability 23

1. Anticipation 24

2. Obviousness 25

B. Prior Art 29

C. Person of Ordinary Skill in the Art 30

D. Claim Construction 32

V. TECHNICAL DISCUSSION of the field AND LEVEL OF ORDINARY SKILL IN THE ART 33

A. Field of the Challenged Patents 33

B. Level of Ordinary Skill in the Art 34

VI. THE CHALLENGED PATENTS 36

A. Effective Filing Date for Each of the Challenged Patents is No Earlier than April 25, 2014 36

A. Technology Background 37

B. the Specifications of the Challenged Patents 44

C. The ’206 Patent 47

1. The Challenged Claims of the ’206 Patent 47

2. The Prosecution History of the ’206 Patent 50

D. The ’374 Patent..... 52
1. The Challenged Claims of the ’374 Patent..... 52
2. The Prosecution History of the ’374 Patent..... 55
E. The ’876 Patent..... 55
1. The Challenged Claims of the ’876 Patent..... 55
2. The Prosecution History of the ’876 Patent..... 58
VII. STATE OF THE ART..... 59
A. Summary OF The Prior Art References..... 60
1. ISDU..... 60
2. Ueda..... 64
3. Smith..... 66
4. Butt..... 68
5. Emma..... 70
VIII. OPINIONS ON CLAIM CONSTRUCTION..... 75
A. The ’206 Patent..... 75
1. “Enable”..... 75
2. “Dangerous Condition”..... 77
A. The ’374 Patent..... 78
A. The ’876 Patent..... 78
3. “Level / Amount”..... 78
IX. OPINIONS ON VALIDITY OF THE ’206 Patent..... 79
A. The prior art references teach all of the elements of the ’206 Challenged Claims 79
1. The ’206 Independent Claims (Claims 9 and 11)..... 79

2. The ’206 Dependent Claims (Claims 10 and 12).....130

B. Reasoning Supporting Opinions on Invalidity of the ’206 PAtent 138

1. The ’206 Independent Claims Are Anticipated By And/Or Alternatively Obvious In View Of ISDU.....138

2. The ’206 Independent Claims Are Anticipated By And/Or Alternatively Obvious In View Of Ueda.....142

3. The ’206 Independent Claims Are Anticipated By And/Or Alternatively Obvious In View Of Smith.....144

4. The ’206 Independent Claims ARE Obvious In View Of Ueda Combined With Smith 147

5. The ’206 Independent Claims are Obvious in vIew of ISDU, Ueda, or Smith, combined with Butt 149

6. The ’206 Dependent Claims are Obvious over the Combination of Emma with ISDU, Ueda, or Smith (with the alternative additional combination with Butt). 152

X. OPINIONS ON INVALIDITY OF THE ’374 Patent.....157

A. The prior art references teach all of the elements of the ’374 Challenged Claims 157

1. The ’374 Independent Claims (Claims 9 and 17).....157

2. The ’374 Dependent Claims (Claims 10, 11, 18, 19 and 20) 165

3. The Dependent Temperature Claim (Claim 15).....171

A. Reasoning Supporting Opinions on Invalidity of the ’374 Patent 173

1. The ’374 Independent Claims Are Anticipated By And/Or Alternatively Obvious In View Of ISDU.....173

2. The ’374 Independent Claims Are Anticipated by and/or Alternatively Obvious in View of Ueda.....176

3. The ’374 Independent Claims Are Anticipated By And/Or Alternatively Obvious In View Of Smith.....177

4. The ’374 Independent Claims ARE Obvious In View Of Ueda Combined With Smith 177

5. The ’374 Independent Claims are Obvious in view of ISDU, Ueda, or Smith combined with Butt.....178

6. The ’374 Dependent Claims and The Dependent Temperature Claim are Obvious over the Combination of Emma with ISDU, Ueda, or Smith (with An alternative additional combination with Butt). 179

XI. OPINIONS ON INVALIDITY OF THE ’876 Patent.....181

A. The prior art references teach all of the elements of the ’876 Challenged Claims 181

1. The ’876 Independent Claims (Claims 1 and 21).....181

2. The ’876 Dependent ClaimS (Claims 26 and 28).....193

B. Reasoning Supporting Opinions on Invalidity of the’876 Patent 197

1. The ’876 Challenged Claims are Obvious in view of Emma combined with ISDU.....197

2. The ’876 Challenged Claims are Obvious in view of Emma combined with SMith 202

3. The ’876 Challenged Claims are Obvious in view of Emma combined with Butt, and ALTERNATIVELY, with Butt and Smith.....206

XII. CONCLUSION.....213

EXHIBITS CONSIDERED[1]

Exhibit No.	Description
1001 ('206 petition)	U.S. Patent No. 9,791,206.
1001 ('374 petition)	U.S. Patent No. 10,495,374.
1001 ('876 petition)	U.S. Patent No. 11,274,876.
1002	RESERVED
1003 ('206 petition)	Prosecution File History, U.S. Patent No. 9,791,206.
1003 ('374 petition)	Prosecution File History, U.S. Patent No. 10,495,374.
1003 ('876 petition)	Prosecution File History, U.S. Patent No. 11,274,876.
1004	Original Intirion Complaint Filed on June 8, 2022.
1005	College Products Motion to Dismiss for Improper Venue filed on September 27, 2022.
1006	Order Transferring case to Iowa filed on April 10, 2023.
1007	Email Admitting that Petitioner has Compulsory Counter claims dated May 3, 2022.
1008	U.S. Application No. 14/262,290 ("the '290 Application"), published as U.S. Publication 2014/0251982.
1009 ('206 petition)	Exemplary embodiment Claim chart 9 sent by Intirion related to the 9,791,206 patent.
1009 ('374 petition)	Exemplary embodiment Claim chart 9 sent by Intirion related to the 10,495,374 patent.
1009 ('876 petition)	Exemplary embodiment Claim chart 1 sent by Intirion related to the 11,274,876 patent.
1010	Email where Patent Owner construes certain terms
1011	U.S. Application No. 12/317,632 ("the '632 Application") published as U.S Publication U.S. Pub. 2009/0188911 ("Emma")
1012	"ISDU: Integrated Smoke detector Unit for Commercial Microwave Ovens", Cory Lloyd *et. al*, Northeastern University (2007). ("ISDU")
1013	U.S. Patent No. 4,587,393 to Ueda ("Ueda")
1014	U.S. Patent No. 4,496,817 to Smith ("Smith")

[1] The three petitions have substantially overlapping exhibits and so only one chart is attached. The differences between them are noted below.

Exhibit No.	Description
1015	U.S. Patent No. 8,446,048 to Butt ("Butt")
1016	Redline Comparison between 290 and Emma
1017	Iowa DJ Complaint
1018	Consolidation Order
1019	Summons return of service, dated June 8, 2023

APPENDICES CONSIDERED

Appendix No.	Description
A	C.V of Dr. Mark N. Horenstein
B	"IRis: Digital Scholarship, Publishing, and Preservation at Northeastern University" ("IRis Brochure") describing the IRis publication.
C	The datasheet for the TGS 816 published in September 1999.
D	IRis at Northeastern University: Why, What, How" ("IRis Introduction") dated on November 18, 2005.
E	The ADEMCO 5806 installation instructions.

DECLARATION OF DR. MARK N. HORENSTEIN

I, Dr. Mark N. Horenstein, declare as follows:

[1]. I am over the age of 18 years and am fully competent to make this Declaration. I make the following statements based on personal knowledge and, if called to testify to them, could and would do so.

I. 'INTRODUCTION

[2]. I have been retained on behalf of College Products, Inc. ("Petitioner").

[3]. I have been asked to study and provide my opinions concerning: U.S. Patent No. 9,791,206 (the "'206 patent"), and the patentability of claims 9, 10, 11 and 12 of the '206 patent (the "'206 Challenged Claims"); U.S. Patent No. 10,495,374 (the "'374 patent"), and the patentability of claims 9, 10, 11, 15, 17, 18, 19, and 20 of the '374 patent (the "'374 Challenged Claims"); and U.S. Patent No. 11,274,876 (the "'876 patent"), and the patentability of claims 1, 21, 26, and 28 of the '876 patent (the "'876 Challenged Claims") (all together, the "Challenged Claims"). The opinions I offer here are made in view of certain prior-art references, the state of the art at the time of the claimed inventions, and the knowledge that a person of ordinary skill in the art would have had at the time of the claimed inventions. Together, the '206 patent, the '374 patent, and

the ’876 patent will be referred to herein as the “Challenged Patents.”

[4]. My opinions and views set forth in this Declaration are based on my education, training, and experience in the field of electrical engineering, sensors, and related technical areas, as well as Petitioner’s Exhibits 1001-1019, and other materials that are cited and discussed herein.

II. BACKGROUND & QUALIFICATIONS

[5]. My curriculum vitae (“vitae”) which includes a summary of my background, experience, publications, and expert-witness experience is included as Appendix A.

[6]. I am a Professor of Electrical Engineering (now Emeritus) in the Department of Electrical and Computer Engineering (ECE) at Boston University (BU) where I have been a faculty member since 1979. In addition to my primary academic appointment, I held various administrative positions at Boston University (BU), including the Associate Dean for Graduate Programs and Research for the College of Engineering (1999-2007), Associate Chair for Undergraduate Programs for the ECE Department (1990-1998 and 2012-2015), as well as appointments at the ranks of Associate Professor (1985-2000) and Assistant Professor (1979-1985).

[7]. I have a Ph.D. in Electrical Engineering from the Massachusetts

Institute of Technology (MIT) which I earned in 1978 while working in the Electric Power Systems Engineering Laboratory. I also hold an M.S. degree in Electrical Engineering from the University of California at Berkeley (1975), and an S.B. degree in Electrical Engineering from MIT (1973).

[8]. I am a Life Fellow of the Institute of Electrical and Electronic Engineers (IEEE) and have been a Registered Professional Engineer (Electrical) in the Commonwealth of Massachusetts. I hold certification from the National Association of Radio and Telecommunications Engineers.

[9]. I am the author of two textbooks: Microelectronic Circuits and Devices, 2nd Ed. (Prentice-Hall 1996) and Design Concepts for Engineers, 5th Ed. (Pearson Education, 2016). I have authored book chapters in two reference books related to electrical engineering. I have authored or co-authored over 70 journal articles on a variety of topics in my fields of expertise, and approximately 125 conference papers. I have advised various Ph.D. and M.S. students performing research in my fields of expertise; these students have gone on to hold positions in industry and academia.

[10]. The courses that I taught over the 40 years I spent as a regular faculty member at BU encompassed basic electrical circuits, analog and digital electronics, control circuits, power electronics, electric motors and machines,

microcontrollers, electromagnetics, radio and microwave communication, robotics, and engineering design. I was named "Teacher of the Year" in Engineering at Boston University four times.

[11]. I am a named inventor on five U.S. patents and one pending application. I have also provided technical expertise in the design and analysis of consumer and industrial electronic products, integrated circuits, power supplies, DC/DC converters, and electromagnetic devices.

[12]. I have extensive experience in the design, analysis, and testing of consumer electrical products, including power supplies, microcontroller-based systems, and control systems of all types. In support of my research in deformable mirror systems, I designed two different analog-multiplexed, high-voltage storage array systems. Similarly, as part of my work in developing self-cleaning solar panels, I designed switching power supplies that produce low-frequency, 3-phase, 1-kV outputs which in turn are powered by low-voltage DC/DC power converters. As part of my work overall in applied electromagnetics, I have designed DC power controllers for thermal management systems, power-amplifier circuits, and analog amplifiers. I also have designed and used transformers of all types, including ferromagnetic, ferrite, and air-core varieties. I have a practical knowledge of refrigeration and

microwave cooking appliances and have repaired several of such devices over the years. I have much practical experience in electrical wiring (e.g., 120 VAC and 240 VAC) for residential and commercial purposes and a good working knowledge of the National Electric Code. I am a licensed Extra Class radio operator.

[13]. At Boston University, I initiated and taught our department's course in power electronics which I first devised then improved over a period of nine years. In support of this activity, I designed circuits for laboratory experiments in power electronics, including buck and boost converters and controllers, H-bridge DC/AC switching converters, and DC to AC-grid interface circuitry. I also taught engineering electromagnetics with focus on microwaves and microwave systems.

[14]. I am an engineer by training and profession. The opinions I express in this Declaration involve the application of my engineering knowledge, expertise, and experience to the evaluation of the Challenged Claims in this matter.

[15]. I have previously testified as an expert witness. A list of those matters over the last five years is attached to this Declaration as part of Appendix A.

[16]. I am being compensated for services provided in this matter at a rate of $400 per hour. I am also being reimbursed for any reasonable expenses, such as travel expenses. My compensation is not contingent on my opinions, on the outcome of any aspects of this matter, or on any of the technical positions that I explain in this Declaration.

[17]. I have no financial interest in Petitioner, the Patent Owner (whom I understand to be Intirion Corporation), or the '206 Patent, the '374 patent, or the '876 patent.

III. BASES FOR OPINIONS EXPRESSED

[18]. The opinions set forth in this Declaration are my own. My opinions are based on my review of materials provided in this matter itemized in "Exhibits Considered" preceding this Declaration, the Appendices, in addition to those cited throughout this Declaration; my educational background; my experience working in the areas of electric appliances in general, including microwave ovens, refrigerators, and related control circuits; safety and fire hazards, and product design. I also rely on my experience as a technical consultant in providing expert testimony for numerous cases involving similar and/or related technology.

[19]. My analysis of the materials relating to this matter is ongoing, and I

will continue to review any new material that is provided to me. This Declaration represents certain opinions that I have formed to date and the bases for those opinions. I reserve the right to revise, supplement, and/or amend my opinions based on new information presented to me and on my continuing analysis of the materials cited throughout this Declaration and those identified in the "Exhibits Considered" list.

IV. UNDERSTANDING OF LEGAL STANDARDS

[20]. I am not an attorney or a legal expert and offer no opinion on the law. For the purpose of preparing this Declaration, I have been informed about certain aspects of the law that are relevant to my analysis and opinions, as set forth below.

A. PATENTABILITY

[21]. I understand that for an invention claimed in a patent to be valid and patentable, it must be, among other things, new and not obvious in light of what was known and came before it. That which was known or came before the claimed invention is generally referred to as "prior art."

[22]. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can be shown to "anticipate" the claim. Second, the prior art can show that the claim would have been "obvious" to a person of ordinary skill in the field of the invention at the time the

invention was made.

1. ANTICIPATION

[23]. It is my understanding that anticipation is a question of fact that is determined from the perspective of a person of ordinary skill in the art (a "POSITA") at the time of the claimed invention. I also understand that the standard for anticipation in an *inter partes* review proceeding is "by a preponderance of the evidence." My understanding of this burden of proof is that it requires that there be a greater than 50% chance that something is true. It is my further understanding that a claim is anticipated only if each and every element in the claim is found, expressly or inherently , in a single prior-art reference.

[24]. I understand that if a prior-art reference does not expressly set forth a particular claim element, the prior art may still anticipate a claim if that element is "inherent" in its disclosure. My understanding of the inherency standard is the evidence must make it clear that the missing descriptive matter is necessarily present in the thing described in the reference. It is my further understanding that inherency may not be established by probabilities or possibilities. In other words, the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.

[25]. I understand that if a claim recites alternatives, for example in the

format "selected from the group consisting of A, B, and C," or "at least one of", then anticipation of the entire claim limitation can be achieved through prior art that discloses just one alternative, for example, a prior art reference that simply discloses B.

[26]. I also have been advised that if a prior-art reference discloses one feature of a challenged claim, the reference can anticipate a claimed invention if the feature is described in another document that has been incorporated by reference into the patent of the challenged claim.

2. OBVIOUSNESS

[27]. It is my understanding that obviousness is a question of law with underlying factual inquiries that are determined from the perspective of a POSITA at the time of the claimed invention. I also understand that the standard for obviousness in an *inter partes* review proceeding is again "by a preponderance of the evidence".

[28]. It is my further understanding that a claimed invention is obvious if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious to a POSITA prior to the effective filing date of the claimed invention to which the claimed invention pertains. I understand that a POSITA is presumed to have knowledge of all relevant prior art.

[29]. It is my understanding that obviousness requires consideration of the following underlying factual inquiries:

- determining the scope and content of the prior art;
- ascertaining the differences between the claimed invention and the prior art;
- resolving the level of ordinary skill in the art; and
- evaluating any "objective evidence" or "secondary considerations" of non-obviousness, such as commercial success, long-felt but unresolved needs, failure of others, industry praise, and unexpected results.

[30]. I understand, however, that for such "objective evidence" or "secondary considerations" to be relevant to the obviousness of a claim, there must be a causal relationship (called a "nexus") between the claim and the evidence. I also understand that this nexus must be based on a novel element of the claim rather than on something in the prior art. I further understand that there are instances in which secondary considerations are unable to overcome primary evidence of obviousness (e.g., motivation to combine with predictable results) that is sufficiently strong.

[31]. It is my understanding that a reference must be analogous art to the claimed invention in order to be properly considered for use in an obviousness inquiry. It is my understanding that a reference is analogous art to the claimed invention if:

- the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or
- the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

[32]. It also is my understanding that a patent claim is not obvious merely by demonstrating that each of its elements was independently known in the prior art. An obviousness determination requires finding both that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so. It is my further understanding that it is important to be careful not to allow hindsight reconstruction of references to produce the claimed invention without any explanation as to how or why the references would have been combined by a of ordinary skill in the art to produce the claimed invention.

[33]. It is my understanding that the following are exemplary rationales for combining references that may support a conclusion of obviousness:

a) Combining prior-art elements according to known methods to yield predictable results;

b) Simple substitution of one known element for another to obtain predictable results;

c) Use of a known technique to improve a similar method or product in the same way;

d) Applying a known technique to a known method or product ready for improvement to yield predictable results;

e) "Obvious to try", i.e., choosing from a finite number of identified, predictable solutions with a reasonable expectation of success;

f) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art; and

g) Some teaching, suggestion, or motivation in the prior art or in the

POSITA's knowledge that would have led one of ordinary skill to modify the prior-art reference or to combine prior-art reference teachings to arrive at the claimed invention.

[34]. In addition to the above, it is my further understanding that a POSITA could have resorted to logic, judgment and common sense available to him or her at the time of the invention to find a claim feature obvious, even if the prior art relied on did not explicitly state or teach that feature. It is also my understanding that when common sense is relied on to find a feature obvious, the reasoning for that conclusion must be articulated with sufficient clarity.

[35]. It is my understanding that an element or term recited in a dependent claim must have a proper antecedent basis. In other words, the term must be defined in such a way that a person of ordinary skill in the art would have understood what that term is referencing.

B. PRIOR ART

[36]. I understand that for the purposes of this proceeding, prior art includes patents and printed publications appearing in or outside the United States before the effective filing date of the claimed invention. I also understand that prior art includes U.S. patents, published U.S. patent applications, and published international applications (pursuant to the Patent Cooperation Treaty) that themselves have an effective filing date before the

effective filing date of the claimed invention, as long as they name another inventor.

[37]. I have been instructed to assume in my analysis, that, for the purpose of determining what qualifies as "prior art", the effective filing date for each of the Challenged Claims ("Effective Filing Date") is April 25, 2014. In other words, I may consider as "prior art" any patents or publications that were publicly available prior to the Effective Filing Date, as well as any patent application filed in the United States before the invention. I further understand that for purposes of this proceeding before the United States Patent Trial and Appeal Board, only patents and other documents that have the legal status of a "printed publication" may be relied upon as prior art.

C. PERSON OF ORDINARY SKILL IN THE ART

[38]. I understand that a POSITA is not an actual, specific individual; rather, a POSITA is a hypothetical person who is presumed to have knowledge of all prior art in the relevant art at the time of the invention. The POSITA would have had the skills needed to take from each reference the information needed to understand and teach to an ordinary person the relevant subject matter.

[39]. I also understand that the factors considered in determining the level of skill of a POSITA include: (*i*) the levels of education and experience of

persons working in the field; (*ii*) the types of problems encountered in the field; (*iii*) prior art solutions to those problems; and (*iv*) the sophistication of the relevant technology.

[40]. I also understand that a POSITA would have been a person of ordinary creativity, not an automaton. Therefore, it is assumed that a POSITA would have applied common sense or have been able to modify or combine prior-art references together, and could also have found a teaching, suggestion, or motivation (whether to modify or combine) either in the references themselves, whether explicitly or implicitly, or in the POSITA's knowledge.

[41]. I understand that sometimes it will be necessary to look to interrelated teachings of multiple patents and publications; the effects of demands known to the relevant field or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art. I understand that all of these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

[42]. I understand that a POSITA may collaborate with one or more other persons of ordinary skill in the art for one or more aspects with which the other person may have superior expertise, experience, and/or knowledge.

In other words, a POSITA may work as part of a multi-disciplinary team and not only draw upon his or her own skill, but also take advantage of certain specialized skills of others in the team to solve a given problem.

D. CLAIM CONSTRUCTION

[43]. It is my understanding that claim construction, or the interpretation of the claims in the patent, is ultimately a question of law. It is my understanding that, in an *inter partes* review, the claim term is given its ordinary and customary meaning as would have been understood by a POSITA at the time of the claimed invention, in light of the specification and the prosecution history, as well as pertinent extrinsic evidence.

[44]. It is my understanding that the claims, the specification, and the prosecution history are referred to as "intrinsic evidence" and are to be read as a POSITA would have done at the time of the alleged invention.

[45]. In addition to the intrinsic evidence, it is my understanding that the court or tribunal may also consider other relevant evidence, called "extrinsic evidence," concerning relevant scientific principles, the meaning of technical terms, and the state of the art. Such evidence includes the testimony of expert witnesses. Although extrinsic evidence may be used to resolve ambiguities that may exist after reviewing the intrinsic evidence, I understand that extrinsic evidence cannot be used to contradict a claim construction that is clear from the

intrinsic evidence.

[46]. It is also my understanding that the ordinary and customary meaning of a term may be evidenced by a variety of sources, including the words of the claims themselves, the specification, the prosecution history, plus any extrinsic evidence that provides relevant scientific principles, the meaning of technical terms, and the state of the art.

[47]. I also understand that some claims are independent and are thus complete by themselves. Other claims that refer to such independent claims are deemed "dependent" on those independent claims. A dependent claim includes all of the limitations of the independent claims on which it depends.

V. TECHNICAL DISCUSSION OF THE FIELD AND LEVEL OF ORDINARY SKILL IN THE ART

A. FIELD OF THE CHALLENGED PATENTS

[48]. The specification of each of the Challenged Patents (collectively the "Challenged Patent Specifications") provides a statement of its field, namely: "improvements to appliances that include compact refrigerators and microwave oven functionality." See, e.g., '206 petition, Ex. 1001 ('206 patent) at 1:17-19. I believe that the field of endeavor as would have been understood by a POSITA would be the field of electrical kitchen appliances which would include refrigerators and cooking appliances, including the control circuits to enable

various functions in such appliances. For example, as stated in the Technical Field section of the '206 Patent: "Exemplary embodiments relate to improvements to appliances. Specifically, exemplary embodiments relate to improvements to appliances that include compact refrigerator and microwave oven functionality." ('206 Patent, Ex. 1001 at 1:15-20). Similarly, in both the Background and Summary sections, the '206 patent states: "Compact refrigerators and associated appliances may benefit from improvements." (*Id*. at 1:33-34). "In one exemplary embodiment, an apparatus is provided that includes a microwave oven." (*Id*. at 1:37-38).

B. LEVEL OF ORDINARY SKILL IN THE ART

[49]. I have been asked to provide my opinions regarding the knowledge and understanding that a hypothetical person of ordinary skill in the art (POSITA) would have had as of the Effective Filing Date of the Challenged Patents (i.e., April 25, 2014). As discussed below, it is my understanding that each of the Challenged Claims is entitled to an effective filing date no earlier than April 25, 2014. Accordingly, the analysis set forth herein is based on the timeframe of the alleged invention as of April 25, 2014.

[50]. It is my opinion, based on reviewing the '206 patent, that as of the Effective Filing Date a POSITA would have had at least a bachelor's degree in electrical engineering or computer engineering. Alternatively, a POSITA could

have had a bachelor's degree in mechanical engineering, industrial engineering, physics, or a related engineering or discipline, plus at least two years of experience working with control circuits, sensors, kitchen appliances, or similar fields.

[51]. I note that as of the Effective Filing Date, I qualified for or exceeded the level of ordinary skill required by the above definition. I am thus in a position to opine on the understanding that a person of ordinary skill in the art would have had as of the Effective Filing Date. My qualification to do so is based, at least and in part, on my education and experience in teaching electrical engineering at Boston University for over 40 years, on my studying of electrical engineering as a graduate student at the Massachusetts Institute of Technology (MIT) and the University of California at Berkeley for six years, and my studies as an undergraduate student at MIT for four years. When I address the understanding of a POSITA, I am referring to the understanding that such a person would have had as of the Effective Filing Date whether or not it specifically stated.

[52]. As stated above, I understand that in applying the obviousness test to a patent claim, it is proper to consider that a POSITA could have collaborated with one or more other persons of ordinary skill in the art for one or more

aspects with which the other POSITA may have had superior expertise, experience, and/or knowledge. This confluence might apply, for example, to a POSITA having knowledge of kitchen appliances with one having expertise in control circuits.

VI. THE CHALLENGED PATENTS

[53]. The technology of the Challenged Patents relates to microwave ovens and microwave oven - refrigerator combinations with a smoke sensor. The Challenged Patents relate to microwave ovens and microwave - refrigerator combinations in which the control functions and power supply outputs are coordinated by a control circuit.

A. EFFECTIVE FILING DATE FOR EACH OF THE CHALLENGED PATENTS IS NO EARLIER THAN APRIL 25, 2014

[54]. Each of the Challenged Patents claims priority as a continuation-in-part ("CIP") application (either directly or indirectly) to U.S. Application No. 14/262,290 ("the '290 Application"), which was filed on April 25, 2014, and published as U.S. Pub. 2014/0251982. Ex. 1008. The '290 Application claims priority as a CIP to U.S. Application No. 12/317,632 ("the '632 Application"), which was filed on December 23, 2008 and published as U.S. Pub. 2009/0188911 ("Emma"). Ex. 1011.

[55]. As shown in ¶¶[69, 78 and 84] below, each of the Challenged

Claims generally contains the following basic elements: Microwave Oven, Control Circuit, Power Supply Outlet, and a Smoke Sensor, where the Smoke Sensor is configured to (*i*) supply a Shutdown Function to the microwave oven, and (*ii*[2][OBJ]. Although there are some variations in the Challenged Claims amongst the Challenged Patents, each of the Challenged Claims requires an implementation of a smoke sensor to shut down a microwave. As shown in a redline comparison of Emma and the '290 Application at ¶[0055], a Smoke Sensor was first mentioned in the '290 Application. *See* Ex. 1016 and Ex. 1011 at ¶[0055]. In my opinion, a smoke sensor was not disclosed in Emma. Because of this lack of smoke-sensor disclosure, it is my understanding that each of the Challenged Claims cannot claim priority to Emma. Thus, my understanding is the earliest possible priority date for the Challenged Claims is the filing date of the '290 Application, namely April 25, 2014.

[56]. For purposes of this Declaration, I thus assume that April 25, 2014 is the earliest priority date of the '206 Patent. However, I offer no opinion as to whether the Challenged Claims are actually entitled to that priority date or are enabled by the '290 Application.

A. TECHNOLOGY BACKGROUND

[2] These elements are described in detail later in this Declaration. Capitalized terms are defined below, for example in ¶[68-71].

[57]. In the time frame of the Effective Filing Date, electrical cooking appliances were generally known to function by converting electricity into heat. Electricity is converted to heat in such appliances using one of several methods. For example, electricity can be passed through a resistive heating element to create heat in an electric oven or range, or likewise through resistive heating elements on a stove top to generate heat. The heat so generated is then transferred to a pot, pan, Pyrex™ bowl, or other cooking dish via conduction, convection, or a combination of both to heat food contained within. Such electrical heating elements are based on Ohm's law of electricity which states that the heat generated by a resistive element will increase as the square of the current (in amperes) passing through the element. As a POSITA would have known, this heating is governed by the widely known Ohm's law which leads to the relationship Power = $(\text{Current})^2 \times (\text{Resistance})$ [3], where the resistance is the ohmage of the heating element, and the power is dissipated into heat needed to heat up or cook the food.

[58]. Cooking is thus regulated by controlling the amount of electricity that flows, averaged over time, through the resistive heating element. This average power determines the amount of heat generated by the resistive heating

[3] In the parlance of electrical engineering, this formula is commonly written simply as $P = I^2R$, where P=power, I=current, and R=resistance.

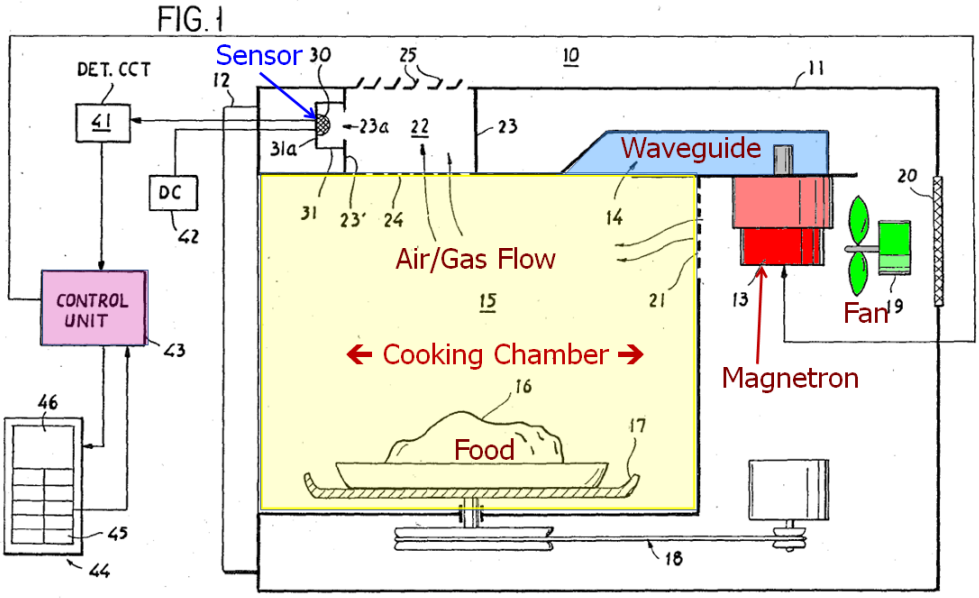
element. In a practical appliance, the average electrical power may be controlled, for example, by cycling the electricity supply on and off to control the current flowing through the resistive heating element. In a typical oven, this on/off cycling is accomplished using a thermostat. Note that many stovetop heating coils are simply powered at a predetermined power level but are not controlled by a thermostat.

[59]. Another electrical cooking method is based on microwave power as produced inside a microwave oven. In a microwave oven, energy is transferred to the food via a high-power, high-frequency radio wave, (generally at frequencies on the order of 3 GHz). These microwaves are produced by a "magnetron" inside the microwave that converts conventional electricity (e.g., 120 V, 60 Hz) into microwaves which are then directed toward the cooking cavity by a waveguide [4]. Note that the magnetron is generally positioned outside the cooking cavity and protected from food vapors and particles by a thin window of mica or other pyroceramic material which isolates the magnetron but allows its microwaves to proceed into the cavity. The microwaves are then absorbed by water molecules in food placed inside the cooking cavity, causing these molecules to "vibrate" on an atomic scale. This

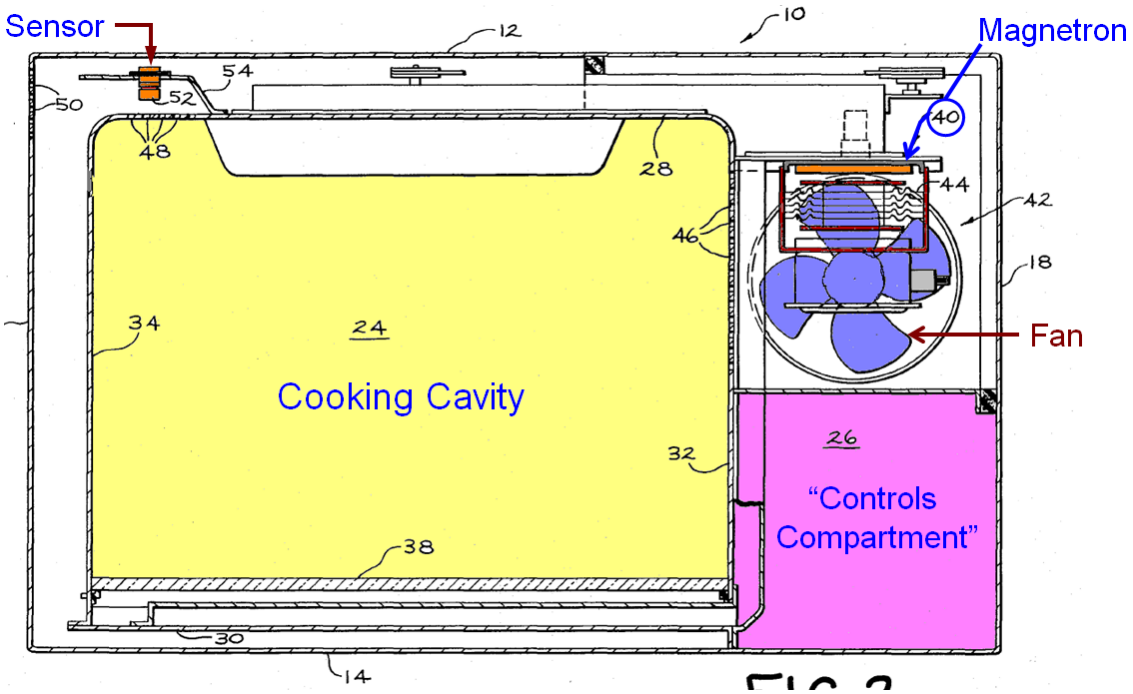
[4] A microwave "waveguide" is a hollow rectangular or round pipe that contains and directs the *rf* radiation.

microwave-induced vibration creates molecular friction within the food that dissipates into heat within the food, resulting in a rise in food temperature. Cooking in a microwave oven is regulated by cycling the electrical supply to the magnetron on and off.

[60]. Microwave cooking cavities have always been, and still are, designed to fully contain the microwaves, because allowing microwaves to escape would have detrimental effects on both nearby electronics and human tissue. Microwave-oven cooking cavities are designed, however, to allow moisture and cooking fumes to escape. These features are exemplified, for example, in Fig. 1 and Fig. 2 from prior-art references Ueda and Smith, respectively. Ex. 1013 at Fig. 1; Ex. 1014 at Fig. 2. (These references are discussed in more detail later):

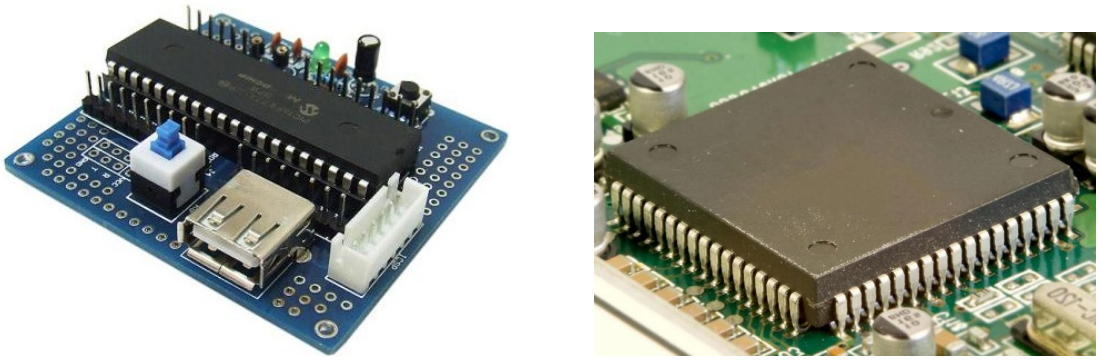


Ex. 1013 at Fig. 1. (annotated).



Ex. 1014 at Fig. 2 (annotated).

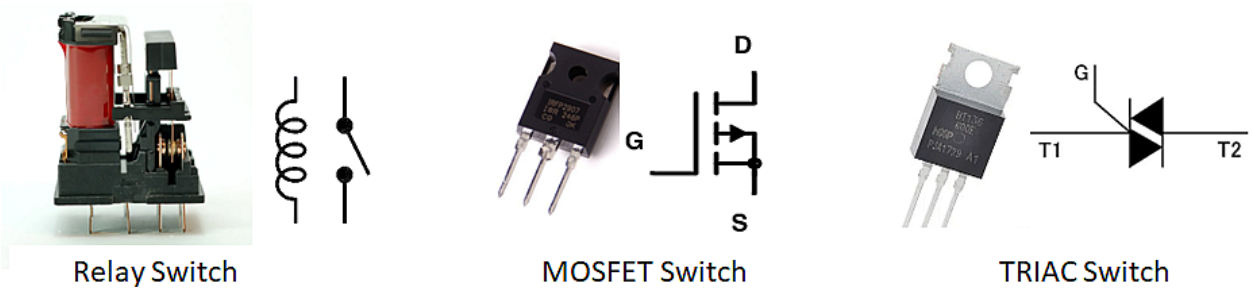
[61]. As a POSITA would have understood, power cycling of a microwave magnetron or resistive heating element as used in electrical cooking appliances can be accomplished through the use of electronic switches controlled by a microcontroller. A microcontroller is a multi-pin semiconductor component, or "chip", that is programmed with designer-specified software logic. A programmed microcontroller can respond, for example, to user inputs, temperature measurements, timing responses, and sensor signals via its array of input/output pins.



Typical multi-pin microcontroller chips on circuit boards

[62]. The electrical switches used in kitchen appliances are able to switch higher voltages at higher currents compared to the microcontroller itself, but the on/off states of such switches are easily controlled using the low voltage, low-

power digital outputs of the microcontroller. Examples of such electrical switches include electromechanical relays that operate via low-power magnetic coils, and solid-state switches that comprise semiconductor switches such as MOSFETS (metal-oxide-semiconductor field-effect transistors), BJTs (bipolar-junction transistors), and TRIACs (triodes for alternating current). The on/off state of each of these latter devices is again controlled via low voltage, low-power digital signals from a microcontroller.



Examples of switches used in kitchen appliances

.

[63]. For example, Fig. 4 from prior-art reference Smith (Ex. 1014, to be discussed in more detail later), reproduced below, shows microcontroller 64 digitally communicating with TRIAC 144 for on/off switching of air circulating blower motor 67, power control relay 68 for de-energizing the magnetron line voltage L1, and TRIAC 140 for power cycling the magnetron vi neutral line N.

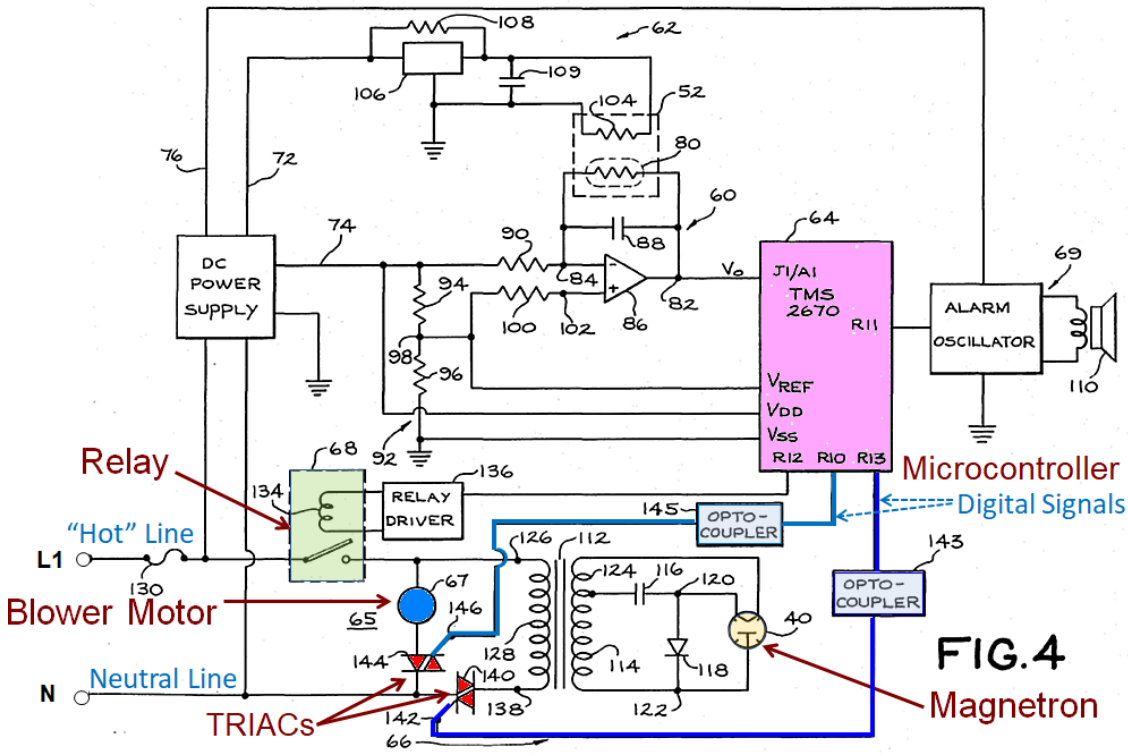
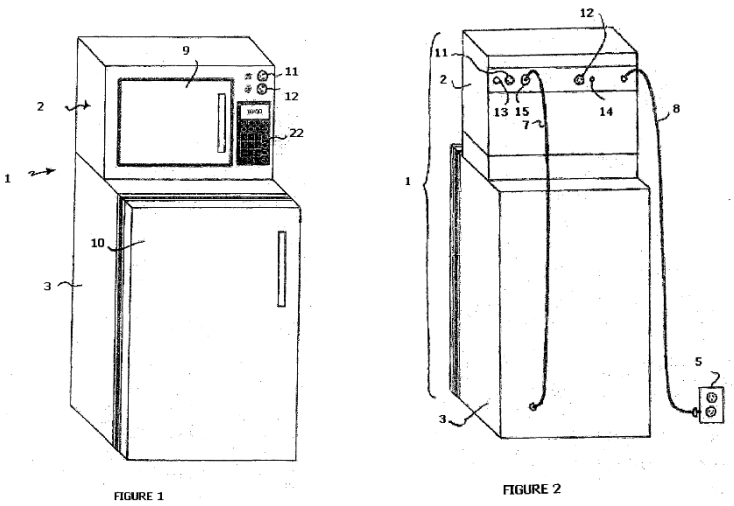


FIG. 4

Ex. 1014 at Fig. 4 (annotated).

B. THE SPECIFICATIONS OF THE CHALLENGED PATENTS

[64]. Each of the Challenged Patents is directed to a microwave oven and refrigerator combination that includes a smoke sensor. As discussed below in ¶[54], Emma, a parent patent and prior art to each of the Challenged Patents, discloses a microwave oven and refrigerator combination, as shown in Figures 1 and 2 below, with auxiliary power receptacles and an electrical control scheme to prevent the combination from overloading.



Ex. 1011 at Figs. 1 and 2.

[65]. Emma generally describes a system where power to the refrigerator and auxiliary receptacle is cut off when the microwave is turned on. When the microwave is turned off, power is restored to those components. Emma states that: "a combination microwave and refrigerator system is constructed having a single plug input supply. The microwave oven is adapted to provide power to a refrigerator, and to auxiliary receptacles … a microprocessor controller adapted to monitor operation of the refrigerator compressor and controls the power to the microwave magnetron and other components." Ex. 1011 at [0008]. Emma further explains that as part of the device's electrical control scheme, power to both the refrigerator compressor and the auxiliary power receptacles is disabled when the microwave demands cooking power: "When power to the microwave is demanded, the [refrigerator] compressor is disabled for a preset minimum

period. When microwave demand ceases, refrigerator power is restored…The control model is adapted to disable the power to the auxiliary receptacles, if the microwave is in operation." Ex. 1011 at [0011-12].

[66]. An example of a control circuit is provided in Emma Fig. 4. This figure shows a microcontroller 4 that is electrically controlling relays 19 and 20 for the purpose of cycling power to refrigerator receptacle 15 and auxiliary outlets 11 and 12:

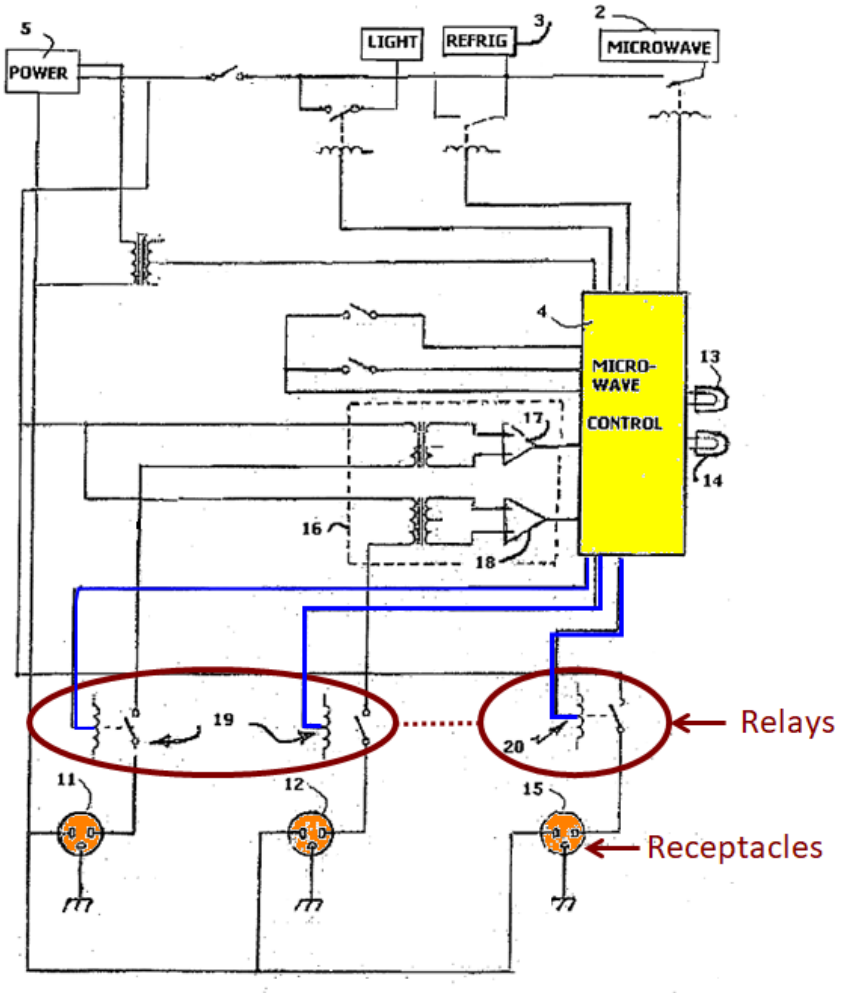


FIGURE 4

Ex. 1011 at Fig. 4, (annotated).

[67]. Each of the Challenged Patent disclosures includes the same microwave-refrigerator combination as does Emma but adds a smoke sensor that can send a signal to the control circuit to shut down the microwave oven if smoke is detected. The control circuit can then reenable the microwave after smoke is no longer present. "[A] safety sensor… such as a smoke or gas sensor may be provided in the microwave oven 2. The smoke sensor 226 operates to turn off the microwave oven upon sensing smoke or polluted air indicative of a potentially dangerous condition…" '206 petition Ex. 1001 ('206 patent) at 9:26-30. "The alcohol/[smoke] sensor 226 may be reset automatically responsive to the alcohol sensor 226 no longer detecting gas indicative of the dangerous condition." *Id.* at 10:29-33.

C. THE '206 PATENT

1. THE CHALLENGED CLAIMS OF THE '206 PATENT

[68]. The '206 patent has 12 claims, including independent claims 1, 9, and 11. '206 petition Ex. 1001 ('206 patent). Only independent claims 9 and 11 (the "'206 Independent Claims") are being challenged in the IPR petition, along with some of their dependent claims.

[69]. As further explained below, the '206 Independent Claims generally contain the basic elements of a Microwave Oven, a Control Circuit, a Power

Supply Outlet, and a Smoke Sensor, where the smoke sensor is configured to supply a Shutdown Function to the microwave upon the detection of smoke and is configured to provide a Reset Enable Function so that the microwave oven may be returned to a state where it can further deliver cooking power. '206 petition Ex. 1001 ('206 patent) at claims 9 and 11. Claim 9 is representative of the '206 Independent Claims.

Claim 9:

"**Microwave Oven**"[5]: An apparatus comprising: a microwave oven configured to be connected to a source of electrical power and having

"**Control Circuit**": a control circuit, wherein the control circuit is configured to control operation of the microwave oven;

Smoke Sensor a smoke sensor, wherein the smoke sensor is positioned in the microwave oven, and is in operative connection with the control circuit,

"**Shutdown Function**": wherein the smoke sensor is configured to cause cooking power to the microwave oven to be withdrawn prior to a set end time of a current cooking session upon the smoke sensor sensing smoke indicative of a dangerous condition;

[5] Prefixes, such "'206", "'374", or "'876" may be included with claim term elements as needed to distinguish between similarly named claim elements, but will be omitted for clarity when referring to a single patent.

"**Reset Enable Function**": and wherein the smoke sensor is configured to be reset after ending the current cooking session prior to the set end time based on sensing the smoke indicative of the dangerous condition, to enable the microwave oven to deliver cooking power in a next subsequent cooking session responsive at least in part to the smoke sensor no longer sensing the smoke indicative of the dangerous condition.
'206 petition Ex. 1001 ('206 patent) at claim 9.

[70]. Claims 10 and 12 include the dependent claims of the Challenged Claims (the "'206 Dependent Claims"). These claims generally add the basic elements of a power supply outlet on the microwave ("auxiliary outlet) designed to power the refrigerator in lieu of the latter being plugged directly into a wall socket, and a control circuit that turns off power to the auxiliary outlet when the microwave oven draws cooking power. '206 petition Ex 1001 ('206 patent) at claims 10 and 12. Claim 10 is representative of the '206 Dependent Claims:

[71]. Claim 10

"**Power Supply Outlet**": The apparatus according to claim 9 and further comprising: a power supply outlet on the microwave oven, wherein the power supply outlet is in operative connection with the control circuit,

"**Refrigerator**": a refrigerator, wherein the refrigerator is electrically connected with the power supply outlet,

"**Withdraw and Deliver Electrical Power**": wherein the control circuit is operative to withdraw electrical power from the refrigerator when the microwave oven draws cooking power, deliver electrical power to the refrigerator when the microwave oven does not draw cooking power.

Id. at claim 10.

[72]. All the '206 Challenged Claims, respectively, contain these same structural limitations, although they may be worded slightly differently or contain additional limitations. Independent claim 11, for example, recites: "…wherein the smoke sensor is positioned in [an] interior area" and "the smoke sensor sensing at least one change in an amount of smoke sensed by the smoke sensor". '206 petition Ex. 1001 ('206 patent) at claim 11. Dependent claim 12 recites that the refrigerator include a compressor which is disconnected from electrical power in the [Withdraw and Deliver Electrical Power] element. *Id.* at claim 12. These distinctions do not substantively change my conclusions regarding the invalidity of the claims.

2. THE PROSECUTION HISTORY OF THE '206 PATENT

[73]. The application for the '206 Patent was filed on April 22, 2016. '206 petition Ex. 1003 ('206 prosecution file history) at 1. It included 17 claims.

Id. At 39-47. In the following discussion, the as-filed claim numbers are referenced first, followed by their as-issued claim numbers in brackets (if applicable).

[74]. The Examiner issued a non-final rejection on March 2, 2017. '206 petition Ex. 1003 ('206 prosecution file history) at 174-91. The Examiner rejected original claims 1, 5-7, 18, and 19 as being unpatentable over U.S. Patent No. 5,521,359 to Bone in view of Japanese Patent No. 5-240447 to Ando, because Bone discloses a microwave-refrigerator combination where power is selectively delivered to the microwave and refrigerator, and Ando discloses using sensors in a microwave to sense smoke and disable the microwave if the smoke has reached a threshold level. *Id.* at 177-80.

[75]. The applicant filed a response to the rejection on May 16, 2017, where they amended the claims and added new claims 21[9], 22[10], 23[11], and 24[12]. *Id.* at 213-225. The amendments and new claims added the requirement that after the smoke sensor disables the microwave, the smoke sensor can be reset so that the microwave can be supplied with power in a next subsequent cooking session. *Id.* The applicant argued that the amended claims should be allowed because they included subject matter that was found allowable over the same prior art in co-pending and related application No.

15/135,883 ("the '883 Application"). *Id.* at 226-227. In the co-pending '883 Application, the Examiner allowed the claims over Bone and Ando because, *inter alia*, the prior art does not teach that the smoke sensor is configured to be reset to enable the microwave oven to deliver cooking power in a next subsequent cooking session *responsive at least in part to the smoke sensor no longer sensing a dangerous condition*. *Id* at 243-244.

[76]. The Examiner issued a notice of allowability on August 21, 2017. '206 petition Ex. 1003 ('206 prosecution file history) at 238-240. The Examiner stated in his reasons for allowance that the prior art does not show or fairly suggest the limitations of the claims incorporated with resetting the smoke sensor or logic circuitry to enable cooking power in a next cooking cycle "*responsive at least in part to the smoke sensor no longer sensing the dangerous condition*." *Id.* at 243-244 (emphasis added).

D. THE '374 PATENT

1. THE CHALLENGED CLAIMS OF THE '374 PATENT

[77]. The '374 patent has 20 claims, with claims 1, 9, and 17 being independent. '374 petition, Ex. 1001 ('374 patent) at claims 1-20. Only independent claims 9 and 17 (the "'374 Independent Claims") are part of the Challenged Claims. Only dependent claims 10, 11, 18, 19 and 20 (the '374 Dependent Claims") and dependent claim 15 (the "'374 Dependent

Temperature Claim") are part of the Challenged Claims.

[78]. Claims 9, 10, 11, 15, 17, 18, 19, and 20 of the Challenged '374 claims contain the same basic elements of the Microwave Oven, Control Circuit, Smoke Sensor, Shutdown Function, Reset Enable Function, Power Supply Outlet, Refrigerator, and Withdraw and Deliver Electrical Power function described above with respect to the '206 Patent. *Id.* at claims 9 and 17. To the extent there are differences, they are discussed below.

[79]. The '374 Smoke Sensor of claims 9 and 17 differs from the '206 Smoke Sensor in that the '374 Smoke Sensor recites a different position limitation, for example, "is positioned in an air passage that extends between a cooking area inside the microwave oven and air outside the microwave oven." '374 petition Ex. 1001('374 patent) at claim 9.

> "'**374 Smoke Sensor**" or "**Smoke Sensor**"[6]: a smoke sensor, wherein the smoke sensor is positioned in an air passage that extends between a cooking area inside the microwave oven and air outside the microwave oven, wherein the smoke sensor is in operative connection with the control circuit.

[6] As noted previously, the prefix "'374" may be omitted when referring solely to the '374 Patent and its meaning is evident.

Id.

[80]. Dependent claims 11 and 19 add a further limitation to the type of smoke sensor used. Claim 11 is representative:

> The apparatus according to claim 10
>
> **"VOC Sensor":** wherein the smoke sensor includes at least one of a photosensor, a motion sensor, an ionization sensor, a VOC sensor, a sensor including a radiation emitter and a radiation receiver.

'374 petition Ex. 1001 ('374 patent) at claim 10.

[81]. Dependent claim 15 adds a further limitation combining the smoke sensor shutdown condition with a temperature sensor shutdown condition:

> The apparatus according to claim 10 and further including:
>
> **"Temperature Sensor":** a temperature sensor, wherein the temperature sensor is operative to sense a temperature corresponding to temperature in the cooking area, wherein the temperature sensor is in operative connection with the smoke sensor, wherein the control circuit is operative to cause cooking power to the microwave oven to be withdrawn prior to the set end time of the current cooking session, responsive to the smoke sensor sensing smoke indicative of the dangerous condition and the temperature being sensed above a temperature level during the cooking session.

'374 petition Ex. 1001 ('374 patent) at claim 15.

[82]. Dependent claims 20 further adds:

> The apparatus according to claim 18,
>
> "**Auxiliary Output Device**": wherein the microwave oven further includes at least one output device including at least one of a USB port, an inductance charging pad, an auxiliary electrical outlet, wherein the at least one output device is in operative connection with the control circuit, and wherein the control circuit is operative to cause the at least one output device to be inoperative when the microwave oven demands cooking power.

'374 petition Ex. 1001 ('374 patent) at claim 20.

2. THE PROSECUTION HISTORY OF THE '374 PATENT

The application for the '374 Patent was filed on April 22, 2016 and included 20 claims. '374 petition Ex. 1003 ('374 prosecution history) at 44-57. The Examiner did not issue any rejections and issued a notice of allowance on July 23, 2019. '374 petition Ex. 1003 ('374 prosecution history) at 102-110.

E. THE '876 PATENT

1. THE CHALLENGED CLAIMS OF THE '876 PATENT

[83]. The '876 patent has 28 claims, with claims 1 and 21 being independent and part of the Challenged Claims (the "'876 Independent Claims"). Only dependent claims 26 and 28 are part of the Challenged Claims (the "'876 Dependent Claims").

[84]. Claims 1 and 21 of the Challenged '876 claims contain the same

basic elements of the Microwave Oven, Control Circuit, Smoke Sensor, Shutdown Function, Reset Enable Function, Power Supply Outlet, Refrigerator, and Withdraw and Deliver Electrical Power function described above with respect to the '206 Patent and '374 Patent. To the extent there are differences, they are discussed in the sections below.

[85]. The '876 Microwave oven limitation of Claim 21 differs from that of the '206 and '374 in that '876 Microwave oven recites an added limitation, for example, "an appliance including…a microwave oven, wherein the microwave oven…includes an interior cooking area." '876 petition Ex. 1001('876 patent) at claim 21:

> "'**876 Microwave oven**" or "**Microwave oven**"[7]: "an appliance including…a microwave oven, wherein the microwave oven…includes an interior cooking area." *Id.*:

[86]. The '876 Refrigerator of Claim 21 differs from that of the '206 and '374 in that the '876 refrigerator recites an added limitation, for example, "wherein the refrigerator includes a plurality of electrically powered refrigerator components…" '876 petition Ex. 1001('876 patent) at claim 21.

[7] As noted previously, the prefix "'876" may be omitted when referring solely to the '876 Patent and its meaning is evident.

"'**876 Refrigerator**" or "**Refrigerator**": "wherein the refrigerator includes a plurality of electrically powered refrigerator components…" *Id.*

[87]. The '876 Smoke Sensor of claims 1 and 21 differs from that of the '206 and '374 Smoke Sensor in that the '876 Smoke Sensor recites a different position limitation, for example, "wherein the smoke sensor is positioned in operative connection with a cooking area inside the microwave oven." '876 petition Ex. 1001('876 patent) at claim 1.:

"'**876 Smoke Sensor**" or "**Smoke Sensor**": "a smoke sensor, wherein the smoke sensor is positioned in operative connection with a cooking area inside the microwave oven, is in operative connection with the at least one power control circuit." *Id.*

[88]. Dependent claim 28 adds a further limitation to the type of smoke sensor used.

The apparatus according to claim 21

"'876 VOC Sensor" "VOC Sensor": wherein the smoke sensor includes at least one of a radiation emitter and radiation receiver, a photosensor, a motion sensor, an ionization sensor, and a VOC sensor.

'876 petition Ex. 1001 ('876 patent) at claim 28.

2. THE PROSECUTION HISTORY OF THE '876 PATENT

[89]. The application for the'876 Patent was filed on November 1, 2019. '876 petition Ex. 1003 ('876 prosecution history). It included 28 claims. *Id.* In the following discussion, the as-filed claim numbers are referenced first, followed by their as-issued claim numbers in brackets (if applicable).

[90]. The Examiner issued a non-final rejection on July 7, 2021. The Examiner rejected original claims 1, 21 and 28 as being unpatentable over U.S. Patent No. 5,521,359 to Bone in view of Japanese Patent No. 5-240447 to Ando, because Bone discloses a microwave-refrigerator combination where power is selectively delivered to the microwave and refrigerator, and Ando discloses using sensors in a microwave to sense smoke and disable the microwave if the smoke has reached a threshold level. *Id.* at 135-37.

[91]. The applicant filed a response to the rejection on July 28, 2021. The applicant argued the originally filed claims should be allowed because Ando does not teach "at least one control circuit is operative to reset and enable the microwave oven to receive cooking power in a next subsequent cooking session...The fact that Ando detects the inside of his microwave has caught fire which may have damaged the device, makes clear that Ando has no reason to reset the safety circuit so that the microwave can be operated again. This is particularly true as a fire may have caused damage to the microwave oven

which could result in the release of radiation or other undesirable and potentially harmful conditions." '876 petition Ex. 1003 ('876 prosecution history) at 202.

[92]. The Examiner issued a notice of allowability on November 9, 2021. *Id.* at 238. The Examiner stated in his reasons for allowance that he found the arguments over the prior art to be persuasive. *Id.* at 244

VII. STATE OF THE ART

[93]. I understand that Petitioner has asserted five prior-art references in its challenge of the Challenged Claims:

- U.S. Publication No. 2009/0188911A1 to Emma ("Emma") Ex. 1011.
- C. Lloyd *et al*, "ISDU: Integrated Smoke Detector Unit for Commercial Microwave Ovens", Electrical and Computer Engineering Undergraduate Capstone Projects, Paper 7, Northeastern University, April 17, 2007. ("ISDU") Ex. 1012
- U.S. Patent No. 4,587,393 to Ueda ("Ueda") Ex. 1013;
- U.S. Patent No. 4,496,817 to Smith ("Smith") Ex. 1014; and
- U.S. Patent No. 8,446,048 to Butt ("Butt") Ex. 1015.

[94]. As I have previously stated, I understand that in order for a reference to be considered when determining the obviousness of a claimed

invention, the reference must be "analogous" prior art. That is, the reference must be: (a) from the same field of endeavor as the claimed invention; or (b) reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

[95]. Each of the references in the above list is from same field of endeavor, namely each pertains to the field of electrical cooking appliances. Thus, in my opinion, each qualifies as analogous prior art. Additionally, it is my opinion that each of these references is reasonably pertinent to the problem faced by the inventor, namely the problem of preventing fires by shutting down a microwave upon detection of an unwanted condition in the appliance. This is because each reference relates to the addition of a smoke or gas sensor to an electrical cooking appliance and the use of such a sensor to shut down the appliance as a means to prevent overcooking and/or prevent a fire from accelerating (e.g., ISDU, Ueda, Smith, and Butt), or relates to using logic circuitry in a microwave-refrigerator combination to shut power to the microwave when the refrigerator is in use (e.g., Emma).

A. SUMMARY OF THE PRIOR ART REFERENCES

1. ISDU

[96]. *ISDU: Integrated Smoke Detector Unit for Commercial Microwave Ovens,* Cory Lloyd et al, Northeastern University which was published on April

17, 2007 ("ISDU"). ISDU indicates its date of publication as April 17, 2007 and indicates on its face that it was published on "IRis." I conducted a basic Internet search for information on the IRis system and concluded that IRis was a precursor to Northeastern University's more current Digital Repository Service. I further located and reviewed a brochure entitled "IRis: Digital Scholarship, Publishing, and Preservation at Northeastern University" ("IRis Brochure") (enclosed as Appendix B[8]) describing the IRis publication repository as a "digital archive" for publishing the work of Northeastern University researchers who want to "promote and preserve their intellectual output." IRis Brochure pg. 1. The IRis Brochure also indicates that it: "Allows others to quickly find, use, and cite your work"; that "Content is indexed by Google and readily accessible worldwide"; and that IRis "Showcases your scholarship to other researchers, funding sources, potential collaborators, and others." *Id*. The IRis Brochure indicates that in February of 2010, the IRis database was accessed from a number of different countries noting that "64% of IRis visits came via Google." *Id*., pg. 3. Importantly, the IRis Brochure states the following about the university's open-access journal available at the time on IRis: "NU's flagship open-access journal has been operating in IRis since

[8] Also available at https://repository.library.neu.edu/downloads/neu:377050

2006!" *Id*., pg. 2, (emphasis added). This date (2006) precedes the publication date of ISDU (2007). This excerpt from the IRis Brochure also confirms that ISDU was published in open access format -- that is, publicly available.

[97]. An additional reference, "IRis at Northeastern University: Why, What, How" (IRis Introduction) is dated on November 18, 2005. [9] This publication explains that IRis will be used for, among other things, "papers, honors projects, theses, and dissertations" which would include the ISDU senior project.

[98]. Given all of the above, it is my opinion that ISDU was a printed publication or was otherwise available to the public before the Effective Filing Date of April 25, 2014 and is thus prior art to the Challenged Patents.

[99]. ISDU discloses, among other things, that "smoke detection devices be integrated into range ovens and microwaves... when smoke is detected during microwave operation, the device will temporarily disable microwave operation and let the user know that the food has begun to smoke or even burn." Ex 1012 at Page 1. Figure 4 from ISDU, showing its "interior microwave

[9] This document is available at r*epository.library.northeastern.edu/files/neu:377039,* and Attached here as Appendix D

compartment" (i.e., the cooking chamber), smoke detector, vent fan, and control circuit, is reproduced below (annotated to clarify hard-to-read notations in original):

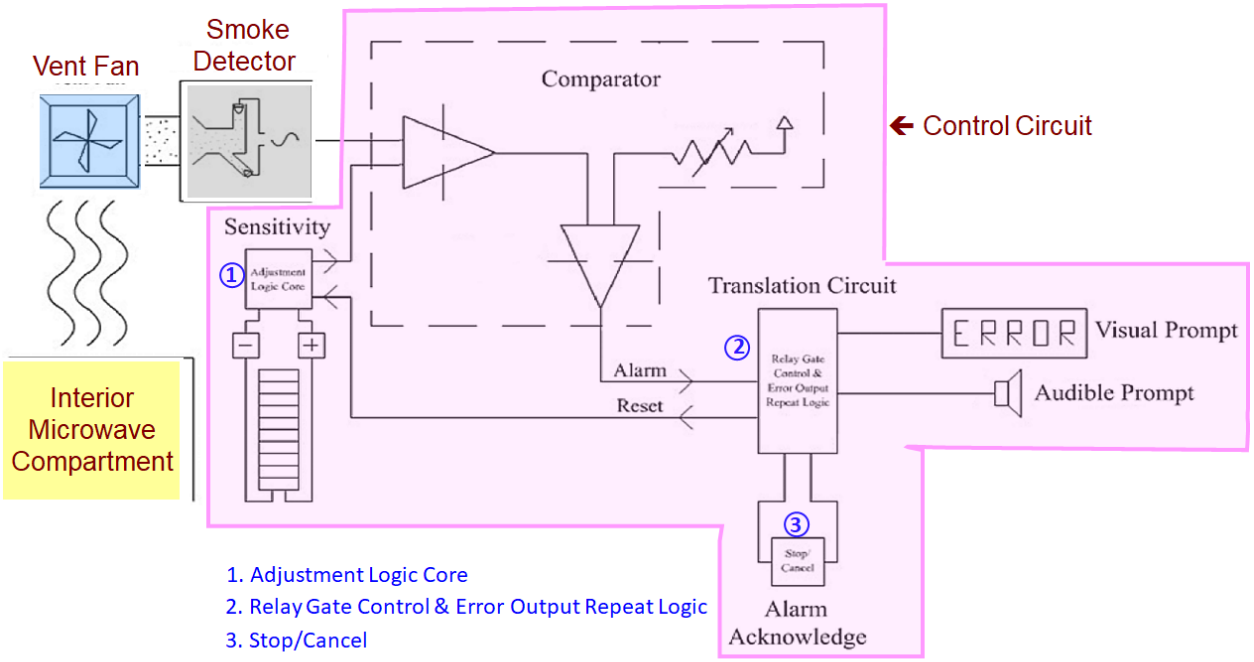


Figure 4

Id. at Fig. 4 (annotated).

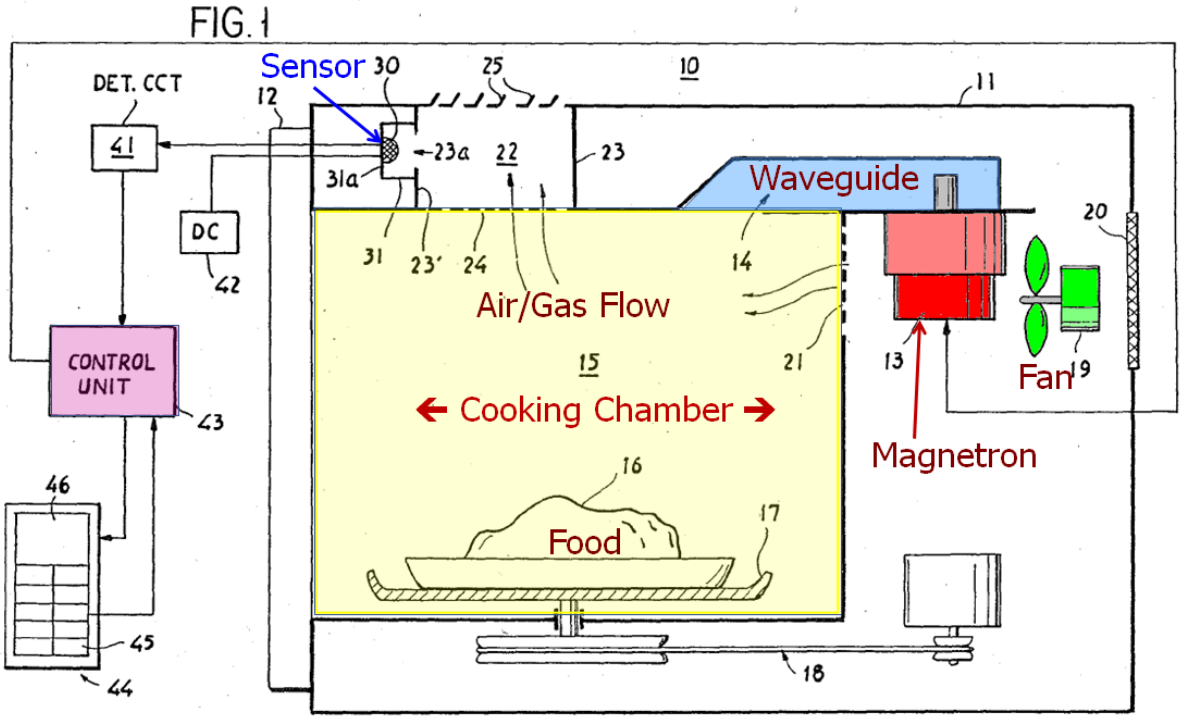
[100]. ISDU discloses the following: "Once smoke is detected, we will send a signal that lets a circuit interrupt the power to the microwave through the use of a 'soft' power-off function already in use by the microwave logic. This will stop the microwave while simultaneously sounding an alarm. After the alert, the user will be able to reset the microwave, change its sensitivity, or stop microwaving." *Id.* at Page 6. "Acknowledgement of the alarm state will

reinstate all normal microwave functions and reset the smoke detector circuit for further use." *Id.* at 9.

2. **UEDA**

[101]. U.S. Patent No. 4,587,393 ("Ueda") (Ex. 1013) is entitled "Heating apparatus having a sensor for terminating operation". Ueda issued on May 6, 1986. Based on its date of publication, Ueda is prior art to the Challenged Patents.

[102]. As shown in Fig. 1, reproduced below, Ueda discloses a microwave oven having a duct 22 for exhausting air from within the cooking chamber 15 through perforation 24 and overlapping slats 25. "The size of perforations 24 and the slits is such that microwave energy does not leak out . . . while permitting a sufficient amount of smoke to escape through them." *Id.* at 2:14-20. A sensor 30 is mounted within an enclosure 31 and "detects the diffusing substance to de-energize the heater when the sensor develops a voltage indicating a predetermined condition of the heated material." *Id.* at 1:38-43.



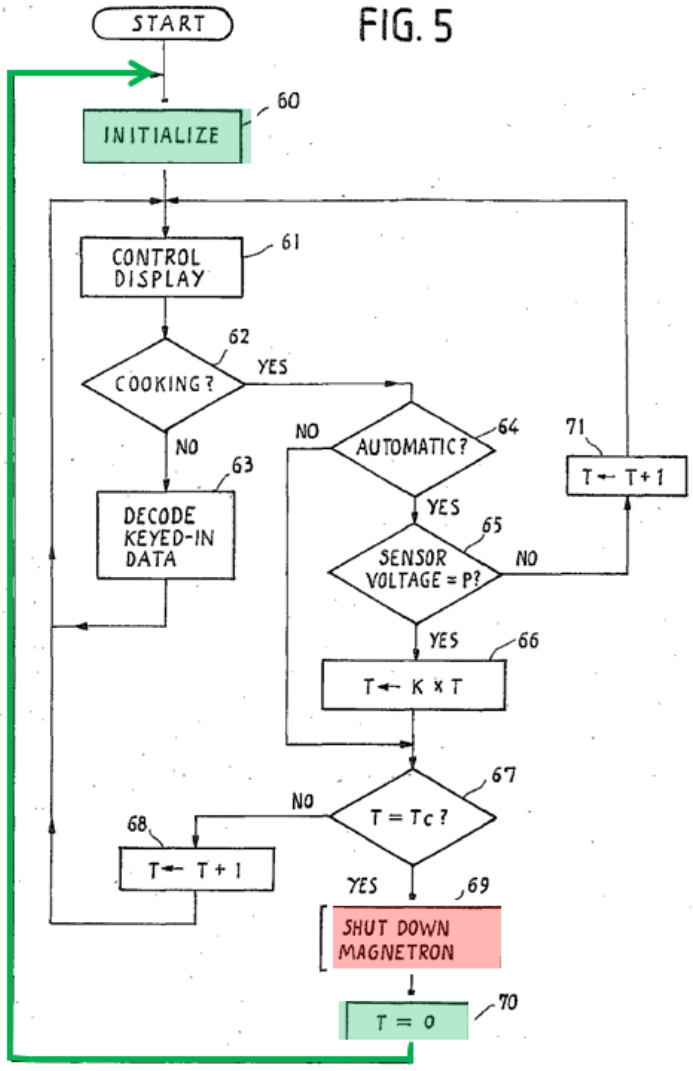
Id. at Fig. 1 (annotated).

[103]. Ueda discloses a logic flow that provides for re-initializing the microwave control sequence following the automatic shutdown of the microwave magnetron:

> "Control then returns to block 61 to successively increment the count T until it reaches Tc in block 67, **whereupon block 69 follows to shut down magnetron 13** and alert the user by operating buzzer 57. Timer count T is reset to zero in block 70 and **control returns to initialization block 60**." (*Id.* at 3:63-68, (emphasis added)).

These operations are also disclosed in Ueda Fig. 5 where the shutdown (red) and

reset (green) steps are shown:



Id. at Fig. 5 (annotated).

3. **SMITH**

U.S. Patent No. 4,496,817 ("Smith") (Ex. 1014) is entitled "Automatic Fire Detection for Microwave Oven" and issued on January 29, 1985. Based on its date of publication, Smith is prior art to the Challenged Patents.

[104]. Smith discloses "a method and apparatus for anticipating the occurrence of a fire in the cooking cavity of a microwave oven." *Id.* at 1:55-57. Smith discloses that "before actually reaching the ignition point, the food begins to char, smoke or smolder" resulting in a period of "rapidly increasing gas concentration in the circulating air . . . ." *Id.* at 3:51-56. Accordingly, in Smith, the oven [10] is provided with a blower for continuously circulating air and a sensor [52] "responsive to the concentration of gases in the circulating air". *Id.* at 1:60-61. Smith further discloses that, "Upon detection of the characteristic rate of change" indicative of the load being heated and closely approaching its combustion point, power to the oven is turned off and indication is provided to the user that a combustion condition in the oven cavity is imminent." (See, e.g., *Id.* at 1:57- 2:4). An overview of the microwave configuration in Smith is shown in Fig. 2, reproduced below.

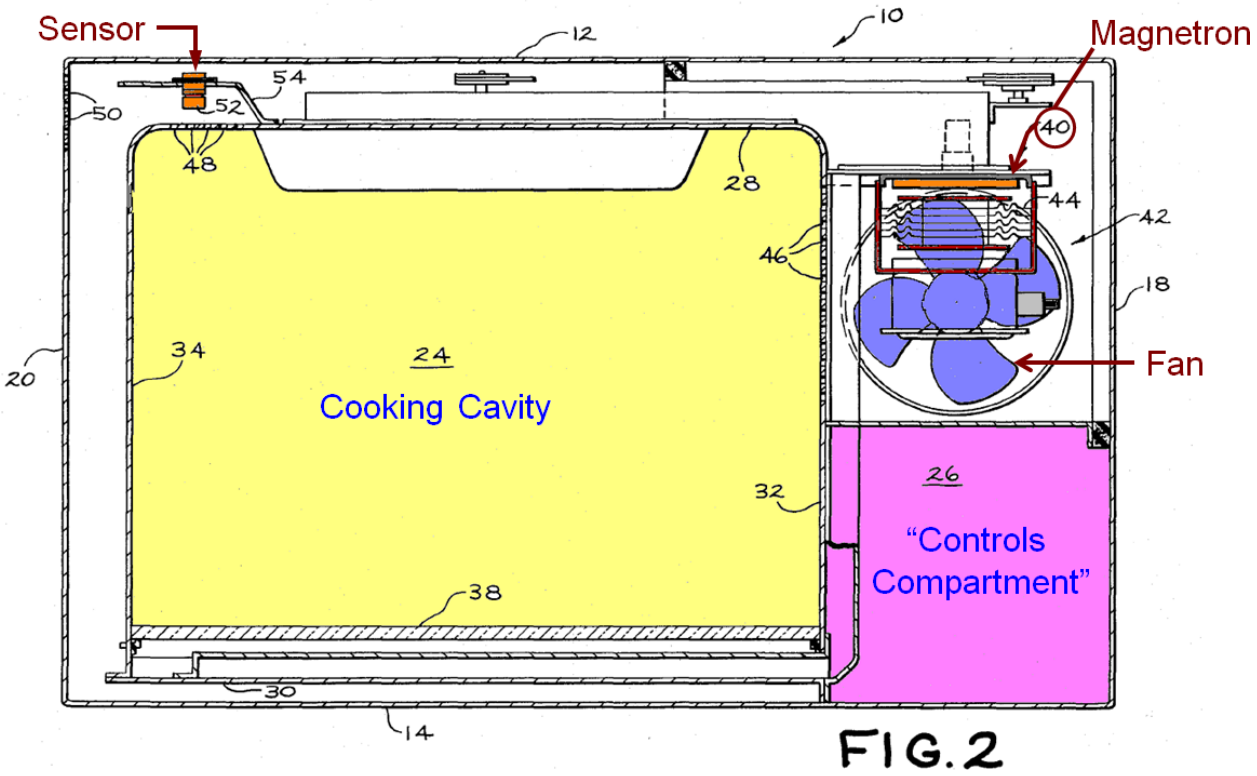


FIG. 2

Id. at Fig. 2 (annotated).

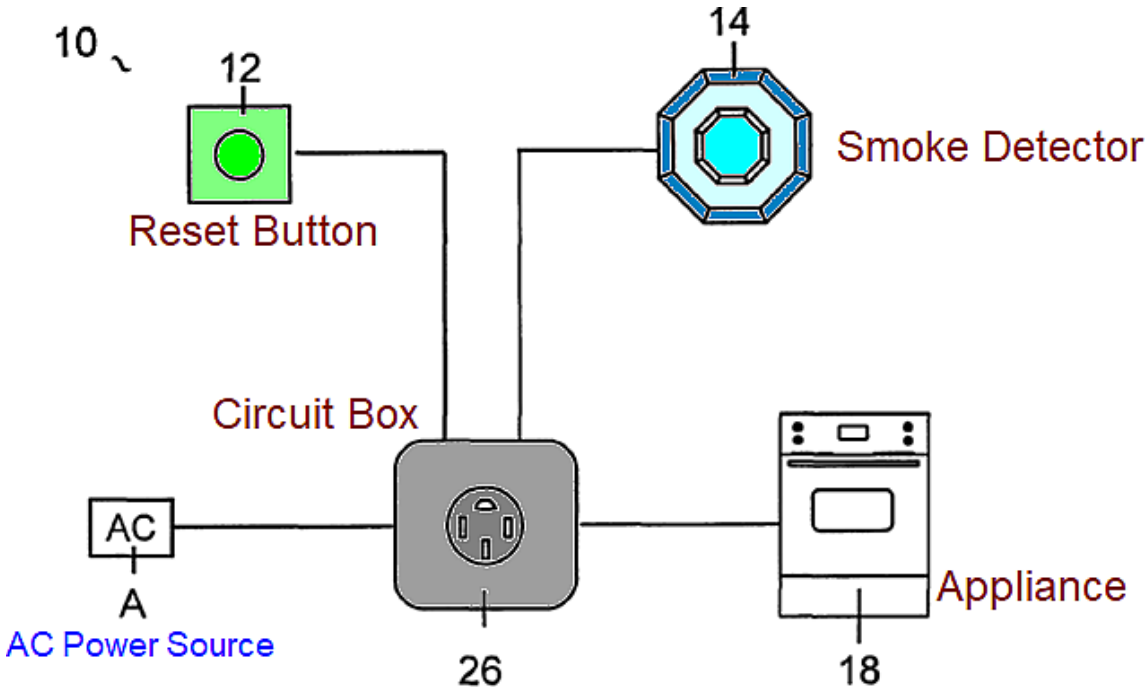
4. **BUTT**

[105]. U.S. Patent No. 8,446,048 ("Butt") (Ex. 1015) is entitled "Controller for a safety shut-off system" and issued on May 21, 2013, based on Application No. 12/733,212 filed on 04/29/2010 which was a national stage entry of PCT/CA2008/001462 filed on August 18, 2008. Based on its date of publication, Butt is prior art to the Challenged Patents.

[106]. Butt discloses "a controller for interrupting a supply of electricity to an appliance upon detection of a trigger, such as smoke." *Id.* at 1:16-18. Specifically, "The trigger signal may be, for example, a signal from a hazard

detector such as a smoke detector." *Id.* at 2:33-34. "The trigger signal may be transmitted… either wirelessly or using a wired connection." *Id.* at 2:50-52.

[107]. As shown in Fig. 1B below, Butt discloses a system 10 which may include a smoke detector 14 (blue) connected to a circuit box 26 (grey) housing the controller 20 shown in Fig. 2 (not shown in Fig. 1). Butt also discloses an appliance (white). As Butt explains, "If the [smoke] detector 14 detects the presence of smoke, then in the wireless embodiment illustrated in FIG. 1 an RF signal 15 is transmitted and is received by the controller 20. Upon receiving the signal, the controller interrupts the AC power supply to the appliance 18 and consequently shuts the appliance 18 off. With the appliance 18 shut off, the energy that would otherwise act as an accelerant for the fire is eliminated, and the progress of the fire is slowed." *Id.* at 4:53-60.



Id. at Fig. 1B (annotated).

[108]. Butt discloses a reset button 12 (above, green) that re-enables the system for further use by first checking for a smoke-alarm system signal, then closing a relay to reconnect the electrical appliance to AC power (A). *See Id.*, 6:53-7:20.

5. **EMMA**

[109]. U.S. Patent Publication No. 2009/01889117 ("Emma") (Ex. 1011), entitled "Multiple Linked Appliances with Auxiliary Outlet", was published on July 30, 2009. Based on its date of publication, Emma is prior art to the Challenged Patents. As discussed above, Emma is also a parent application to the '206 patent.

[110]. Emma is directed to: "A combination microwave and refrigerator system [that is] is constructed having a single plug input supply." (*Id.* at Abstract). In the combination of a microwave oven and a refrigerator ("microwave/refrigerator combo", or "combo"), the refrigerator is plugged into an auxiliary outlet that is controlled by a control circuit adapted to open and close a relay which supplies or shuts off power to the refrigerator or other loads while the microwave is actively operating. This operation, i.e., directing all power to the microwave when it is cooking, is part of what is disclosed in the '206 Patent. Its purpose is to prevent a current overload condition for the supply circuit. *See, e.g.*, *Id*. at [0033]. Also: "Circuit 4 controls the power to microwave 2 and refrigerator 3 and also low power receptacles 11 and 12 to avoid overload conditions." *Id.* at [0037].

[111]. As shown in Fig. 2 below, Emma discloses a microwave oven / refrigerator combination 1 in which the refrigerator 3 connects to refrigerator receptacle 15 on the back of the microwave. This outlet comprises an auxiliary power supply outlet on the microwave oven. Both appliances receive AC power via power cord 8 which is plugged into wall outlet 5 (pink), but the refrigerator receives its power via refrigerator receptacle 15 which can be turned on or off by the control circuitry inside the microwave. Ex 1011 at [0008].

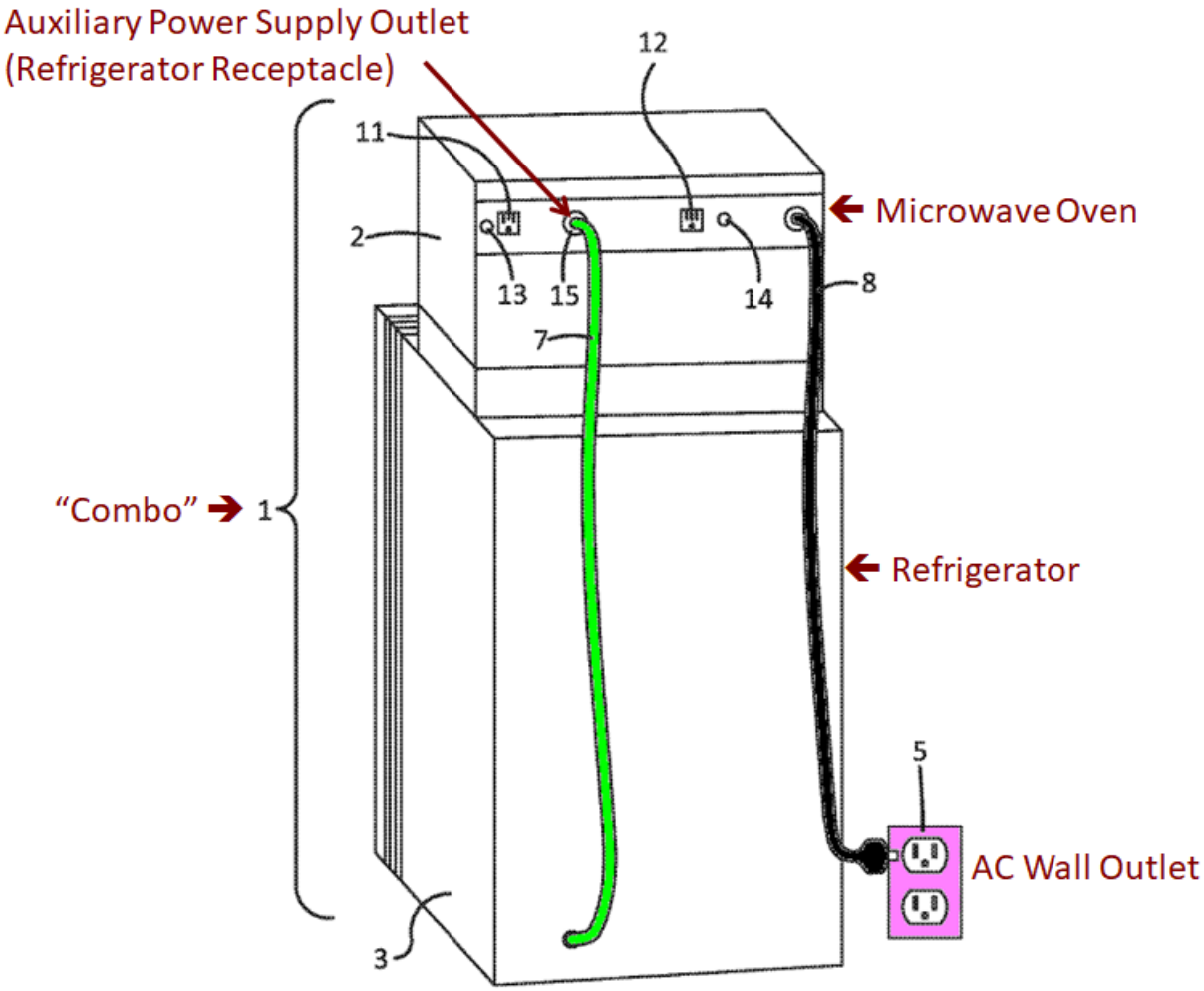


FIGURE 2

Id. at Fig. 2 (annotated).

[112]. Furthermore, as disclosed in Emma, the "microwave oven includes a microprocessor controller adapted to monitor operation of the refrigerator compressor and controls the power to the microwave magnetron and other

components." *Id.* at [0008].

[113]. As shown in Fig. 4 below, Emma discloses a control circuit 4 (yellow) that digitally operates three relays numbered 19 and 20 via controller 4 (blue signal pathways). The three relays control power to the receptacles 11, 12, and 15 (orange).

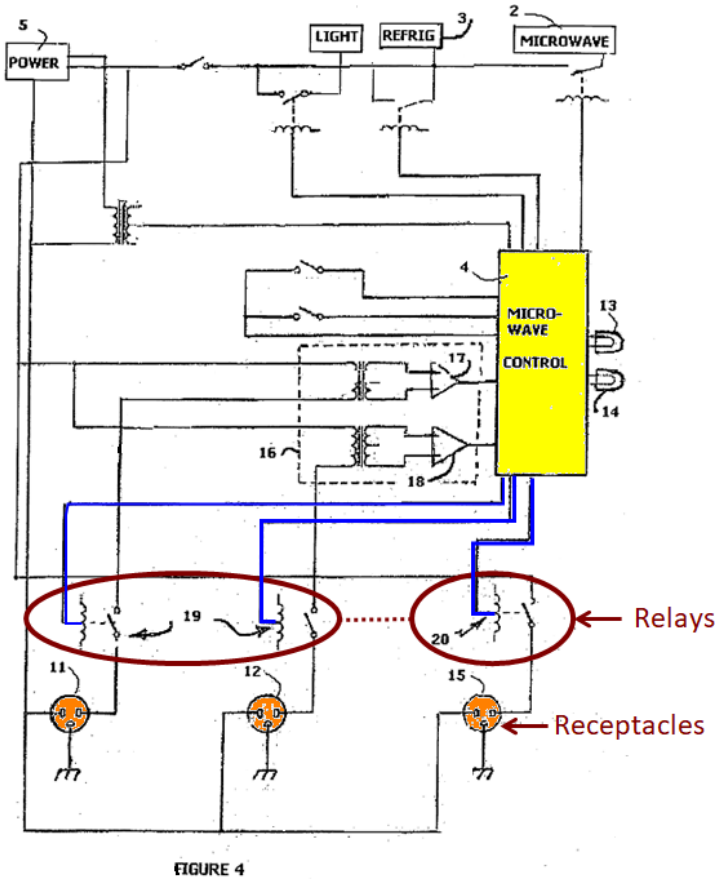


FIGURE 4

Id. at Fig. 4 (annotated).

[114]. Emma discloses the following: "The current demands of the microwave 2 are generally the most significant contribution to overload, as shown in FIG. 8. To avoid overload conditions, power to the low power

receptacles 11 and 12 and refrigerator receptacle 15 is disabled during microwave operation." *Id.* at [0033]. This concept is illustrated in Emma Fig. 8 is shown below:

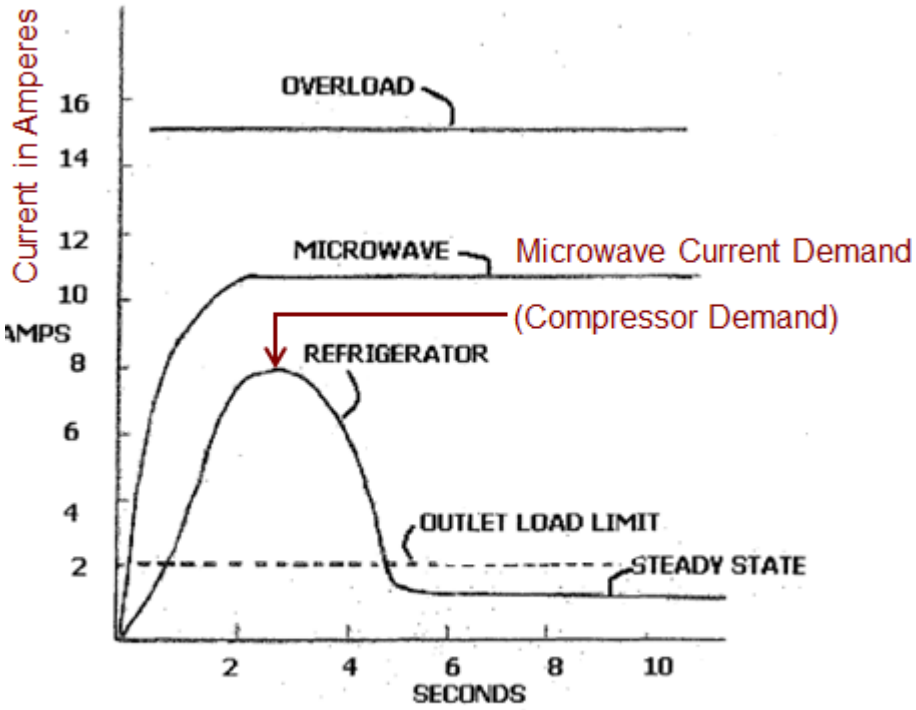


FIGURE 8

Id. at Fig. 8 (annotated).

[115]. Emma discloses several control models by which power to the refrigerator is disabled while the microwave is in operation. One control method involves disconnecting power to the refrigerator at its microwave-mounted refrigerator receptacle while the high-power demanding microwave is running: "To avoid overload conditions, power to the low power receptacles 11 and 12

and refrigerator receptacle 15 is disabled during microwave operation." *Id.* at [0033].

VIII. OPINIONS ON CLAIM CONSTRUCTION

[116]. I have also been informed that the United States Patent and Trademark Office and the Patent Trial and Appeal Board ("PTAB") only construe claims when it is necessary to resolve an underlying controversy between a petitioner and the patent owner. Given the disclosure of the prior-art references asserted by Petitioner, it is my opinion that none of the claim terms in the Challenged Claims require construction to resolve the patentability determinations presented in the Petition. I reserve the right to provide opinions regarding any terms proposed for construction by Patent Owner.

[117]. I have, however, reviewed infringement contentions and correspondence provided to Petitioner from Patent Owner. (*See,* generally, '206 petition Ex. 1009 (Claim 9 Infringement Chart). These demonstrate Patent Owner's interpretation of certain claim limitations, as discussed below:

A. THE '206 PATENT

1. "ENABLE"

[118]. Claim 9 recites "wherein the smoke sensor is configured to be reset after ending the current cooking session prior to the set end time based on sensing the smoke indicative of the dangerous condition, **to enable the**

microwave oven to deliver cooking power in a next subsequent cooking session responsive at least in part to the smoke sensor no longer sensing the smoke indicative of the dangerous condition." (Emphasis added).

[119]. Claim 11 recites "wherein the control circuit is configured to reset after ending the current cooking session prior to the set end time due to sensing the dangerous condition, **to enable cooking power to again be available to the microwave oven** in a next subsequent cooking session responsive at least in part to the smoke sensor no longer sensing the dangerous condition." (Emphasis added).

[120]. I have reviewed Patent Owner's infringement contentions and correspondence to Petitioner demonstrating Patent Owner's interpretation of this element. (*See*, generally, '206 petition Ex. 1009 (Claim 9 Infringement Chart).

[121]. In the claim charts and return correspondence from Patent Owner to Petitioner explaining its infringement allegations against Petitioner, Patent Owner contends that enabling the microwave (after ending the current cooking session prior to the set end time, based on sensing the smoke indicative of the dangerous condition) has no "temporal limitation." Ex. 1010. Namely, that as long as the microwave oven is operating and the smoke sensor is not sensing a

dangerous condition, it satisfies the requirement of enabling the microwave oven. *Id.* My opinions in this Declaration do not conflict with this interpretation, and thus I have applied what I understand to be Patent Owner's proposed construction of these terms in this Declaration. However, it is still my opinion, as explained below, that the claims are invalid whether the Board adopts Patent Owner's own construction or not. In any case, I reserve the right to provide opinions regarding any terms proposed by Patent Owner for construction.

2. **"DANGEROUS CONDITION"**

[122]. Claims 9 and 11 also recite: "responsive at least in part to the smoke sensor **no longer sensing the dangerous condition**." (Emphasis added).

[123]. I have reviewed Patent Owner's infringement contentions and correspondence to Petitioner demonstrating Patent Owner's interpretation of this element. (See, generally, Ex 1009). In the claim charts and correspondence from Patent Owner to Petitioner explaining its infringement allegations, Patent Owner interprets "dangerous condition" to mean simply "sensing some level of smoke". My opinions in this Declaration do not conflict with this interpretation, hence I have also applied what I understand to be Patent Owner proposed construal of these terms in this declaration. However, it is still my

opinion, as explained below, that the claims are invalid whether the Board adopts Patent Owner's proposed construction or not. Thus, I reserve the right to provide opinions regarding any terms proposed by Patent Owner for construction.

A. THE '374 PATENT

[124]. The claim construction issues discussed above with respect to the '206 Patent above (¶¶[43-47]) are equally relevant to the 374 Patent and are incorporated herein by reference.

A. THE '876 PATENT

[125]. Although I do not believe any claim term requires a construction to find the '876 Challenged Claims invalid for the reasons provided in this Petition. However, as explained below, I have applied Patent Owner's interpretations of one claim term to avoid unnecessary arguments regarding claim construction. The Challenged Claims are invalid even using Patent Owner's constructions.

3. "LEVEL / AMOUNT"

[126]. As Claims 1 and [21] recite: "responsive at least in part to a level [an amount] of smoke sensed by the smoke sensor." Ex. 1001 at claims 1, 21. In its infringement contentions, which I have reviewed, Patent Owner interprets "level of smoke" as merely detecting smoke. '876 petition Ex. 1009 (Claim 1 Infringement Chart) at 6. My opinions in this Declaration do not conflict with

this interpretation, hence I have also applied what I understand to be Patent Owner proposed construal of these terms in this declaration. However, it is still my opinion, as explained below, that the claims are invalid whether the Board adopts Patent Owner's proposed construction or not. Thus, I reserve the right to provide opinions regarding any terms proposed by Patent Owner for construction.

IX. OPINIONS ON VALIDITY OF THE '206 PATENT

[127]. In my opinion, all of the features and elements of the Challenged Claims were well known in the art as of the Effective Filing Date. In performing my analysis, I have considered and cited only references that are prior art to the '206 patent.

A. THE PRIOR ART REFERENCES TEACH ALL OF THE ELEMENTS OF THE '206 CHALLENGED CLAIMS

1. THE '206 INDEPENDENT CLAIMS (CLAIMS 9 AND 11)

a. Microwave Oven

[128]. Both Claim 9 and Claim 11 of the '206 Patent recite "a microwave oven configured to be connected to a source of electrical power."

i. ISDU

[129]. In its Abstract, ISDU states the following: "We suggest that **smoke detection** devices be integrated into range ovens and **microwaves**, the

leading causes of domestic structure fires." Ex.1012 at 1 (emphasis added).

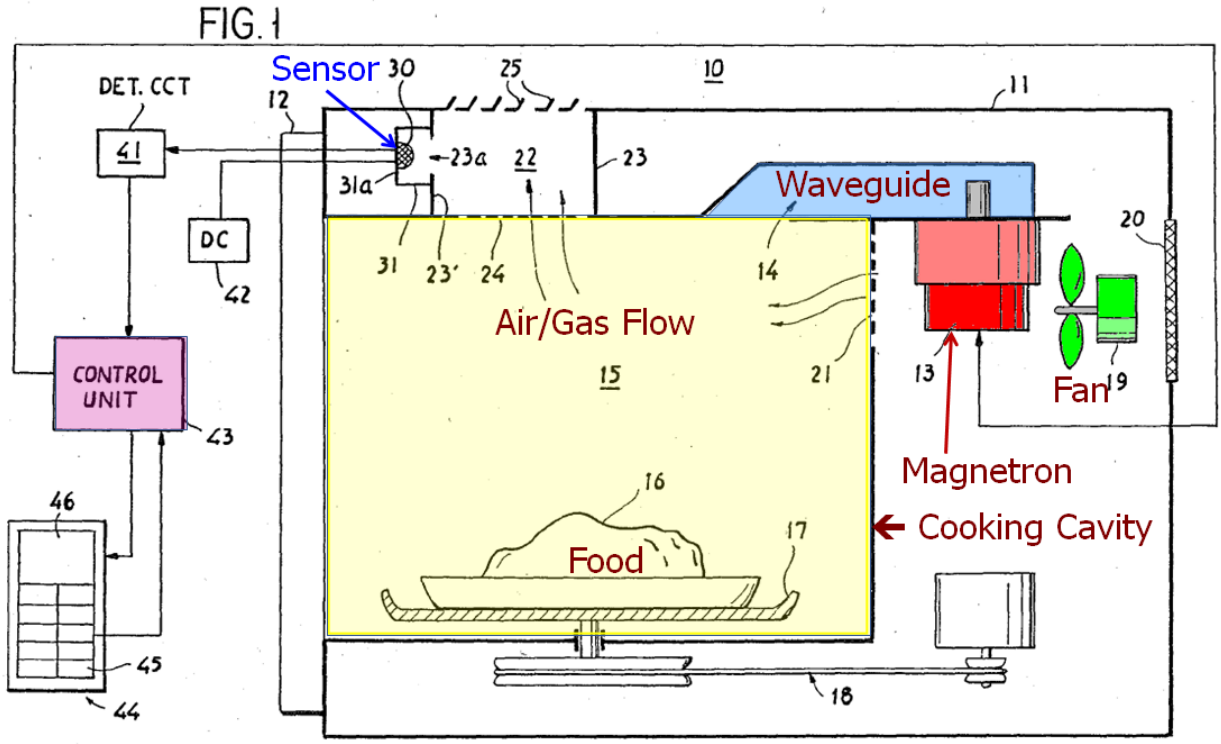
[130]. In addition to disclosing a microwave oven and smoke detector, ISDU also discloses a microwave oven connected to a source of electrical power. Specifically: "To do this, we plan to have the smoke detector powered by the integrated low-voltage power supply. Once smoke is detected, we will send a signal that lets a circuit **interrupt the power to the microwave** through the use of a 'soft' power-off function already in use by the microwave logic." *Id.* at Page 6 (emphasis added). Additionally, ISDU it states, in referring to a power supply that enables the smoke detector: "[p]ower will be drawn from the low voltage power supply integrated into the microwave. Should power consumption exceed available power for the circuitry, an additional low voltage power supply will be installed and integrated into the input AC source." *Id.* at Page 9. Further, it is inherent that a microwave be connected to a source of electrical power to work.

[131]. Given the above, it is my opinion that ISDU discloses a microwave oven as required of the '206 patent claims.

ii. Ueda

[132]. Ueda discloses a microwave oven: "Referring now to FIG. 1, there is shown a microwave oven 10 comprising a housing 11 with a hinged door 12. Magnetron 13 is mounted in a position adjacent an energy radiating duct 14

through which microwave energy is radiated into a heating chamber 15 in which foodstuff 16 is placed on a rotating disc 17 driven by a belt-drive system 18." Ex. 1013 at 2:4-10. Figure 1 of Ueda (reproduced below) shows "a microwave oven with a control unit." *Id.* at 1:50-51.

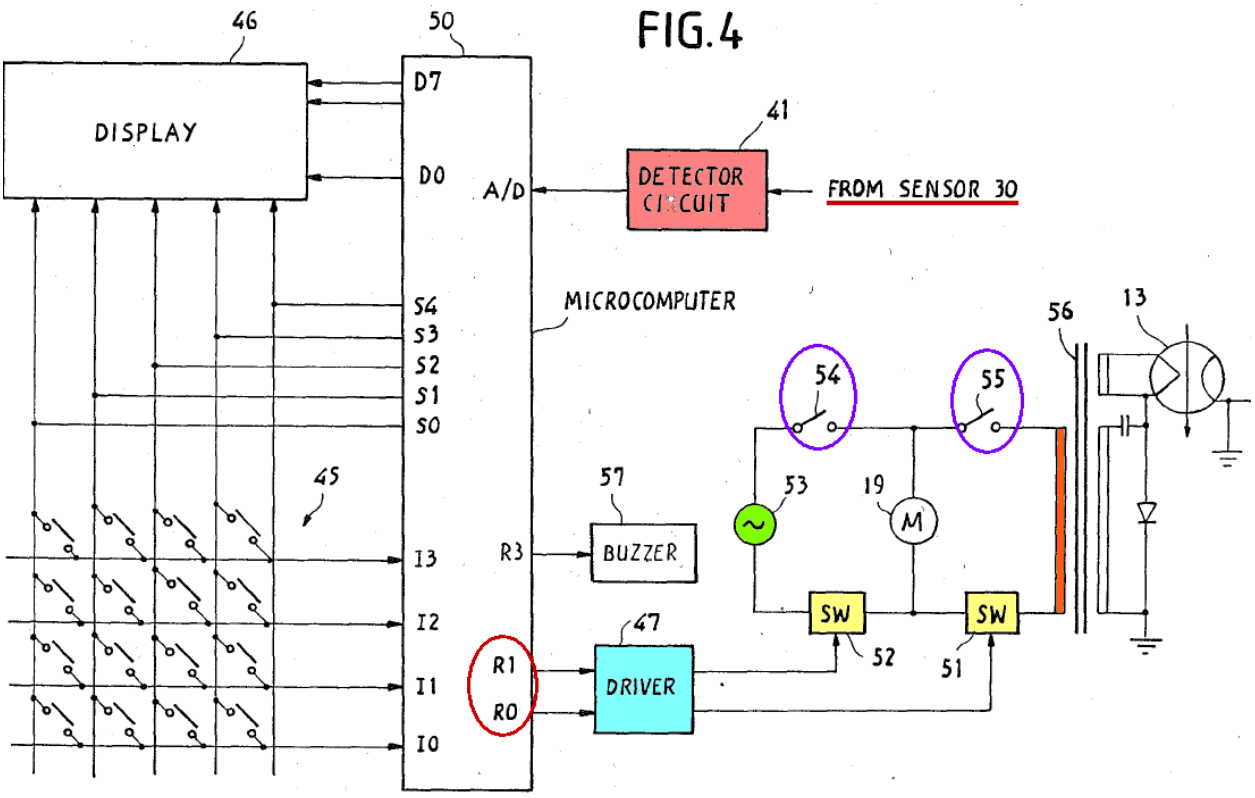


Id. at Fig. 1 showing microwave **10** with control unit **43**

[133]. Ueda further discloses that its microwave oven is connected to a source of electrical power. As explained below, in reference to the block diagram of Fig. 4 reproduced below), Ueda teaches how the microwave oven receives power and how the power is directed internally:

> Driver 47 [blue] is connected to output terminals R0, R1 [circled in red] to amplify power turn-on control pulse from terminal R1 and power-level control pulses from terminal R0 and respectively, applies them to series connected switching elements 51 and 52 [yellow], responsive to AC power source 53 [green]… switches 51 and 52 are also in series with door switches 54, 55 [circled in purple] and a primary winding of a transformer 56 [orange]. Switching element [51] completes a circuit for the fan motor 19 and a circuit for the primary winding of the transformer 56, 40 having a secondary winding connected to the cathode of magnetron 13. By varying the duty cycle or frequency of the pulses applied to switching element [51], the power level of the magnetron is controlled.

Id. at 3:31-44, annotated. Note the connection to the detector circuit (red) from the smoke sensor **30**.



Id. at Fig. 4 (annotated).

iii. Smith

[134]. Smith discloses a microwave oven. For example, Figures 1 and 2 (reproduced below) show a microwave oven 10. Ex. 1014 at 2:37-43. The outer 40 cabinet comprises six cabinet walls including upper and lower walls 12 and 14, a rear wall (not shown), two side walls 18 and 20, and a front wall partly formed by a hingedly supported door 22 and partly by control panel." *Id.*

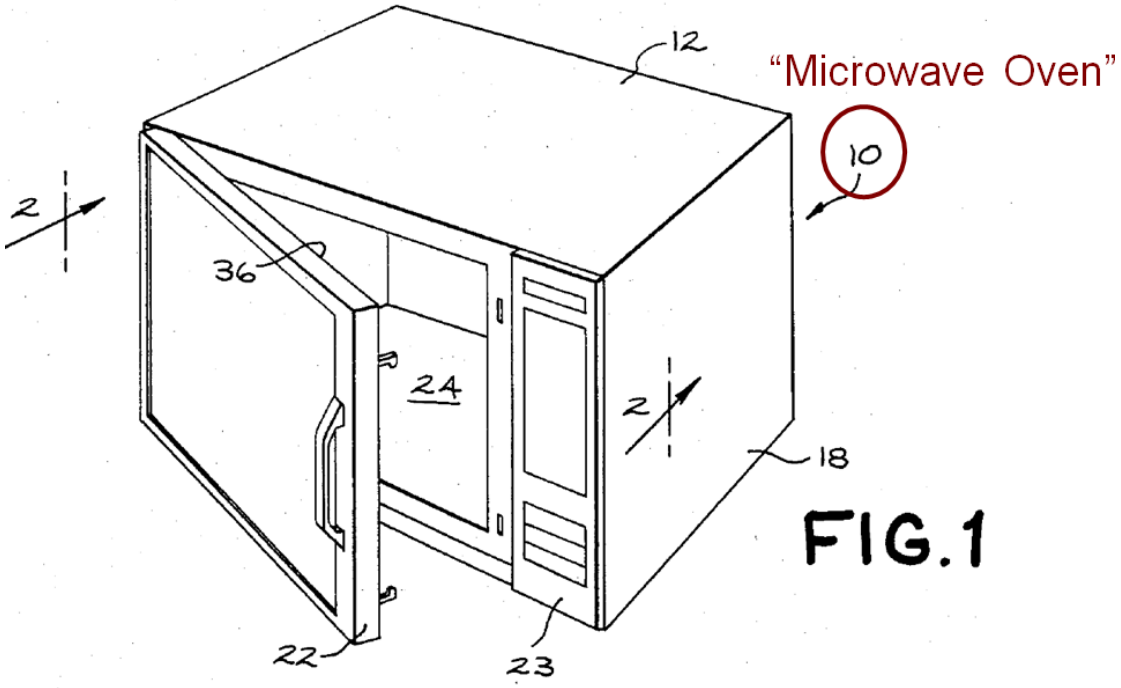


FIG. 1

Id. at Fig. 1 (annotated).

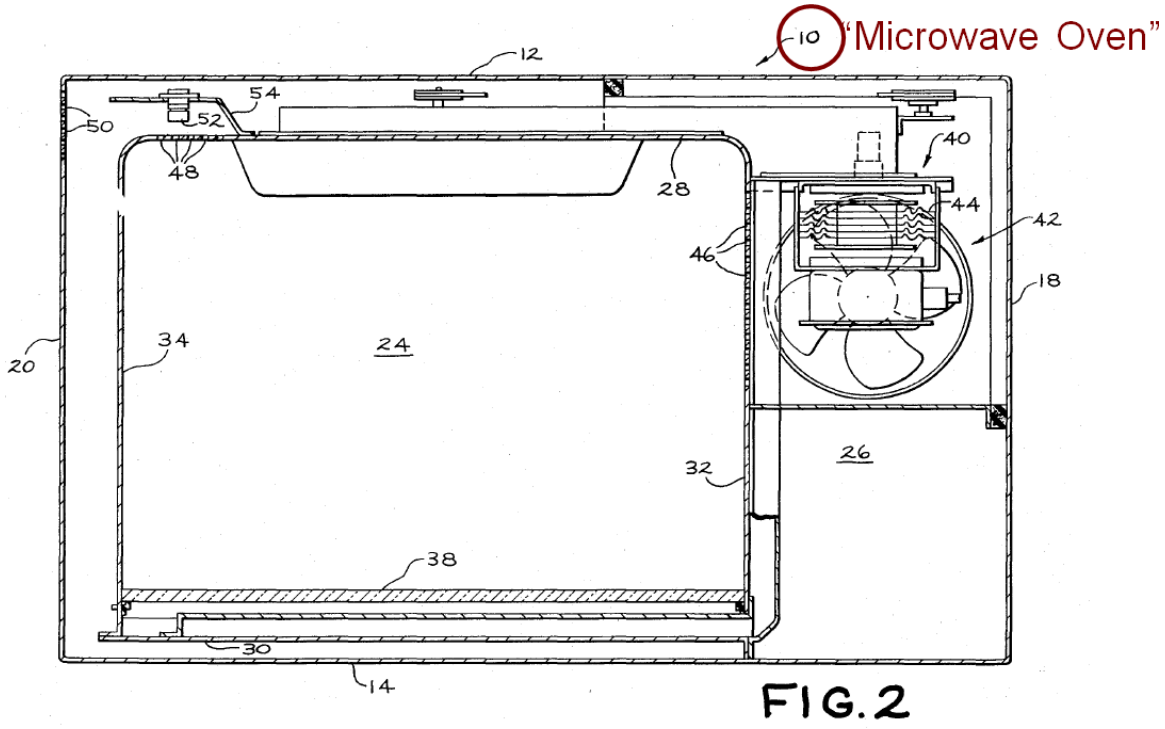


FIG. 2

Id. at Fig. 2 (annotated).

[135]. Smith further discloses a microwave oven that is connected to a source of electrical power. The primary source of power is 120 VAC as explained by Smith in the following, in reference to Fig. 4: "Power for the circuit of FIG. 4 is provided by a conventional DC power supply circuit 70 which converts a **standard 120 volt, 60 Hz AC signal input on lines L1 and N** to dc output power signals of -9 volts, -9 volts and -16 volts on lines 72, 74, and 76, respectively…" Ex. 1014 5:15-19 (emphasis added). A POSITA would have understood the symbols L1 and N to be the standard electrical notations for the "hot" and "neutral" wires, respectively, carrying AC power and available at a standard wall outlet. These lines feed the DC Power Supply as shown in this annotated version of Smith Fig. 4. Here red is the "hot" line (L1), and black is the neutral (N):

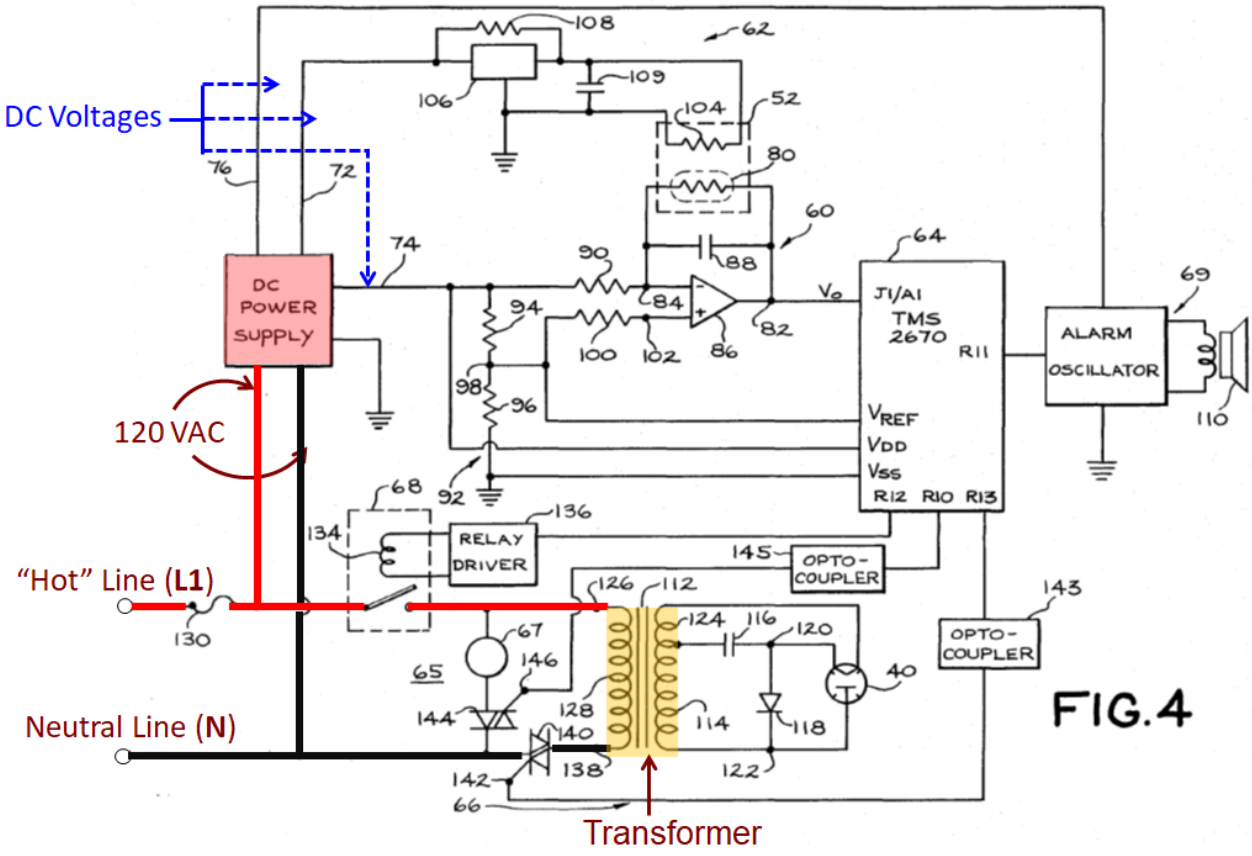


FIG. 4

Id. at Fig. 4 (annotated).

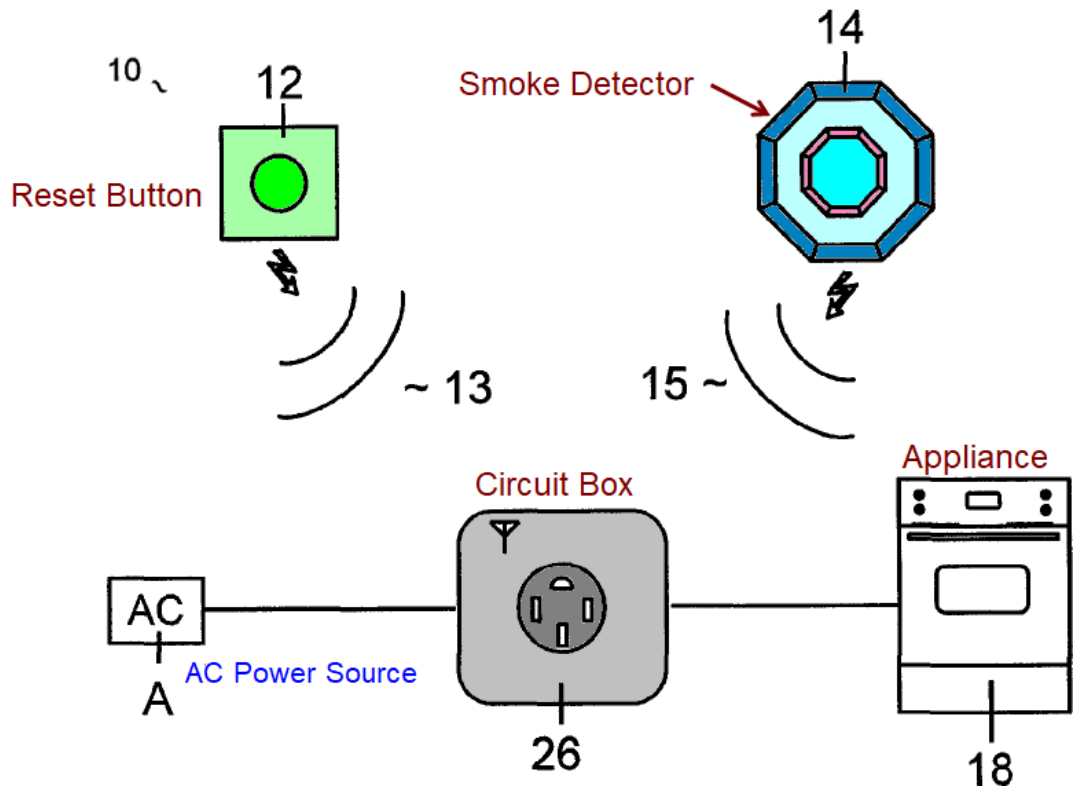
As Smith further explains, the hot and neutral (L1 and N) lines also power the magnetron 40 [orange] by way of TRIAC 140 and transformer 112. These connections, also shown above in Fig. 4, confirm that "power control relay 68 [is used] for controlling energization of magnetron power circuit 66 and air circulating blower 67. *Id.* at 5:9-11.

iv. Butt

[136]. Butt discloses a device that can be coupled to any kitchen appliance: "A detailed description of an exemplary embodiment of the present

invention is given in the following. It is to be understood, however, that the invention is not to be construed as limited to this embodiment. The exemplary embodiment set out below is directed to a safety shut-off system used in a kitchen, ***but the invention may be applied to other applications involving electrical appliances generally***." *Id.* at 3:61-67 (emphasis added). A POSITA would understand that Butt discloses electrical cooking appliances that can create smoke would include ovens, such as microwave ovens.

[137]. Butt further discloses an electrical appliance connected to a source of electrical power. As explained below, in reference to Figure 1A, Butt teaches a device that can be coupled to an AC power source and an electrical appliance and can communicate wirelessly when the device detects smoke: "In the embodiment of FIG. 1A, the system 10 comprises a smoke detector 14 and a wireless transmitter housed therein (not shown), a panic/reset button 12 and a wireless transmitter housed therein (not shown), a standard circuit box 26 and a controller 20 housed therein, an AC power source A, and an electric appliance 18." Ex. 1015 at 4:29-34. Additionally, Butt also states: "During normal operation, the appliance 18 is plugged into the circuit box 26 and the controller 20 allows electricity to be conducted from AC power supply A to the appliance 18." *Id.* at 2:37-40.



Id. at Fig. 1A (annotated).

v. Emma

[138]. Emma discloses a microwave oven connected to a source of electrical power: "A system of linked appliances comprising: a **microwave oven** connected to a source of power." *See, e.g.*, Ex. 1011 at Claim 1. Emma also states in its specification: "This embodiment consists of two stand-alone appliances, a refrigerator 3 and a microwave oven 2." *Id.* at [0026]. As shown in Figure 2 (reproduced below), "[r]efrigerator 3 is connected to microwave oven 2 by power cord 7 to refrigerator receptacle 15, shown at the rear of the microwave 2 in FIG. 2." *Id.* at [0026].

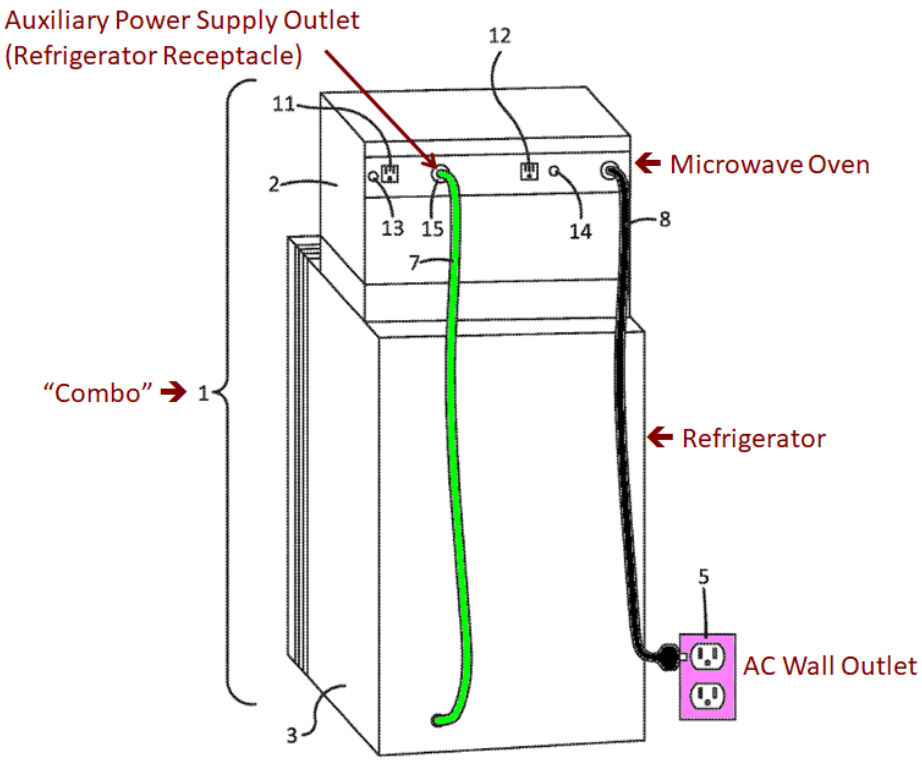
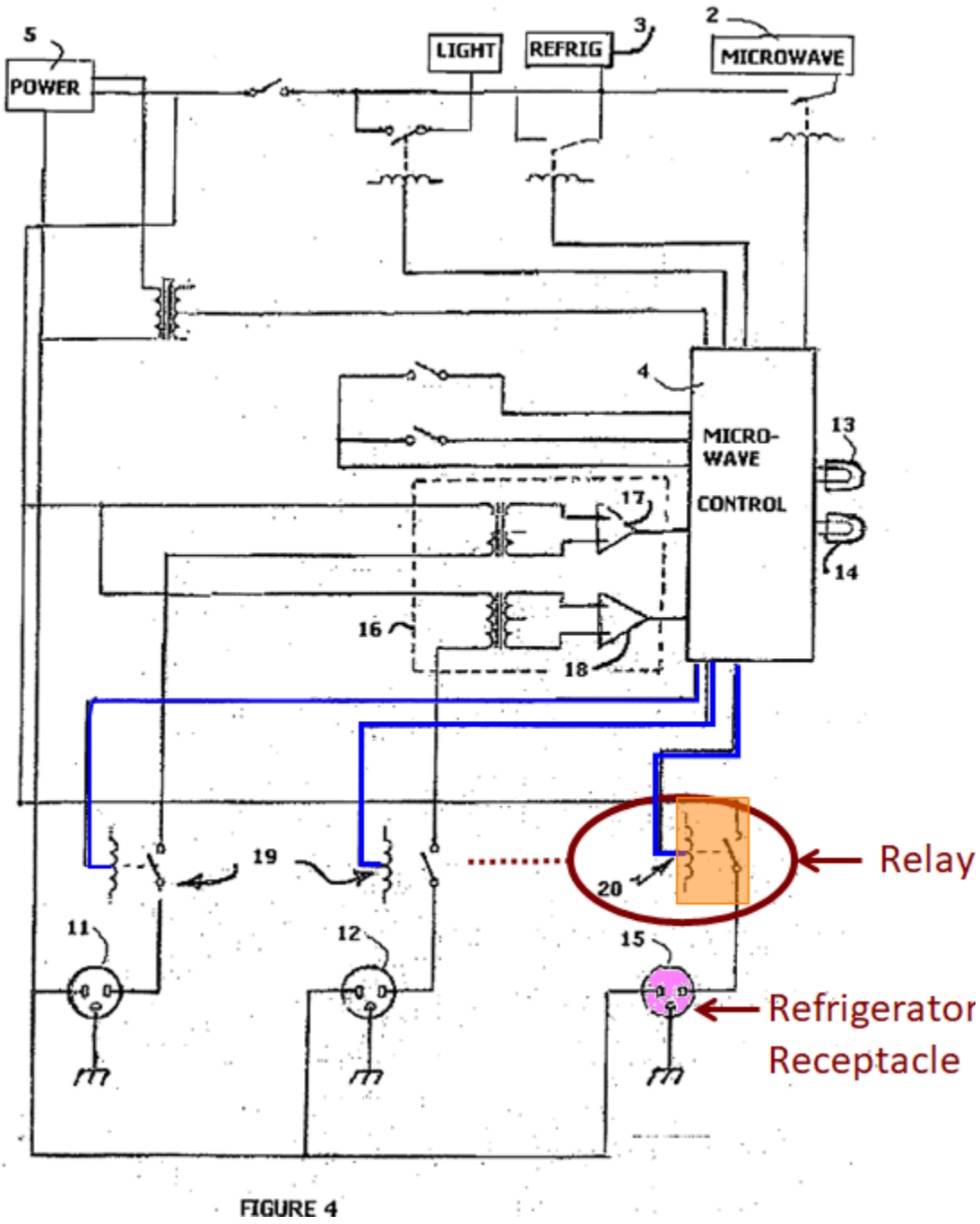


FIGURE 2

Id. at Fig. 2 (annotated).

[139]. As shown in the block diagram of Figure 4 (reproduced below), refrigerator receptable 15 [pink] is connected through relay 20 (orange) to power receptacle 5 (pink). *Id*. at Fig. 4.



Id. at Fig. 4 (annotated).

b. Control Circuit

[140]. Claim 9 recites "having a control circuit, wherein the control circuit

is configured to control operation of the microwave oven." Claim 11 recites "having a control circuit configured to control operation of the microwave oven."

i. ISDU

[141]. ISDU discloses a control circuit configured to control the operation of a microwave oven: "[w]hen smoke is detected during microwave operation, the device will turn off the microwave and let the user know that the food has begun to smoke or even burn. To do this, we plan to have the smoke detector powered by the integrated low-voltage power supply. Once smoke is detected, we will send a signal that lets a circuit interrupt the power to the microwave through the use of a 'soft' power-off function already in use by the **microwave logic**. This will stop the microwave while simultaneously sounding an alarm." Ex. 1012 at 6. (emphasis added).

[142]. Additionally, the circuit portion of ISDU in Fig. 4, shown below, consisting of a Core Logic Element (1), Relay Control and Output Logic (2), Alarm (3), and Translation Circuit, comprises the control circuit of the ISDU system. Thus, ISDU teaches the use of a control circuit configured to control the microwave by shutting down the microwave upon detecting smoke. (*See*, e.g., *Id.* at 7-8).

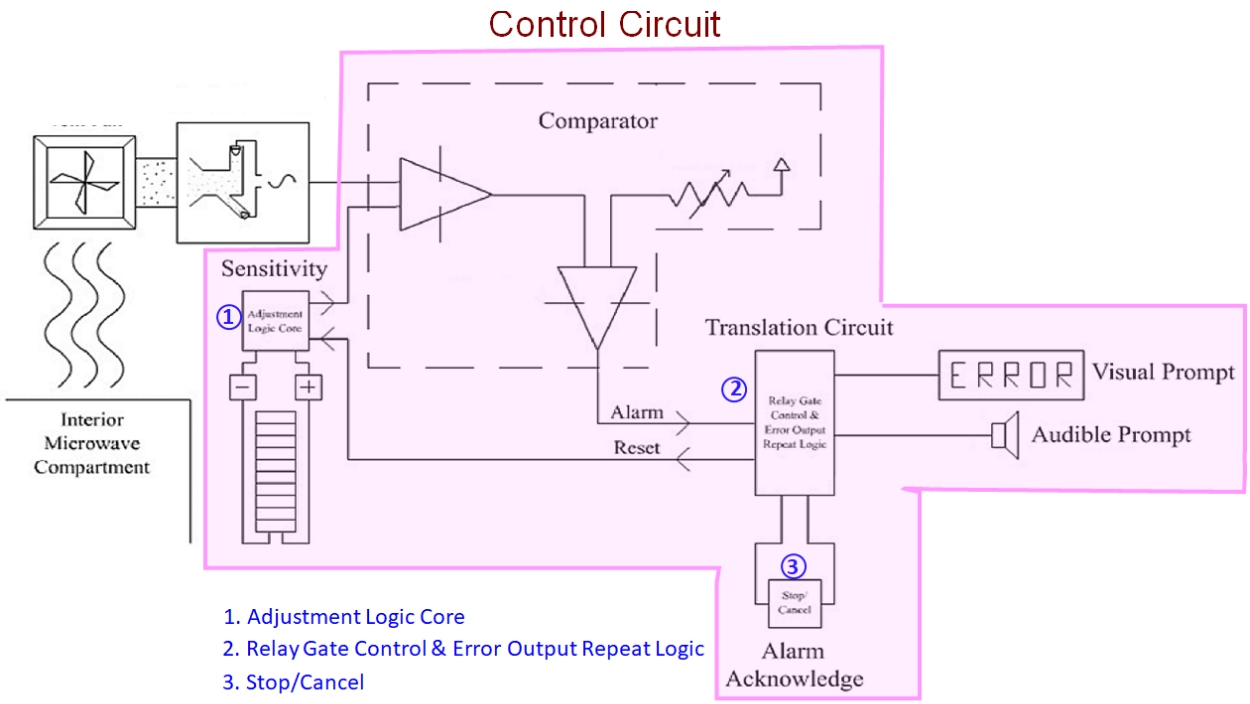


Figure 4

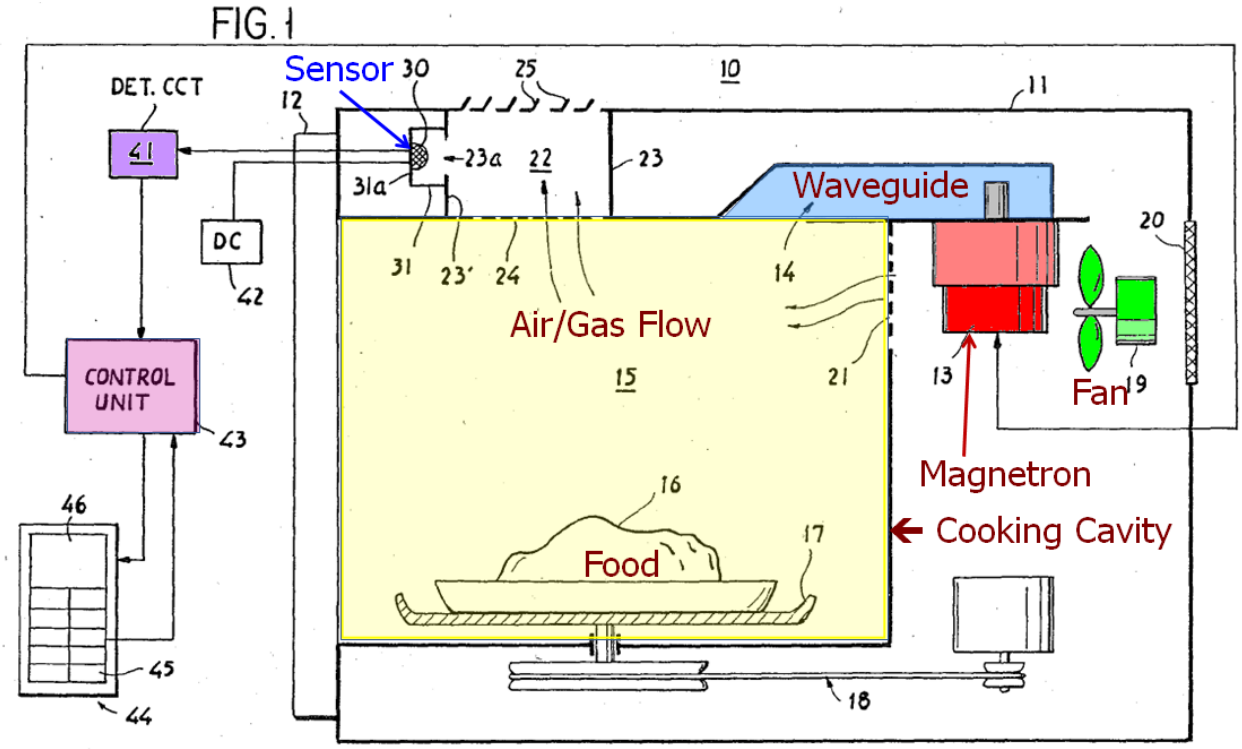
Id. at Fig. 4 (annotated).

ii. Ueda

[143]. Ueda discloses a microwave oven having a control unit (i.e., "control circuit") configured to control the operation of the oven. As explained below, the control unit receives input from the data-entry/display panel and sensor 30 and directs the microwave oven based on the data received.

[144]. Specifically, Ueda states: "Returning to FIG. 1 [reproduced below], the apparatus further includes a control unit 43 [pink] and a data-entry/display panel 44 having a plurality of keys 45 and a liquid-crystal display 46. Control unit receives data from the data-entry/display panel 44 to initiate a cooking

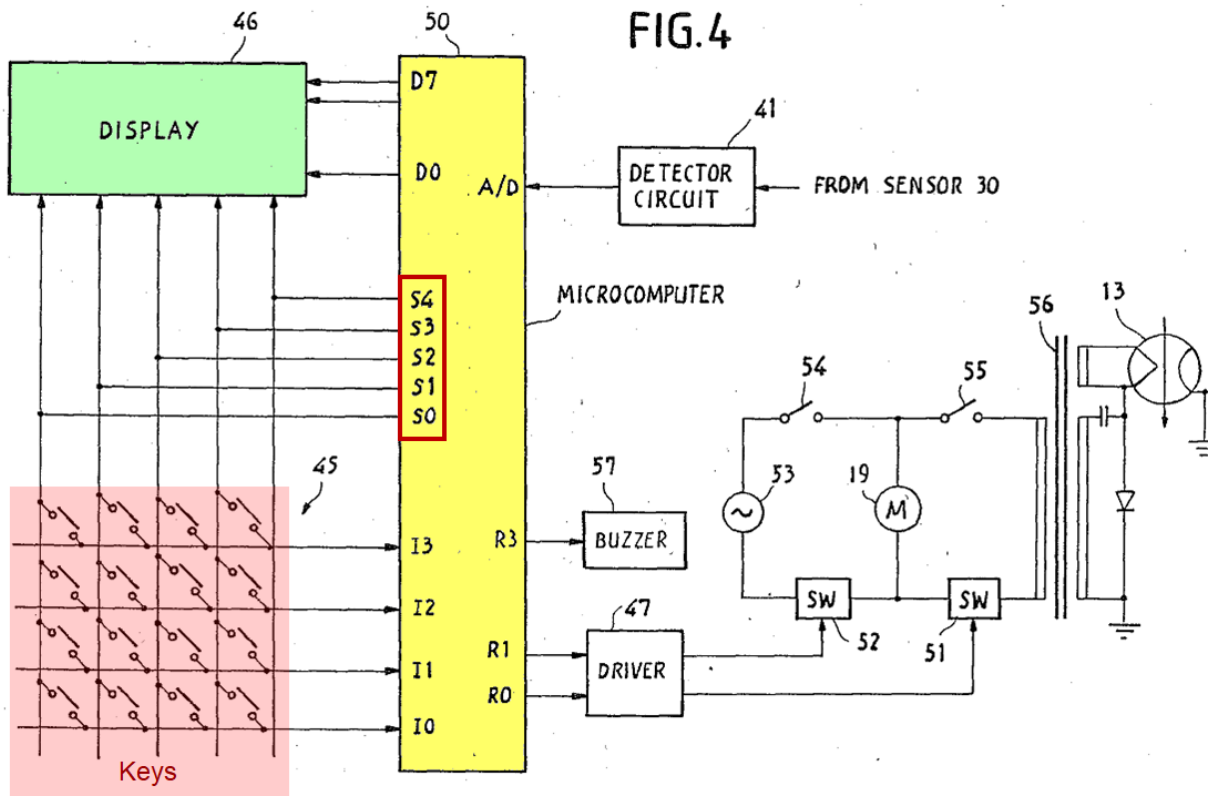
operation according to the contents of input data by energizing magnetron 13 [red] via a driver 47 and further receives an output signal from detector circuit 41 [purple; connected to sensor 30 to terminate the cooking operation.



Id. at Fig. 1 (annotated).

[145]. FIG. 4 shown below [*See also* discussion above at ¶[143] is a detailed circuit diagram of the structure of the control unit 43 inside Ueda. "Input data entered by select keys 45 are applied to terminals I_0-I_3 of a microcomputer 50 [yellow] which decodes the input data into a series of eight-segment codes which are applied through terminals D_0-D_7 to display 46 [green)] and a series of digit codes applied thereto through terminals S_0-S_4." Ex. 1013 at

3:9-23.



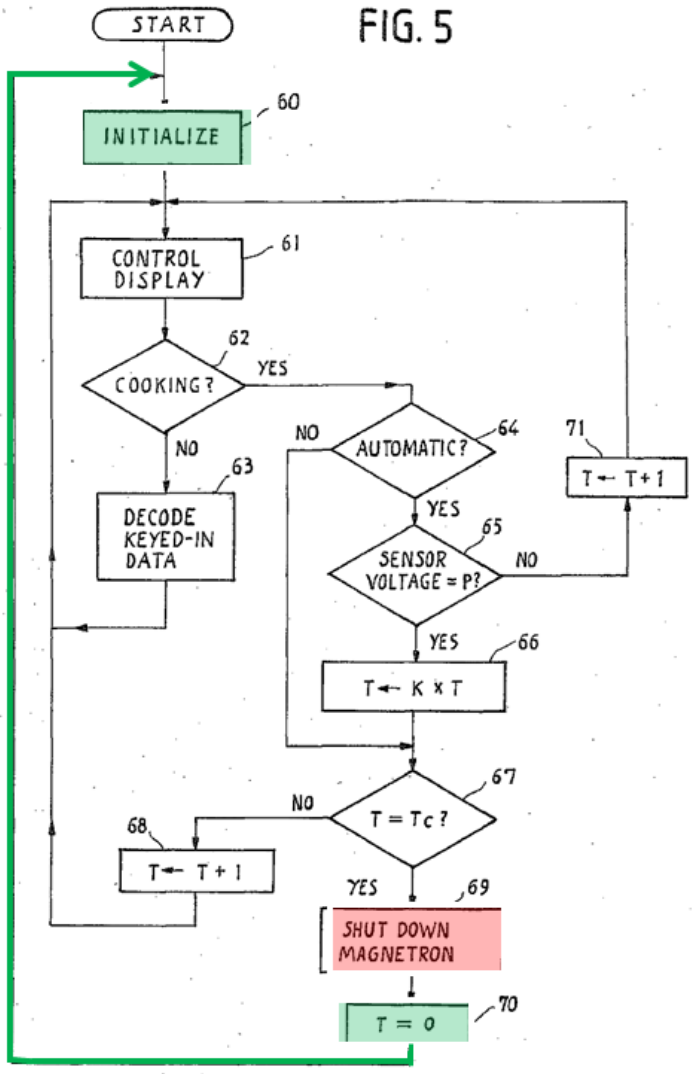
Id. at Fig. 4 (annotated).

iii. Smith

[146]. Smith discloses an embodiment of microprocessor 64 in Fig. 4 as the Texas Instruments TMS2670 Series 4K (Ex. 1014 at 6:34-37). A POSITA would have recognized this microprocessor as an exemplary form of "control circuit" – in this case configured to control the operation of the microwave oven. As explained below, Smith teaches that this device can cut power to the appliance coupled to the controller, based on the smoke detector detecting smoke or the user's input (i.e., pressing the panic/reset button). For example:

"Upon detection of a rate of change greater than reference ΔL, (Yes to Inquiry 180) a signal is provided at output port R_{12} **causing power control relay 68 to open**, thereby de-energizing magnetron 40 and the blower motor 67 (Block 182)." *Id.* at 9:17-21 (emphasis added).

[147]. As I have previously explained, Smith also discloses a control circuit in FIG. 4 (shown above) in the form of the Texas Instruments TMS2670 Series 4K microprocessor (*Id.* at 6:34-37). In the flow diagram of FIG. 5 (shown below), Smith describes the algorithm used by the microprocessor to control the microwave oven: "Operation of the circuit of FIG. 4 will now be described with reference to the flow diagram of FIG. 5. This flow diagram illustrates an algorithm which is implemented in the ROM of microprocessor 64. From this diagram, one of ordinary skill in the programming art can readily prepare a set of instructions for permanent storage in the ROM of microprocessor 64. It is of course to be understood that other portions of the microprocessor ROM may be utilized to implement additional oven control algorithms." *Id.* at 7:16-25.

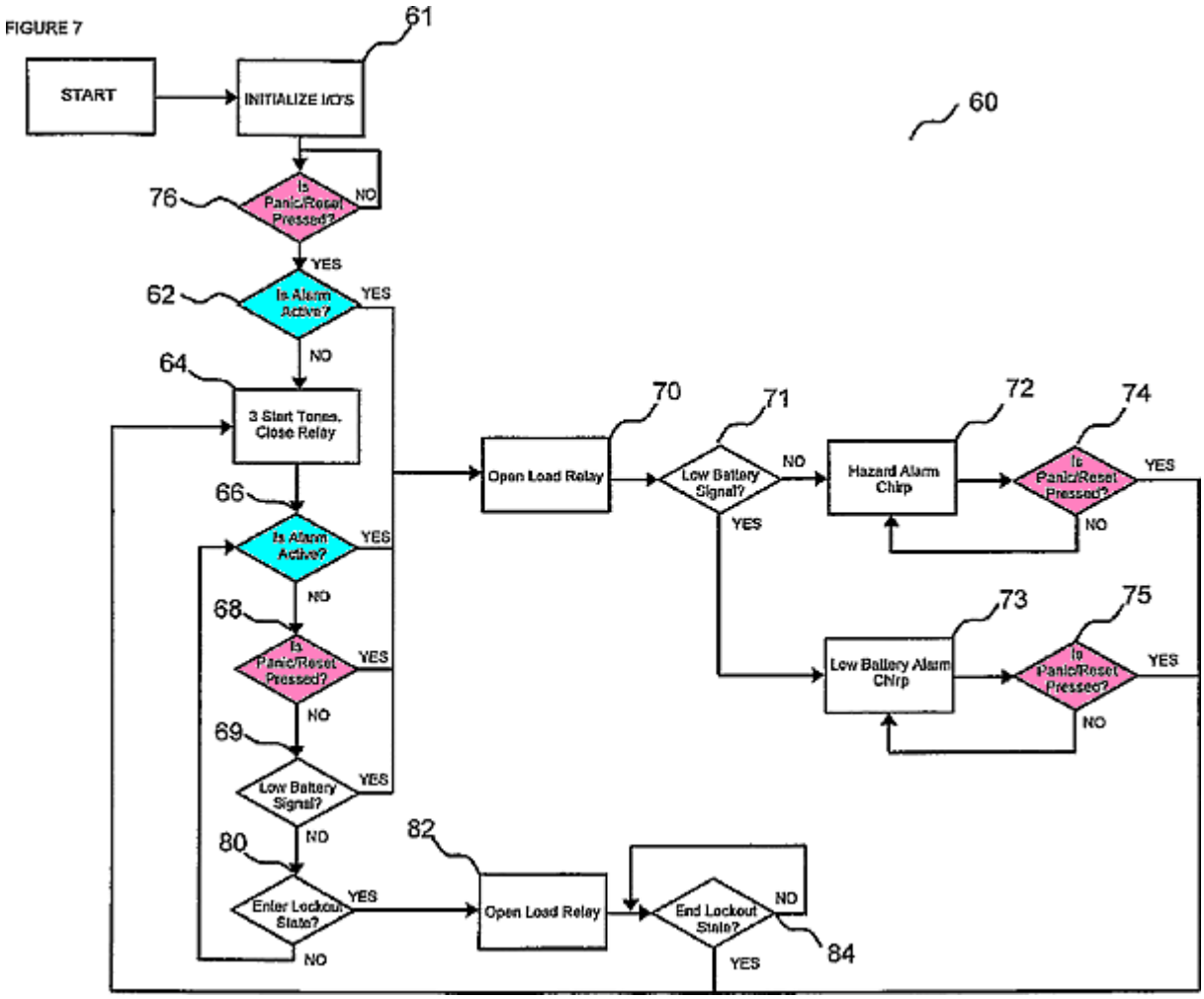


Id. at Fig. 5 (annotated).

iv. Butt

[148]. Butt discloses a microcontroller (i.e., an exemplary form of "control circuit") configured to control the operation of the microwave oven. As explained below, the device taught in Butt may cut power to the appliance that is coupled to the controller, based on the smoke detector detecting smoke or the user's input (i.e., pressing the panic/reset button): "[t]he microcontroller 36 is

programmed with firmware that operates according to the flowchart of FIG. 7. If, pursuant to the algorithm implemented in the firmware, power to the appliance 18 needs to be interrupted, or if the panic/reset button 12 is pressed indicating an emergency notwithstanding smoke not having been detected by the detector 14, the microcontroller 36 sends a signal to the relay driver 42. The relay driver 42 consequently opens a relay 44 and interrupts the AC power Supply to the appliance 18." Ex. 1015 at 5:44-51. This logical flow is summarized in Butt Fig. 7, shown below. The instances at which the microcontroller polls the panic/reset button are highlighted in red; the instances where the microcontroller polls the smoke-triggered alarm are highlighted in blue:



Id. at Fig. 7 (annotated).

v. Emma

[149]. Emma discloses a microprocessor controller (i.e., an exemplary form of "control circuit") that is in operative connection with the refrigerator receptable or first power supply outlet (i.e., "power supply outlet"). Specifically, Emma states in claim 1: "wherein the control processor is configured to enable or disable power to the microwave oven, the first power supply outlet and the second power supply outlet, according to an algorithm in

the control processor…." Ex. 1011 at claim 1. Additionally, Emma also teaches the following: "[c]ontroller 4 may be programmed to manage the power to the components of the system to avoid overload conditions, while minimizing disruptions in the use of an individual appliance." *Id.* at [0030]. Lastly, FIG 3 in Emma, reproduced below, contains a hierarchical block diagram of the system -- specifically the microprocessor and its distribution of power to the respective components of the device.

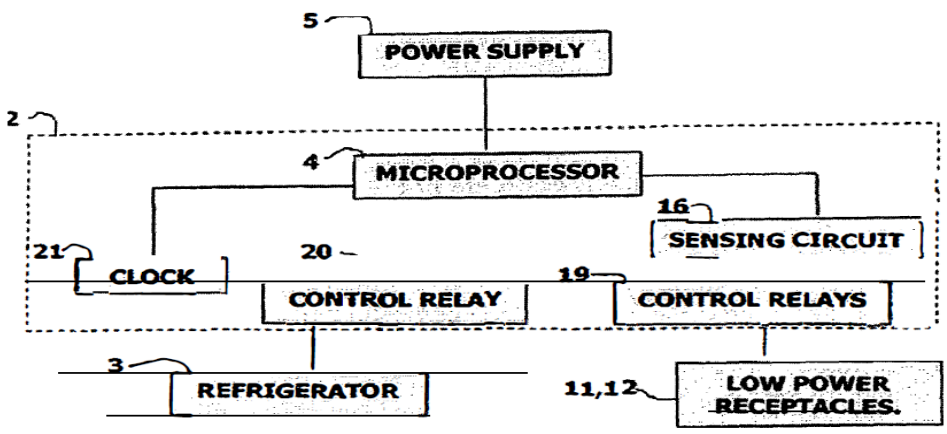


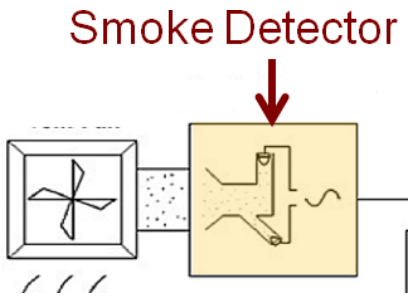
FIGURE 3

c. Smoke Sensor

i. ISDU

[150]. ISDU discloses a smoke sensor positioned in the microwave oven. Specifically, ISDU states that the portion of the design in which "…smoke

detection devices be integrated into range ovens and microwaves, the leading causes of domestic structure fires." Ex. 1012 at 1. Additionally: "We have decided to invest our time and effort towards integrating a smoke detection device into a microwave." *Id.* at 3. ISDU further states, when referring to Figure 4, that "the smoke detection device that will receive a steady influx of air from the cooking cavity." *Id.* at 20. The upper-left-hand corner of ISDU Fig. 4 shows the smoke detector:



Id. at Fig. 4 (upper left-hand corner, annotated).

[151]. ISDU discloses a microwave oven that has interior microwave compartment as the cooking cavity and an interior area adjacent the cooking cavity within the microwave: "First and foremost will be the smoke detection device that will receive a steady influx of air from the cooking cavity." Ex. 1012 at 20.

[152]. The cooking cavity is the region that receives the microwaves from the magnetron and, as a POSITA would have known, the microwaves form

three-dimensional standing waves of reflection to interact with the food. As shown in Fig. 4below, the smoke detector resides in an area interior to the microwave appliance:

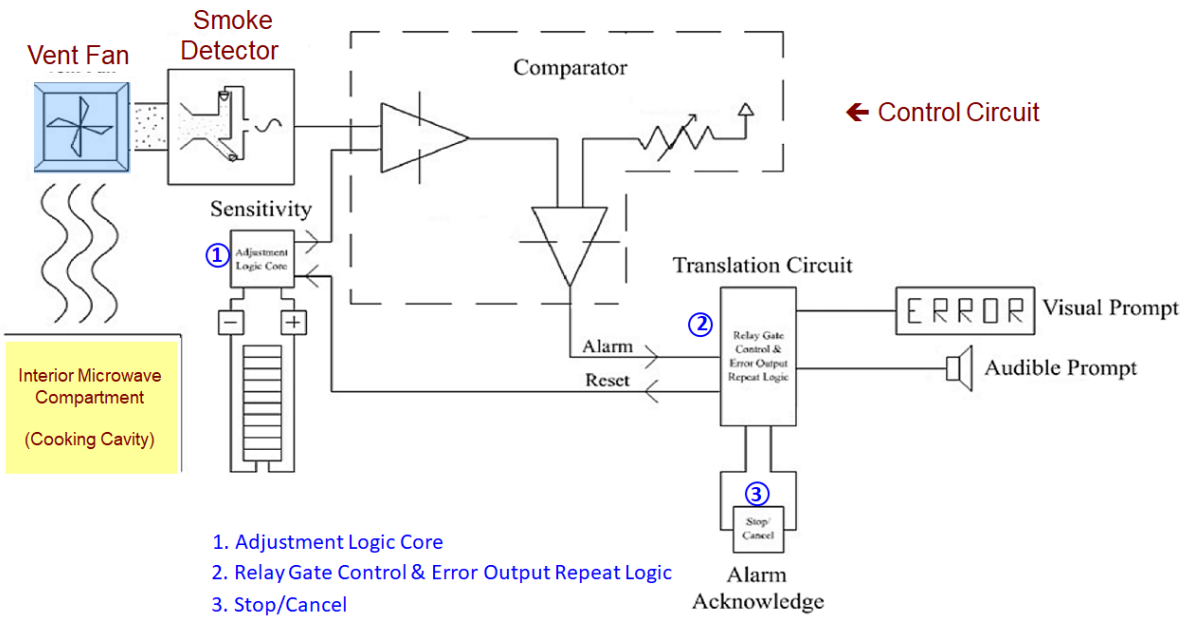


Figure 4

Id. at Fig. 4 (annotated).

[153]. Lastly, ISDU discloses a smoke detection unit in operative connection with a circuit (i.e., "control circuit"). As explained in ISDU, the smoke-detection unit interfaces with the microwave logic to control shutting down the microwave when smoke is detected:

> "When smoke is detected during microwave operation, the device will tum off the microwave and let the user know that the food has begun to smoke or even burn. To do this, we plan to have the smoke detector powered by the integrated low-voltage power supply. Once smoke is detected, we will send a signal that lets a circuit interrupt the power to

the microwave through the use of a 'soft' power-off function already in use by the microwave logic. This will stop the microwave while simultaneously sounding an alarm." *Id.* at pg. 5.

ii. Ueda

[154]. Ueda discloses a microwave oven with an interior area ("cooking cavity"). "Referring now to FIG. 1 [see above], there is shown a microwave oven 10 comprising a housing 11 with a hinged door 12. Magnetron 13 [red] is mounted in a position adjacent an energy radiating duct 14 through which microwave energy is radiated into a heating chamber 15 [yellow] in which foodstuff 16 is placed on a rotating disc 17 driven by a belt-drive system 18. Outside air is drawn by a fan 19 [green] through a filter 20 into the housing 10 to cool the magnetron 13, thence into the cooking chamber 15 through inlet openings 21 provided on a side wall of the chamber. The air inside the chamber 15 is exhausted through a duct 22 defined by side walls 23, a bottom wall having perforations 24 and a top wall having slits with a series of overlapping slats 25." Ex. 1013, 2:4- 17.

[155]. Ueda further discloses a gas/humidity sensor (i.e., "smoke sensor", as further discussed below) wherein the smoke sensor is positioned in the microwave oven: "…the heating apparatus comprises a chamber in which a material to be heated is placed and a heater for heating the material to cause it to

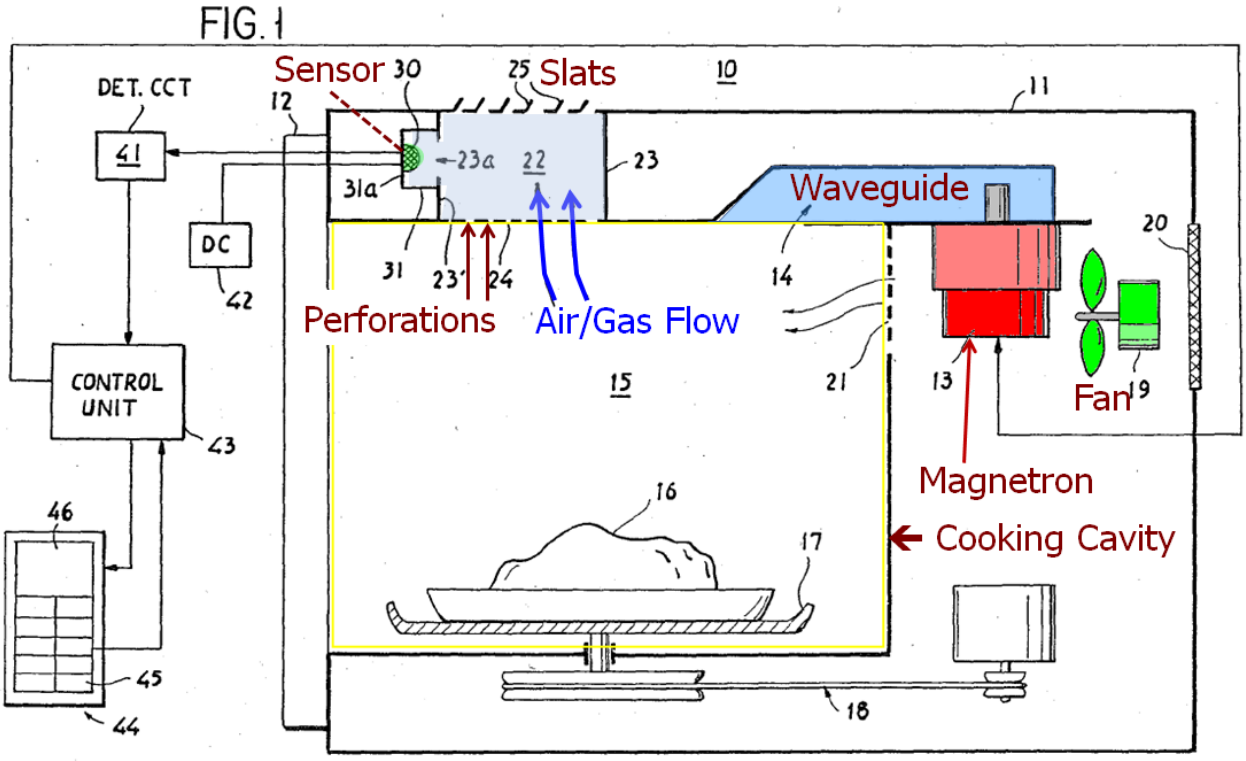
emit a substance in a gaseous state." *Id.* at 1:26-30. Ueda also states that, "The size of perforations 24 and the slits is such that microwave energy does not leak out of duct 22 while permitting a sufficient amount of smoke to escape through them." *Id.* at 2:17-20.

[156]. Ueda discloses the smoke sensor is in an interior area (i.e., inside of) the microwave. As Ueda states, "An enclosure outside of the opening collects gas diffusing from the duct through the opening. A sensor located in the enclosure detects the diffusing substance to de-energize the heater when the sensor develops a voltage indicating a predetermined condition of the heated material." *Id.* at 1:38-44.

[157]. Additionally, as explained below and as shown in Ueda Figure 1 (see below), Ueda discloses sensor 30 that is located within the housing 10 adjacent a duct for receiving gas/smoke:

> "A side wall 23 of the duct 22 [blue] is formed with an opening 23a which is closed by an enclosure 31 on the outside duct 22. A humidity/gas sensor 30 is mounted on a vertical wall 31a of enclosure 31 opposite from opening 23a. Because humidity/gas sensor 30 is located away from the path of the bulk of exhausted moisture-laden laminar airflow, the sensor responds only to the diffusing water vapor or gas; the vapor or gas diffuses at a speed

proportional to the gradient of vapor/gas concentration between duct 22 and enclosure 31. *Id.* at 2:24-34.



Id. at Fig. 1 (annotated).

[158]. Lastly, Ueda discloses a sensor being in operative connection with the control unit (i.e., "control circuit"). As explained below, the sensor may terminate the cooking operation by sending a signal to the control unit:

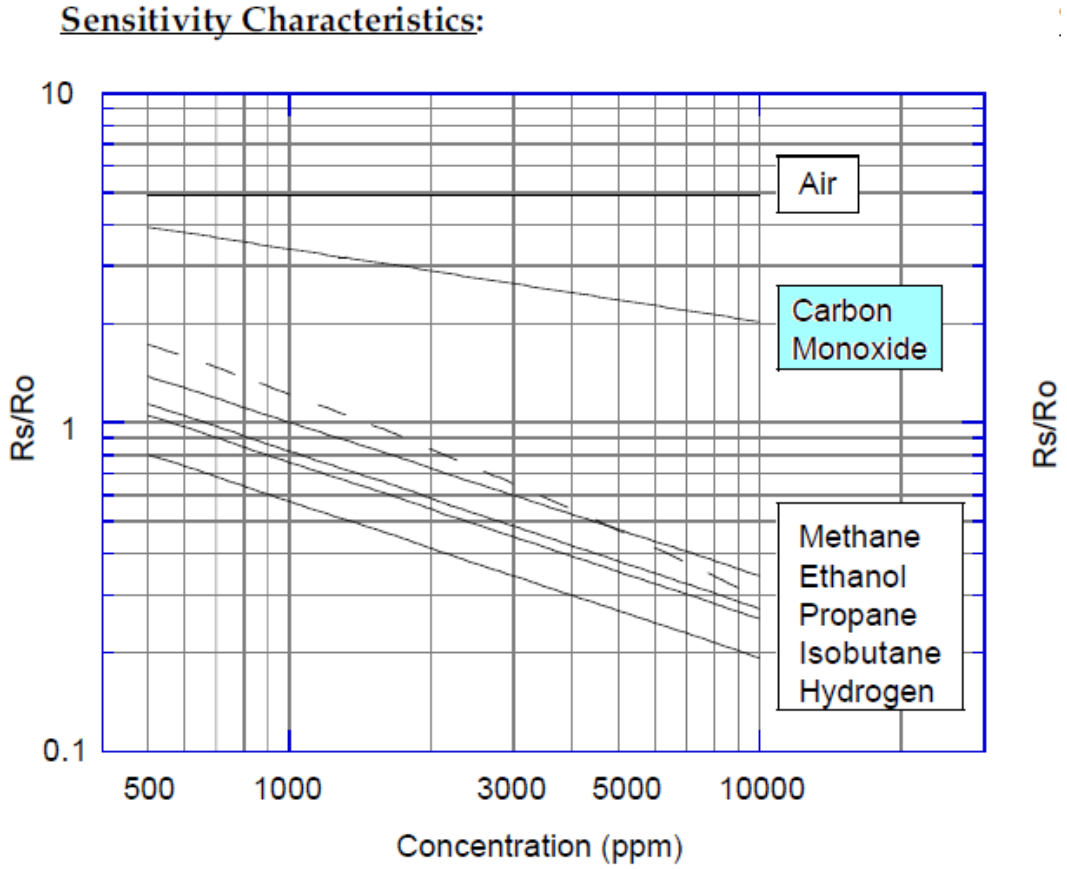
"Returning to FIG. 1, the apparatus further includes a control unit 43 and a data-entry/display panel 44 having a plurality of keys 45 and a liquid-crystal display 46. Control unit receives data from the data-entry/display panel 44 to initiate a cooking operation according to the contents of input data by energizing

magnetron 13 via a driver 47 and further receives an output signal from detector circuit 41 to terminate the cooking operation." *Id.* at 3:9-17.

[159]. To the extent the Board may conclude that Ueda does not expressly show each and every element including, for example, expressly disclosing the claimed smoke sensor, then in my opinion, Ueda inherently teaches this limitation. Ueda discloses that the gas sensor may be an SnO_2 sensor: "[a] further suitable sensor is of a gas sensor composed of SnO_2 which is available from Figaro Engineering Inc. (Japan)." *Id.* at 2:54-56. A POSITA (or any person skilled in engineering or science, as the concept is a basic one) would have known, smoke is a collection of small solid particles plus water vapor and gases such as carbon dioxide, carbon monoxide, or other volatile and involatile gases. Both CO_2 and CO are byproducts of the combustion of organic substances (e.g., food) that produces smoke. Ueda discloses the use of an SnO_2 sensor from Figaro Engineering Inc. This device is also disclosed in Smith which explicitly references the Figaro Engineering Model TGS No. 816 sensor. (Ex. 1014 at 3:13-18). [10] The datasheet for the TGS 816 (Appendix C), published in September 1999, describes this sensor as being "for the detection of Combustible Gases". (TGS-816 Datasheet, title). As shown in the

[10] Smith lists the Figaro sensor as TGS-186, but no such sensor exists. I believe this to be a typographical error in Smith; "186" should be "816".

"Sensitivity Characteristics" plot below taken from the datasheet, the TGS- 816 is capable of measuring carbon monoxide which is a known component of smoke. Thus, the SnO_2 sensor disclosed in Ueda (and in Smith) could detect at least one, if not several, byproducts of smoke-producing combustion:



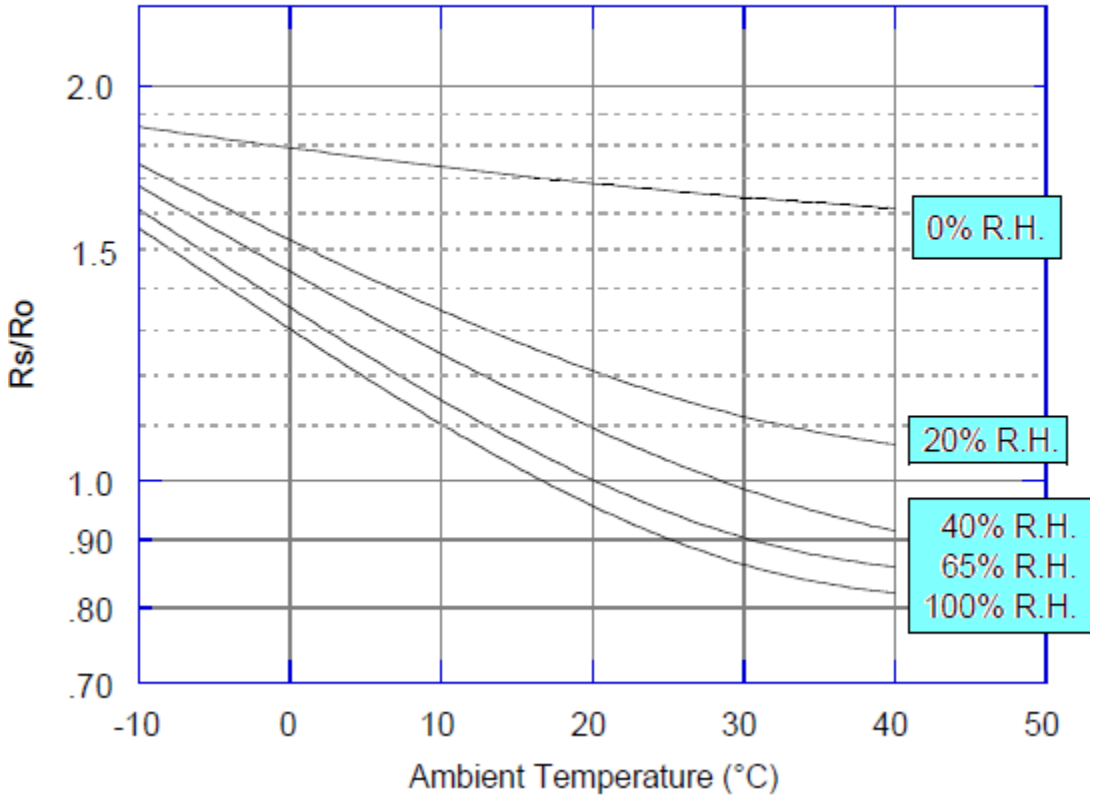
TGS-816 datasheet (Sep. 1999) at (unnumbered) pg. 1.

[160]. As also shown in the above "Sensitivity Characteristics" plot, the TGS- 816 is also capable of measuring methanol, ethanol, propane, and isobutane, which a POSITA would have recognized as volatile organic

compounds. Thus, the SnO_2 sensor disclosed in Ueda (and in Smith) is a volatile organic compound sensor.

[161]. The datasheet for the TGS-816 also provides a "Temperature/Humidity Dependency" plot (see below) showing how the sensor responds to different levels of humidity. This plot confirms that the TGS-816 is capable of measuring humidity as well, another known component of smoke:

Temperature/Humidity Dependency:

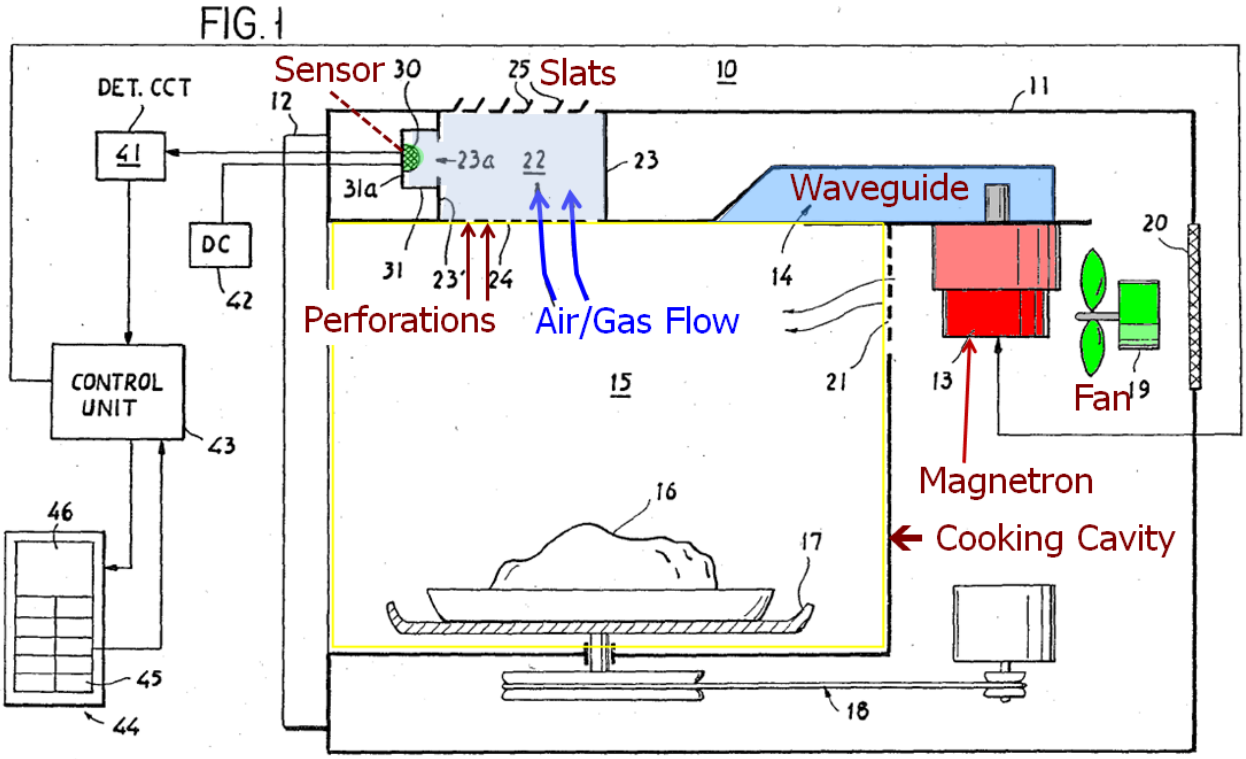


Id.

[162]. Ueda further discloses the perforations 24 and overlapping slats 25

shown in Fig. 1 (provided again below for convenience). These openings in the microwave permit smoke to interact with sensor 30:

> "The air inside the chamber 15 is exhausted through 15 a **duct 22** defined by side walls 23, a bottom wall having **perforations 24** and a top wall having slits with a series of overlapping **slats 25**. The size of perforations 24 and the slits is such that microwave energy does not leak out of duct 22 while **permitting a sufficient amount of smoke to escape through them** [perforations and slits]. The side walls 23 have a sufficient vertical length to produce an upward draft of laminar airflow. The heated foodstuff produces water vapor and gas, which are exhausted through duct 22. A side wall 23' of the duct 22 is formed with an opening 23a."
>
> Ex. 1013 at 2:14-26. (Emphasis added).



Id. at Fig. 1 (annotated).

[163]. Given that Ueda discloses the escape of smoke from the chamber 15 into duct 22, where the smoke then interacts with sensor 30, it is my opinion that sensor 30 in Ueda is a smoke sensor.

[164]. Additionally, because the gases that can be detected by sensor 30 are products of combustion, it is my further opinion that, irrespective of the above, Ueda's gas sensor 30 gas sensor 30 is inherently a smoke sensor.

iii. Smith

[165]. Smith discloses a microwave oven with an interior area, in this case termed the "cooking cavity": "[t]he space inside the outer cabinet is divided generally into a **cooking cavity 24** and a controls compartment 26. Cooking cavity 24 is formed by a top wall 28, a bottom wall 30, side walls 32 and 34, the rear cavity wall being a cabinet wall and the front cavity wall being defined by the inner face 36 of door 22. A shelf 38 of pyroceramic material or other suitable material pervious to microwave energy is provided in the lower region of cavity 24 to support food loads to be heated in cavity 24." Ex. 1014, at 2:44-54 (emphasis added). These features of the microwave are illustrated in Figs. 1 and 2, shown again below:

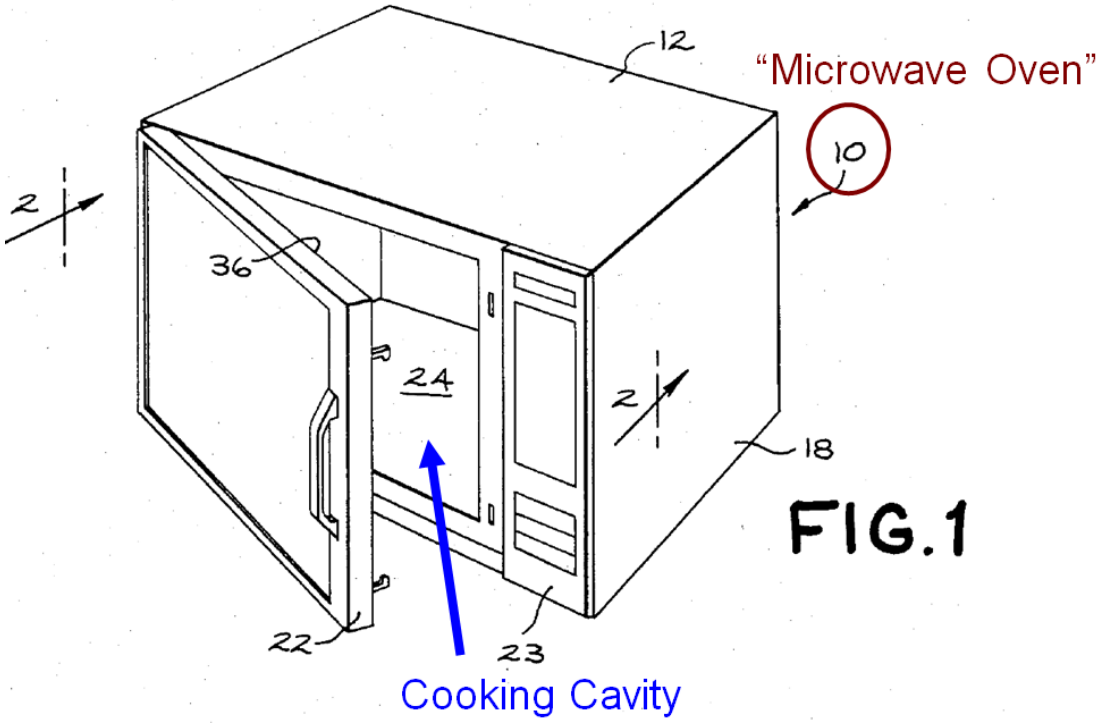


FIG. 1

Id. at Fig. 1 (annotated).

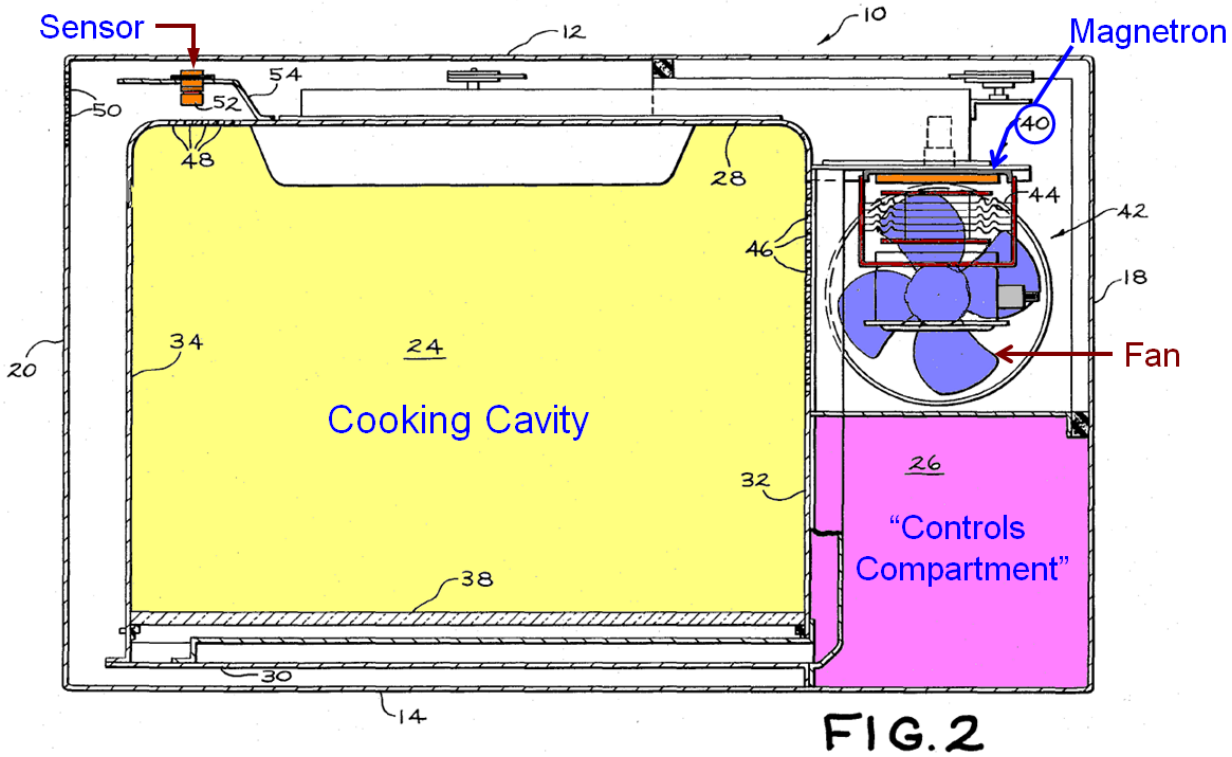


FIG. 2

Id. at Fig. 2 (annotated).

[166]. Smith also discloses gas sensor 52 positioned in the microwave oven. Smith additionally confirms that sensor 52 is used to detect smoke so that the microwave can be shut down in the event of a fire. Firstly, Smith describes the need to detect smoke and explains that smoke will be accompanied by an increase in gas concentration prior to combustion leading to a fire: "However, before actually reaching the ignition point, the food begins to char, **smoke** or smolder, resulting in a second period of relatively **rapidly increasing gas concentration** in the circulating air, comparable to that rate of increase which characterizes the normal cooking period." *Id.* at 3:51-54 (emphasis added). A POSITA would have known, of course, that the "ignition point" described by Smith is the temperature at which combustion is initiated.

[167]. Smith also specifies an exemplary gas sensor in the form of the Figaro Engineering Model TGS No. [186] that is positioned in the microwave oven: "Means for sensing the concentration level of such gases in the air leaving the cavity is provided in the form of a **gas sensor 52** disposed in the air flow path between perforations 48 in cavity wall 28 and vent openings 50 in cabinet wall 20. Sensor 52 is supported proximate perforations 48 by mounting bracket 54 which is suitably secured to cavity wall 28. Sensor 52 in the illustrative embodiment of FIG. 2 is a gas sensor readily commercially available from Figaro Engineering, Inc., identifiable as **Model TGS No. 186**. This sensor

is responsive to the cumulative concentration of water vapor and various organic gases." *Id.* at 3:6-18 (emphasis added).

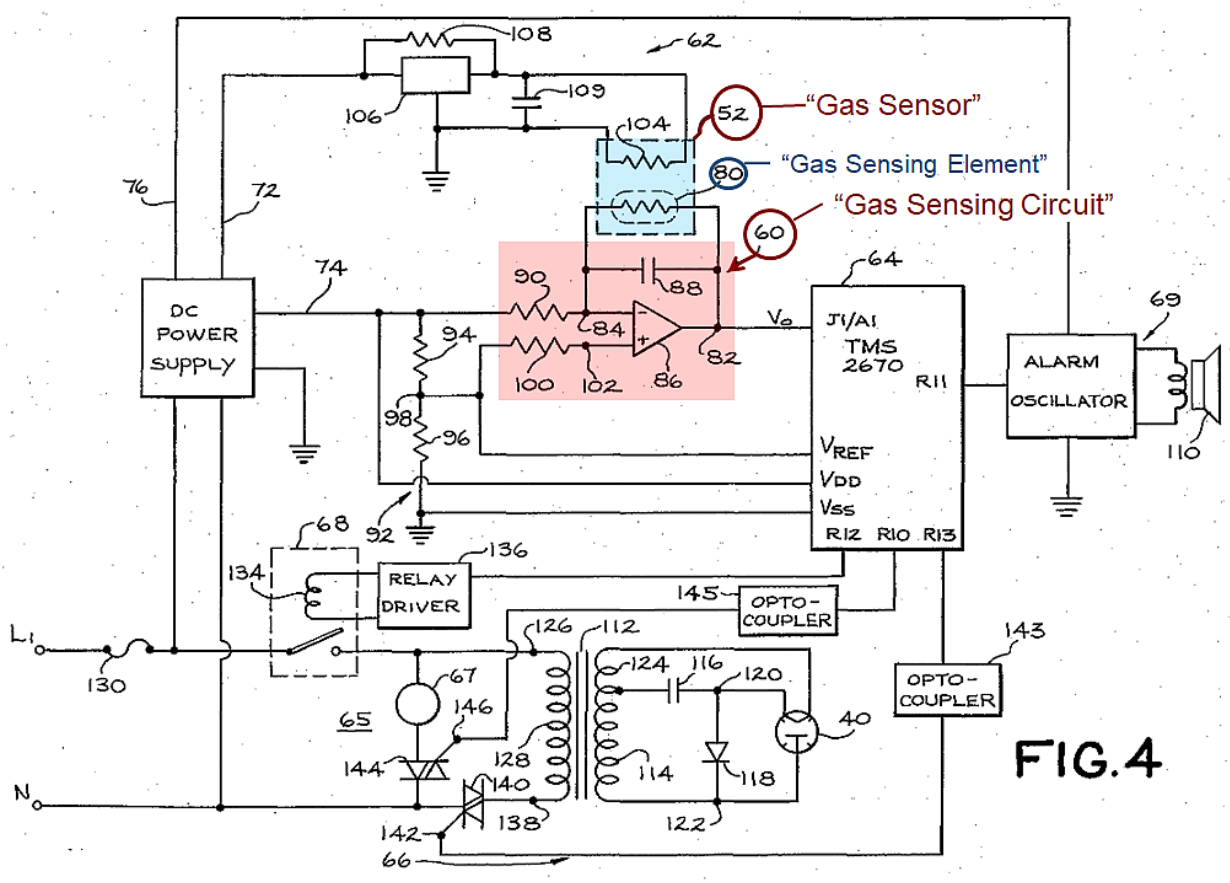
[168]. After reviewing Figaro Engineering's product data sheet for the TGS-861 and Smith's description of sensor 52, I have concluded the Model TGS No. "186" disclosed by Smith was a typographical error that is referring to the Model TGS No. 816 sensor from Figaro Engineering Inc. A data sheet for Model TGS No. 816 is enclosed as Appendix C.[11]

[169]. As discussed above at ¶¶[159-64] in the context of Ueda, the Model TGS No. 816 sensor detects a variety of gases found in smoke; it can also detect changes in humidity. (See "Sensitivity Characteristics" and "Temperature/Humidity Dependency" plots presented in the section on Ueda *supra*. These characteristics of the TGS No. 816 confirm that it functions as a smoke sensor.

[170]. Smith further discloses the gas sensor used for sensing gas concentration inside the microwave oven in operative connection with the microprocessor (i.e., "control circuit"): "Referring now to the simplified

[11] See, for example: *www.environmental-expert.com/products/figaro-model-tgs816-combustible-gas-sensor-725535,* and *www.figaro.co.jp/en/product/docs/tgs816_product_infomation_rev01.pdf*)

schematic circuit diagram of FIG. 4 [shown below], gas sensor 52 is incorporated in a microprocessor-based control arrangement which illustratively embodies the apparatus and performs the method of the present invention. The circuit of FIG. 4 includes a gas sensing circuit 60 for sensing the concentration level of gases in the circulating air as it exits cooking cavity 24 and generating a voltage signal having a magnitude representative of the sensed gas concentration level…" Ex. 1014 at 4:61- 5:3. A POSITA would have recognized that "gas sensing circuit 60" is based on the canonical "difference amplifier" that was well known long before the time frame of Smith. This circuit compares the gas-sensor signal generated in conjunction with "gas sensing element 80" (a gas-sensitive resistor) to a reference voltage V_{REF} produced by the microprocessor:



Id. at Fig. 4 (annotated).

iv. Butt

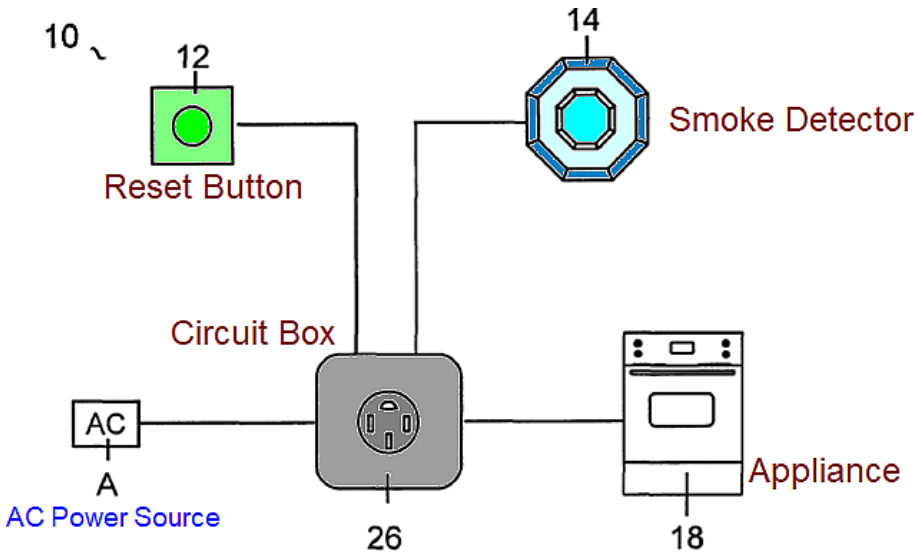
[171]. Butt addresses the problem of fires due to kitchen appliances, which would include microwave ovens: "The National Fire Protection Association reports that between the years 1999-2002, for example, there were 114,000 reported home fires associated with cooking alone." Ex. 1015 at 1:22-25. Butt controls power to an electrical kitchen appliance coupled to a controller, where the Butt system includes a smoke detector, a panic/reset button, and a wireless transmitter. "In the embodiment of FIG. 1A, the system 10 comprises a smoke

detector 14 and a wireless transmitter housed therein (not shown), a panic/ reset button 12 and a wireless transmitter housed therein (not shown), a standard circuit box 26 and a controller 20 housed therein, an AC power source A, and an electric appliance 18." *Id.* at 4:29-34. Each of these elements is shown above in Fig. 1A. The controller 20, to be discussed in more detail below, is shown in Butt Figs. 2 and 6.

[172]. Finally, Butt teaches that its smoke detector is in operative connection to the controller (i.e., "control circuit"). As explained below, if the detector detects smoke, then a signal is sent to the controller to interrupt power to the kitchen appliance: "Upon receiving the signal, the controller interrupts the AC power Supply to the appliance 18 and consequently shuts the appliance 18 off. With the appliance 18 shut off, the energy that would otherwise act as an accelerant for the fire is eliminated, and the progress of the fire is slowed. While the fire is not actively extinguished by the safety shut-off system, by slowing the progress of the fire the system helps to minimize fire damage." *Id*. at 4:53-63.

[173]. Butt provides additional information about the interconnection of its various elements: "Alternatively, in the embodiment shown in FIG. 1B, the controller 20, detector 14, and panic/reset button 12 are all wired together." *Id.*

at 5:3-4. The wiring takes the place of the RF signals 13, 15 illustrated in FIG. 1A. The wiring can be performed by the user alone, by a professional in a completed home, or by a professional during the construction of the home." *Id.*, 5:1-6.



Id. at Fig. 1B (annotated).

d. Shut Down Function

i. ISDU

[174]. ISDU discloses the claimed [Shut Down Function]:

> Our design will work on the principles (sic) that when smoke is detected during microwave operation, the device will temporarily disable microwave operation and let the user know that the food has begun to smoke or even burn. The product, Integrated Smoke Detection

> Unit (ISDU) for commercial microwave ovens, will work in the following way. The presence of particulate during cooking will trigger our device thus sounding an alarm and halting microwave operations. Ex. 1012 at1.

[175]. Additionally, ISDU describes the benefits of an automatic shutdown function include reusing the microwave: "With the introduction of a smoke detection circuit inside the microwave the consumer will be alerted, by a louder more intense alarm, that they have overcooked their food or that there is another cause of smoke inside the microwave. This alarm will not only save the consumer from having to purchase a new microwave but could save their home and their life." *Id.* at Introduction at 3.

ii. Ueda

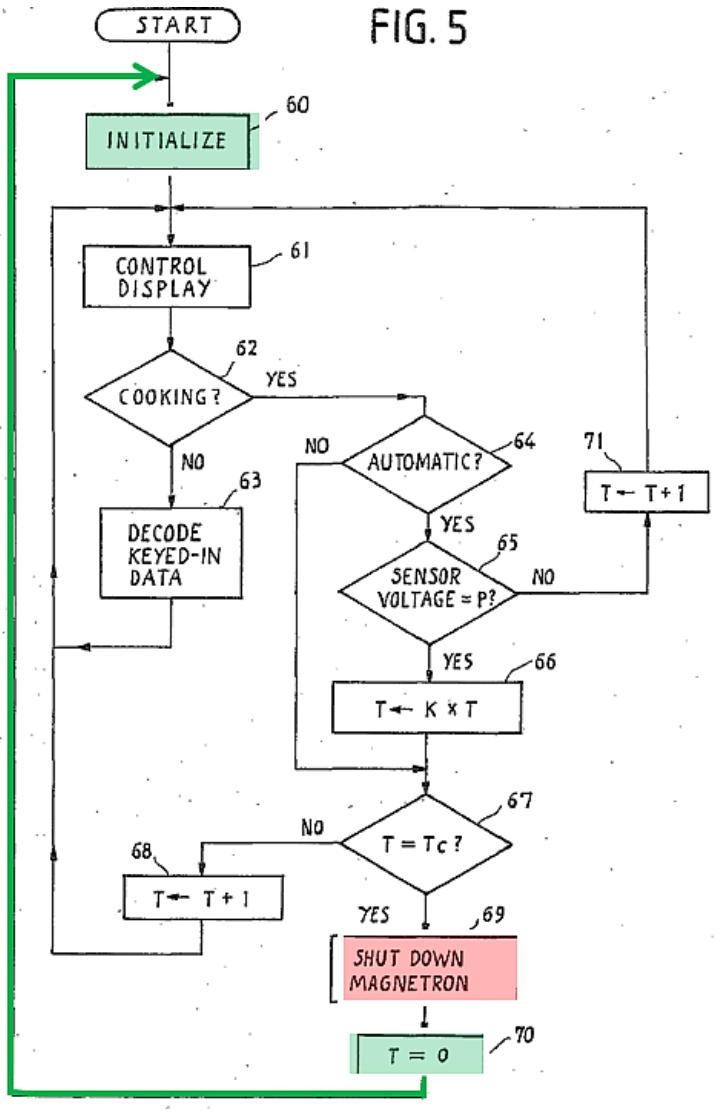
[176]. Ueda discloses that its gas sensor is configured to cause cooking power to be withdrawn from the microwave oven based on the output of the gas sensor. Specifically, Ueda states: "A sensor located in the enclosure detects the diffusing substance to **deenergize the heater** when the sensor develops a voltage indicating a predetermined condition of the heated material." Ex. 1013 at 1:40-44 (emphasis added).

[177]. Further, Ueda discloses that its control unit will stop the cooking operation upon receiving a signal from the detector circuit: "Returning to FIG. 1, the apparatus further includes a control unit 43 and a data-entry/display panel

44 having a plurality of keys 45 and a liquid-crystal display 46. Control unit receives data from the data-entry/display panel 44 to initiate a cooking operation according to the contents of input data by energizing magnetron 13 via a driver 47 and further **receives an output signal from detector circuit 41 to terminate the cooking operation**." *Id.* at 3:9-17 (emphasis added).

[178]. Finally, Ueda discloses that when a certain sensor threshold has been reached, the circuit will withdraw power from the magnetron to shut down the microwave cooking operation: "If the operation is in automatic mode, block 65 is executed by comparing the digitized value of absolute humidity with a predetermined value P. If the latter has not been reached, block 71 is repeatedly executed by incrementing the timer count T by one until the humidity value P is reached in block 65, whereupon control advances to block 66 to multiply the timer count value T by a constant K (which ranges from zero to 3 depending on the material of the foodstuff being cooked). Timer count value T which is obtained by block 71 is compared with a set value Tc which, in the automatic mode, is determined by the material of the foodstuff dictated by the input data. Blocks 67 and 68 are executed repeatedly until K × T becomes equal to Tc. Blocks 69 and 70 follow to shut down magnetron 13, operate buzzer 57 and reset timer count T to zero and allow control to return to block 60." *Id.* at 4:1-17.

[179]. This shutdown feature is further disclosed in Fig. 5, reproduced below. Here the shutdown feature (block 69) is highlighted in red:



Id. at Fig. 5 (annotated).

iii. Smith

[180]. Smith discloses a gas sensor (i.e., "smoke sensor") in operative connection with a microprocessor (i.e., "control circuit") that can cause power

to be withdrawn prior to the gas sensor sensing at least one change in an amount of smoke sensed by the smoke sensor: "Upon detection of a rate of change greater than reference ΔL, (Yes to Inquiry 180) a signal is provided at [microprocessor] output port R12 causing power control relay 68 to open, thereby deenergizing magnetron 40 and the blower motor 67 (Block 182). It will be appreciated that fan motor 67 and magnetron 40 could alternatively be deenergized by inhibiting trigger signals to trigger terminals 146 and 142, respectively, rather than by opening relay 68. The deenergizing of both the magnetron and the blower motor using either technique in effect turns off power to the oven. Also following a Yes to Inquiry 180, a signal is provided at [microprocessor pin] R11 triggering the alarm oscillator circuit 69 into oscillation to provide an audible signal to the user that a fire condition in the cavity is imminent (Block 184). By detecting the occurrence of a rapid increase in the rate of change of concentration level by the hereinbefore described method, magnetron 40 is deenergized prior to the load being heated in the oven reaching its actual combustion temperature, thereby anticipating a potential fire condition and preventing the load from reaching its combustion point." Ex. 1014 at 9:17-39, annotated.

[181]. As explained above, Smith Fig. 5 details the control algorithm implemented by the microprocessor following the detection of a fire in the

microwave oven.

iv. Butt

[182]. Butt teaches a detector (i.e., a "smoke sensor") that, upon sensing smoke, interrupts power to the appliance prior to the full duration of the cooking session as set by the user: "If the detector 14 detects the presence of smoke, then in the wireless embodiment illustrated in FIG. 1 an RF signal 15 is transmitted and is received by the controller 20. Upon receiving the signal, the controller interrupts the AC power supply to the appliance 18 and consequently shuts the appliance 18 off. With the appliance 18 shut off, the energy that would otherwise act as an accelerant for the fire is eliminated, and the progress of the fire is slowed. While the fire is not actively extinguished by the safety shut-off system, by slowing the progress of the fire the system helps to minimize fire damage. In the case of a false alarm, or when the danger posed by the fire has passed, a user can press the panic/reset button 12, which will transmit an RF signal 13 to the controller 20, and the controller 20 will restore the AC power supply to the appliance 18." Ex. 1015 at 4:53-67; 1:34-35

[183]. Butt also makes mention of prior art that "… generally describe systems having a detector for detecting a signal indicative of fire, such as smoke". *Id.* at 1:33-35

[184]. Butt further teaches that after smoke has been detected and an alarm was activated or the panic/reset button was pressed or a low-battery signal was sent to the microcontroller, power to the kitchen appliance is interrupted by way of relay signals: "If the alarm 14 is active, the panic/reset button 12 is pressed, the microcontroller 36 has received the low-battery signal, or if signals 13, 15 are detected immediately following initialization, then a signal is sent to open the relay 44 (block 70) to interrupt the AC power supply to the appliance 18. If the relay 44 is open for a reason other than having received the low-battery signal (determined at block 71), then the micro controller 36 sounds a "hazard alarm' that indicates to the user that power has been interrupted because of a potentially dangerous condition (e.g.: the presence of smoke or because someone has pressed the panic/reset button 12) (block 72). The relay 44 remains open until the panic/reset button 12 is pressed (block 74), following which the microcontroller 36 closes the relay 44 and again enters the loop during which it waits for the smoke detector 14 to detect smoke, for the panic/reset button 12 to be pressed, for the low-battery signal, or for the system to enter a lockout state, as described below (blocks 66, 68, 69 and 80)." *Id.* at 7:4-21.

[185]. Butt further explains that it was previously known to have a safety shut-off system to switch off an electrical appliance upon detecting a signal indicative of fire: "a detector for detecting a signal indicative of fire, such as smoke; a switch that connects an appliance, such as an electric range, to an AC power supply; and a controller that opens the switch upon receiving a signal from the detector." Ex. 1015 at 1:34-37

e. Reset Enable Function

i. ISDU

[186]. ISDU discloses a smoke detection device (i.e., "smoke sensor") configured to reset and re-enable the microwave and smoke detection device after the cooking session was ended due to the [Shut Down Function]. As explained below, acknowledgement of the smoke alarm will reset normal microwave function and reset the smoke detector for further use:

> Triggering the smoke detector will output a number of alarm conditions to alert the user. The alarm state will consist of a suspension of normal microwave functions including the cessation of magnetron operation, a visual alert to be displayed on the integrated microwave LCD, and an audible alert. The latter two prompts will repeat at specified intervals to continuously alert the user to the alarm state and do so until such a time as steps are taken to acknowledge the situation. Acknowledgement of the alarm state will **reinstate all normal microwave functions** and **reset the**

smoke detector circuit for further use.

Ex. 1012 at 8 (emphasis added).

[187]. ISDU discloses a microwave oven resetting at least in part to the condition where the smoke sensor is no longer sensing smoke: "Acknowledgement of the alarm state will reinstate all normal microwave functions and reset the smoke detector circuit for further use." *Id.* at 8.

[188]. Given all of the above, it is my opinion that ISDU discloses the features of microwave oven, control circuit, power-supply outlet, smoke sensor, shutdown function, and reset enable function, and thus anticipates claim 1 of the '206 patent.

ii. Ueda

[189]. Ueda recites the gas/humidity sensor (i.e., "smoke sensor") configured to be reset after the current cooking session to deliver cooking power in the next subsequent cooking session: "Blocks 67 and 68 are executed repeatedly until K × T becomes equal to Tc. Blocks 69 and 70 follow to shut down magnetron 13, operate buzzer 57 and reset timer count T to zero and allow control to return to block 60." Ex. 1013 at 4:13-17. This reset feature is shown by the green block (70) and pathway in Fig. 5 above.

[190]. Additionally, Ueda discloses the microwave being reset at least in part due to the sensor no longer sensing gas/humidity. "Blocks 67 and 68 are executed repeatedly until K × T becomes equal to Tc. Blocks 69 and 70 follow to shut down magnetron 13, operate buzzer 57 and reset timer count T to zero and allow control to return to block 60." *Id.* at 4:13-17.

[191]. Given all of the above, it is my opinion that Ueda discloses the features of microwave oven, control circuit, power-supply outlet, smoke sensor, shutdown function, and reset enable function, and thus anticipates claim 1 of the '206 patent.

iii. Butt

[192]. Butt teaches that a user may press the panic/reset button to restore power to the appliance: "In the case of a false alarm, or when the danger posed by the fire has passed, a user can press the panic/reset button 12, which will transmit an RF signal 13 to the controller 20, and the controller 20 will restore the AC power supply to the appliance 18." Ex. 1015 at 3:63-67. A POSITA would have had no trouble in understanding that "danger posed by fire" would mean that the smoke sensor had originally detected smoke; but afterwards, the appliance may be re-enabled.

[193]. Butt further teaches that the panic/reset button will only restore

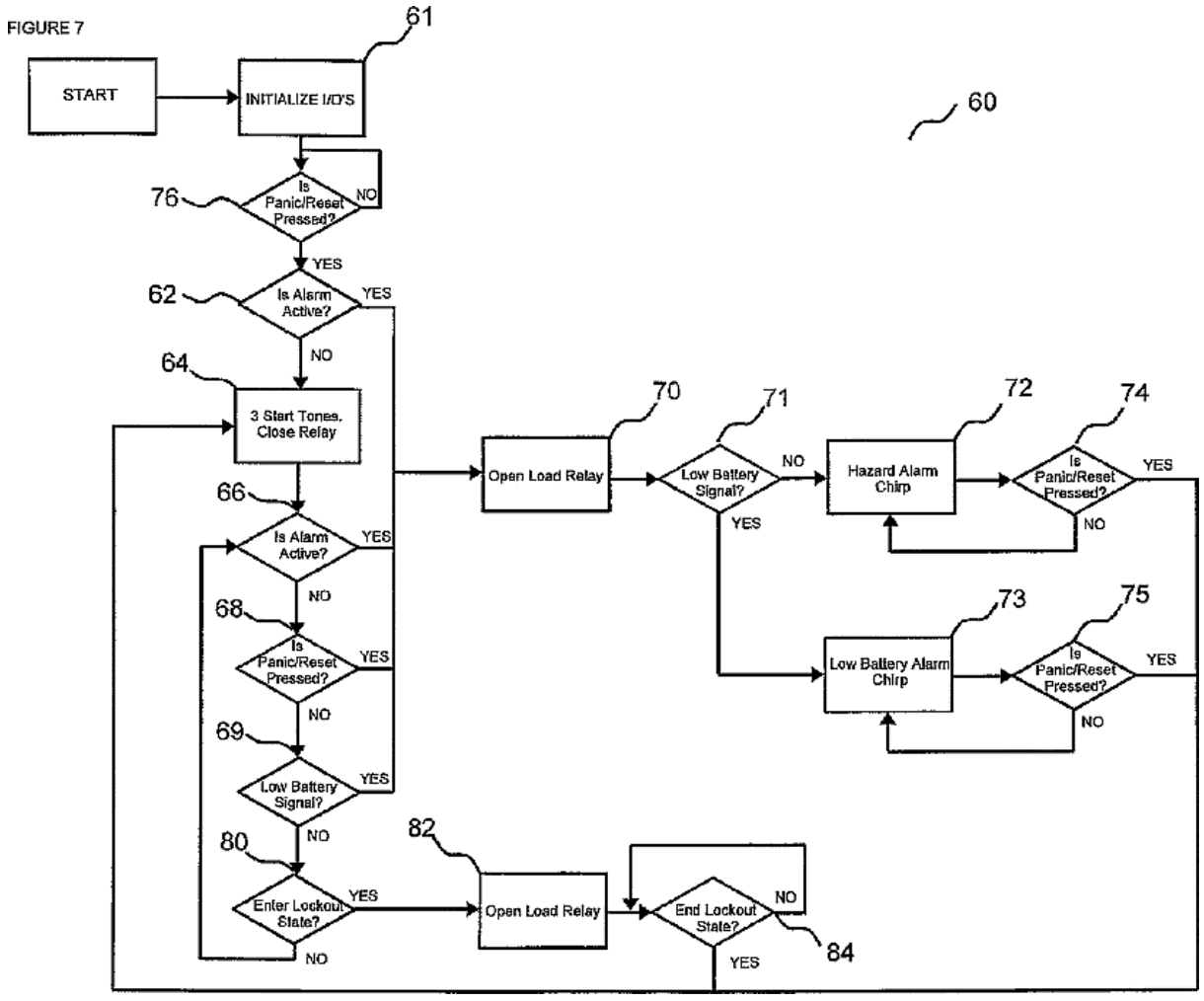
power to the controller associated with itself. As Butt states: " . . . the signal 13 received from one panic/reset button 12 will only restore the AC power supply of the particular controller 20 associated with that specific panic/reset button 12." Ex. 1015 at 5:22-25. Butt also explains the reason why reset is not automatic, specifically the desire to prevent an unattended appliance from restarting itself without human input: "A benefit of waiting for the user to press the panic/reset button 12 before closing the relay 44 (see block 64, discussed below) is that if power to the appliance 18 has previously been interrupted as a result of a power failure, the user may have left the appliance "on" forgetting that, when the power failure ends and power is restored some time later, the appliance 18 could be untended and therefore could create a fire hazard. By requiring the user to press the panic/reset button 12 upon the system starting up, power will be restored to the appliance 18 only at the user's explicit request…" *Id.* at 6:41-51.

[194]. The system of Butt will be capable of reset at least in part when the smoke sensor no longer senses smoke. The microcontroller checks to see if the smoke alarm is still present following a reset attempt: "Following the user's pressing the panic/reset button 12, the microcontroller 36 checks to see whether the smoke alarm 14 is active (block 62). If not, the microcontroller 36 sends a signal to the relay driver 42 to close the relay 44 (block 64), and enters a loop

during which time it simply waits for either the signal 15 indicating that the smoke alarm 14 has detected Smoke or the signal 13 indicating that the panic/reset button 12 has been pressed (blocks 66 and 68)." *Id.* at 6:53-60.

[195]. As shown in the flow chart of FIG. 7, reproduced and discussed in more detail below, Butt further teaches that after smoke has been detected and an alarm is activated -- or, when the panic/reset button has been pressed or, as another alternative, a low-battery signal has been sent to the microcontroller then power to the kitchen appliance is interrupted by way of relay signals and remains interrupted until the panic/reset button is pushed. The device then enters a loop during which it checks for one of the above discussed situations: "If the alarm 14 is active, the panic/reset button 12 is pressed, the microcontroller 36 has received the low-battery signal, or if signals 13, 15 are detected immediately following initialization, then a signal is sent to open the relay 44 (block 70) to interrupt the AC power supply to the appliance 18. If the relay 44 is open for a reason other than having received the low-battery signal (determined at block 71), then the micro controller 36 sounds a "hazard alarm' that indicates to the user that power has been interrupted because of a potentially dangerous condition (e.g.,: the presence of Smoke or because someone has pressed the panic/reset button 12) (block 72). The relay 44 remains open until the panic/reset button 12 is pressed (block 74), following

which the microcontroller 36 closes the relay 44 and again enters the loop during which it waits for the smoke detector 14 to detect smoke, for the panic/reset button 12 to be pressed, for the low-battery signal, or for the system to enter a lockout state, as described below (blocks 66, 68, 69 and 80)." *Id.* at 7:8-21.



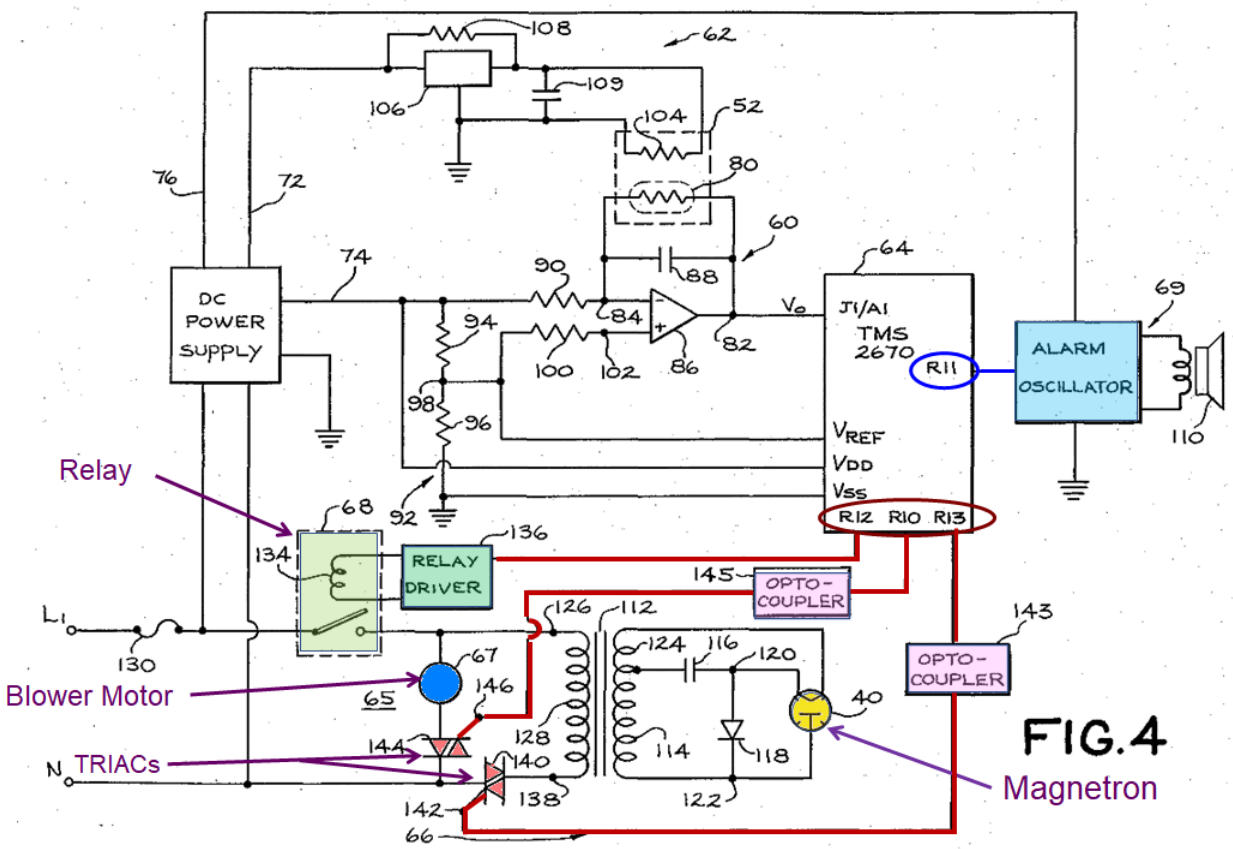
Id. at Fig. 7.

iv. Smith

[196]. Smith discloses the electrical circuit shown in FIG 4 (reproduced below), a portion of which facilitates the microprocessor 64 in disabling power to the microwave magnetron, for example by opening the control relay to remove power from the magnetron: "Upon detection of a rate of change greater than reference ΔL, (Yes to Inquiry 180) a signal is provided at output port R12 causing power control relay 68 to open, thereby de-energizing magnetron 40 and the blower motor 67 (Block 182). It will be appreciated that fan motor 67 and magnetron 40 could alternatively be de-energized by inhibiting trigger signals to TRIAC gate terminals 146 and 142, respectively, rather than by opening relay 68. The de-energizing of both the magnetron and the blower motor using either technique in effect **turns off power to the oven**. Also following a Yes to Inquiry 180, a signal is provided at R11 triggering the alarm oscillator circuit 69 into oscillation to provide an audible signal to the user that a fire condition in the cavity is imminent (Block 184)." Ex. 1014 at 9:17-39 (emphasis added).

[197]. These features of Smith's circuit are highlighted in the annotated version of Fig. 4 shown below. This figure shows the signal pathways by which the disclosed power control relay and TRIAC are electronically controlled by microcontroller 64. The signal to control former is buffered by relay driver 136, whereas the signals to control TRIACs 140 and 144 are transferred via generic

optocouplers 143 and 145:



Id. at Fig. 4 (annotated).

2. THE '206 DEPENDENT CLAIMS (CLAIMS 10 AND 12)

a. Power Supply Outlet

[198]. Emma discloses a power supply outlet on a microwave oven.

[199]. Claim 1 of Emma recites: "a first power supply outlet provided on the microwave oven." Ex. 1011. Further, Emma discloses: "this embodiment consists of two standalone appliances, a refrigerator 3 and a microwave oven 2.

Refrigerator 3 is connected to microwave oven 2 by power cord 7 to refrigerator receptacle 15, shown at the rear of the microwave 2 in FIG. 2." Ex. 1011, at [0026]. Figure 2 from Emma is shown below:

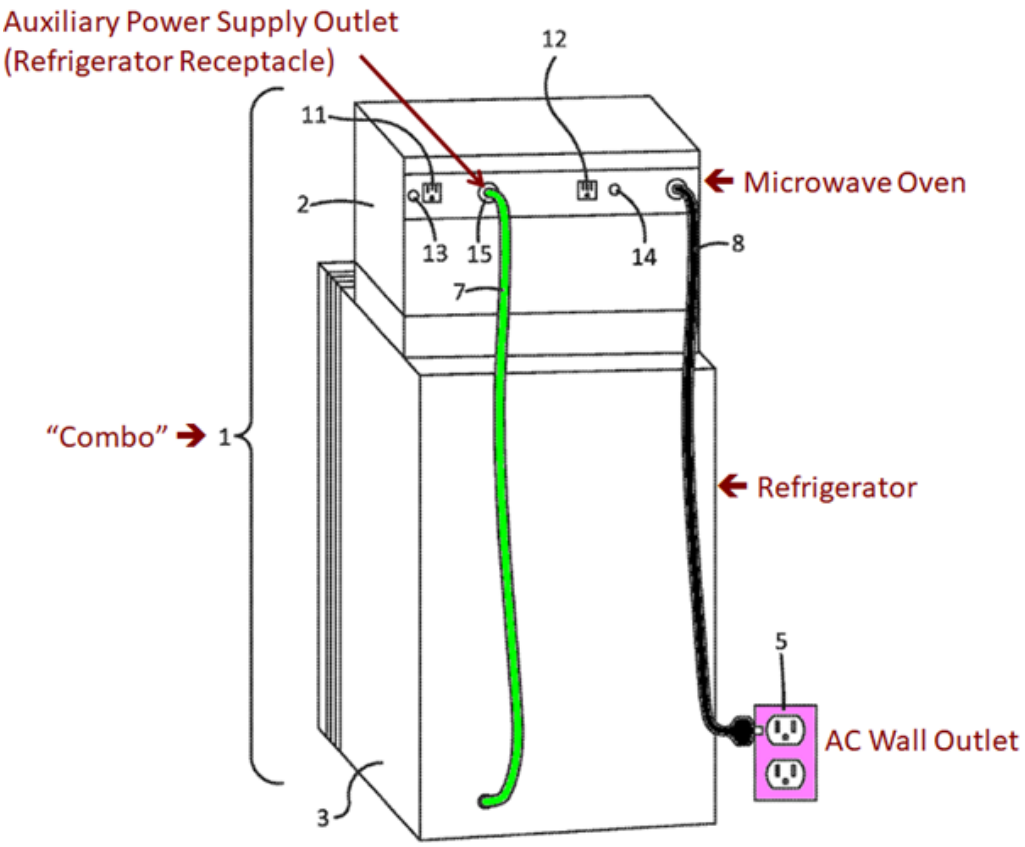


FIGURE 2

Id. at Fig. 2 (annotated).

[200]. Emma also discloses a microprocessor (i.e., "control circuit") that is in operative connection with the refrigerator receptable or first power supply

outlet (i.e., "power supply outlet"). Ex. 1011. Claim 1 in of Emma recites: "wherein the control processor is configured to enable or disable power to the microwave oven, the first power supply outlet and the second power supply outlet, according to an algorithm in the control processor." Ex. 1011. Further, Emma states that, "Controller 4 may be programmed to manage the power to the components of the system to avoid overload conditions, while minimizing disruptions in the use of an individual appliance." Ex. 1011 at [0030]. The control paths from the microcontroller to other parts of the system is shown in Fig. 3, reproduced below:

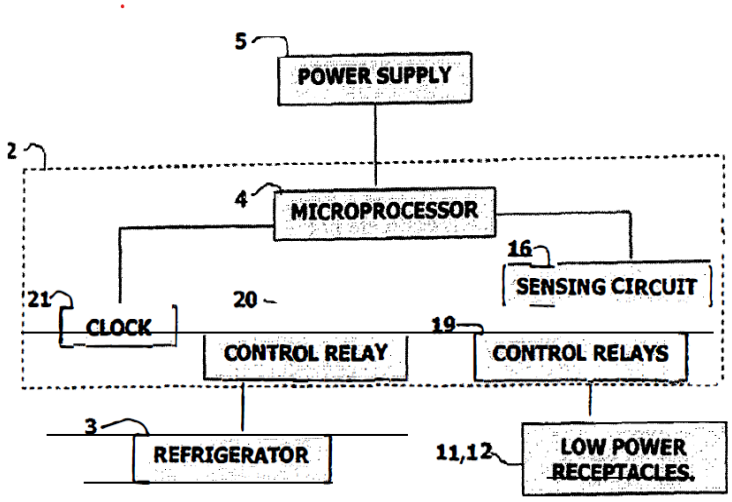


FIGURE 3

Id. at Fig. 3.

b. Refrigerator

[201]. Emma discloses a refrigerator connected to the refrigerator receptacle (i.e., "power supply outlet") on the microwave which itself is connected to a power source. Claim 1 in Emma recites: "a refrigerator connected to the source of power by connection to the first power supply outlet...". Ex. 1011. As shown below the "Refrigerator 3 is connected to microwave oven 2 by power cord 7 to refrigerator receptacle 15, shown at the rear of the microwave 2 in FIG. 2." Ex. 1011 at [0026].

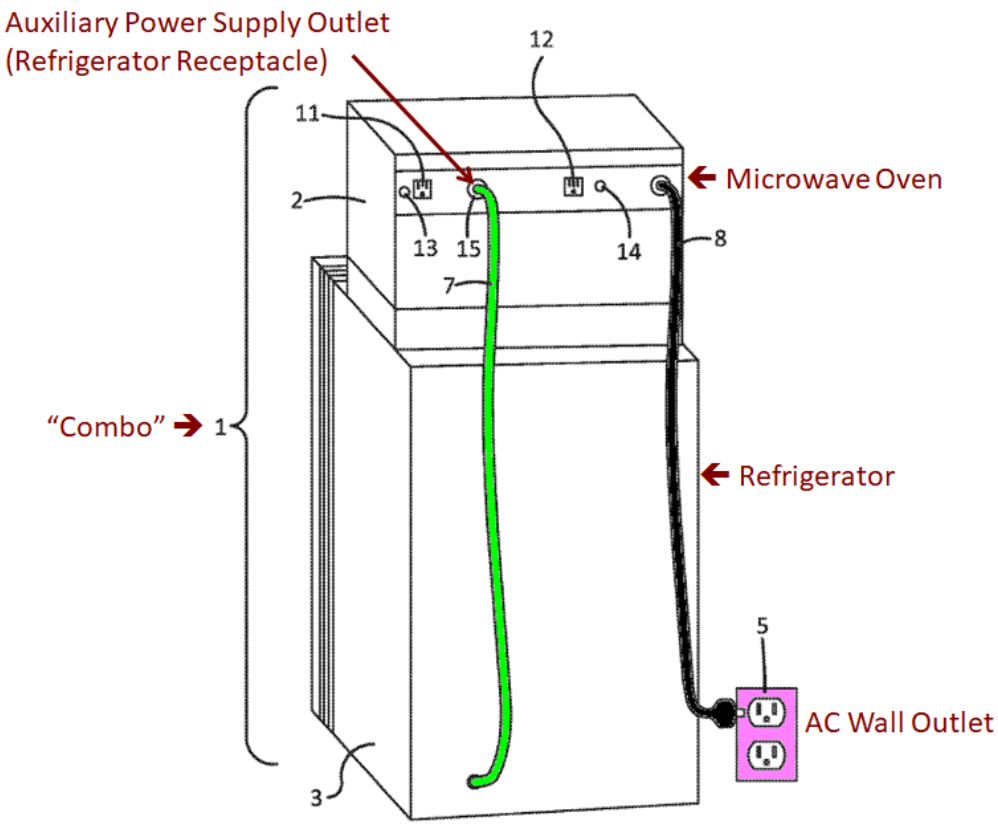


FIGURE 2

Id. at Fig. 2 (annotated).

[202]. Finally, Emma discloses both a compressor and a microwave oven with an interior area: "The appliances (microwave and refrigerator) may be of standard design with features commonly available. The internal components of the appliances are well known and do not need to be described herein." Ex. 1011 at [0026]. Additionally, Emma discloses: "The duty cycle of a refrigerator used in these combined systems includes a current spike that occurs during the first few seconds of operation. This is the startup current for the **refrigerator**

compressor and is considerably reduced, as the compressor obtains its operational speed." Ex. 1011 at [0005] (emphasis added).

c. Withdraw and Deliver Electrical Power

[203]. Emma discloses a microprocessor ("control circuit") which is operative to withdraw power to the refrigerator when the microwave is in use. Claim 1 cited in Emma recites: "wherein the algorithm causes the control processor to: disable the refrigerator and the second power supply outlet, when the microwave demands power." Emma further recites: "Refrigerator 3 is generally subject to control by the microwave microprocessor controller 4 of the microwave oven 2." Ex. 1011, at [0026]. As shown, when the Microwave demands cooking power, it will first disable power to the Refrigerator and the auxiliary outlets in order to provide necessary power to the microwave. As Emma states: "In the embodiment of FIG. 7, priority is given to the power demands of the microwave oven, as indicated above. Use of the receptacles 11, 12, and 15 are, therefore, disabled during microwave operation." Ex. 1011 at [0038].

[204]. As shown in the diagram below of its control circuit (Figure 4), Emma discloses a control circuit providing for digitally operating relays 19, 20 for controlling the low power auxiliary outlets 11, 12 and refrigerator receptacle 15:

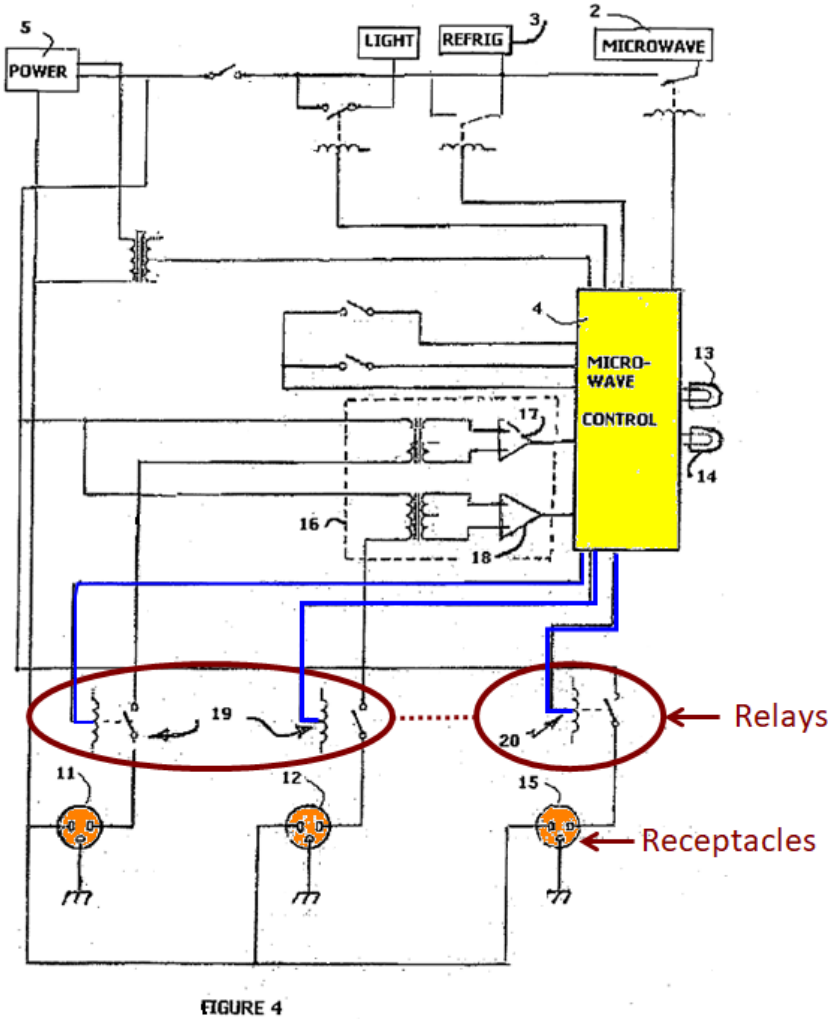


FIGURE 4

Ex. 1011 at Fig. 4 (annotated).

[205]. The microprocessor in Emma (i.e., the "control circuit") enables power to the refrigerator when the microwave is not in use: "Controller 4 may be programmed to manage the power to the components of the system to avoid overload conditions, while minimizing disruptions in the use of an individual appliance." Ex. 1011 at [0030]. The microprocessor also ceases electrical power

to the compressor based on the demands of the microwave oven:

> … The current demands of the microwave 2 are generally the most significant contribution to overload, as shown in FIG. 8. To avoid overload conditions, power to the low power receptacles 11 and 12 and refrigerator receptacle 15 is disabled during microwave operation. If the refrigerator 3 is under power when the microwave 2 is turned on, the power, to the refrigerator is turned off and clock 21 begins to count for a predetermined period during which the compressor of refrigerator 3 cannot be restarted. Ex. 1011 at [0033].

The block diagram if Fig. 3 shows the relationships between the various components it the system of Emma:

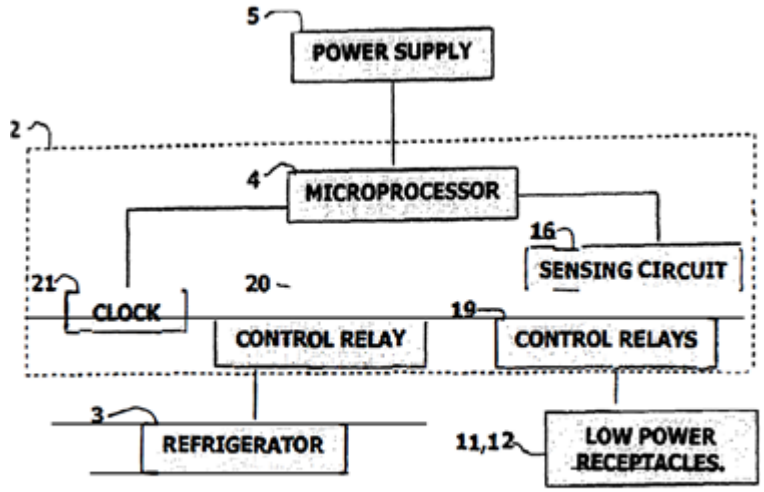


FIGURE 3

Id. at Fig. 3

[206]. Emma also discloses electrical power being made available to the compressor of the refrigerator when the microwave oven is not in use: "A further embodiment of the processor operational model is shown in FIG. 6. In this model, the refrigerator demands power. This may be triggered by a temperature increase in the refrigerator and involve startup of the refrigerator compressor with an associated peak power demand. If the microwave is on, the recycling of the refrigerator will be delayed. If the microwave was on and subsequently cycled off, the clock 21 must be checked to determine if the restart can occur." *Id.* at [0037].

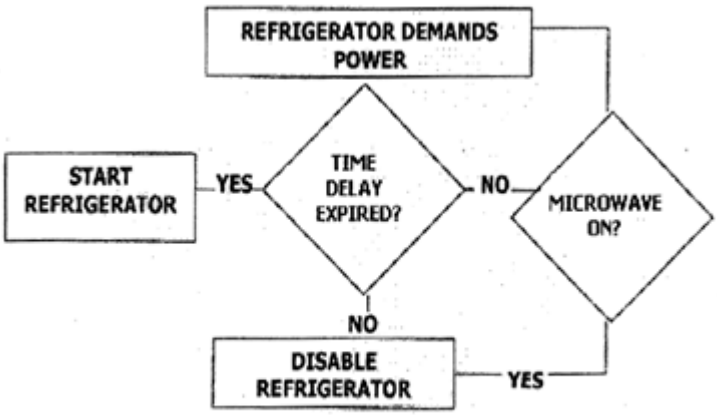


FIGURE 6

Id. at Fig. 6

B. REASONING SUPPORTING OPINIONS ON INVALIDITY OF THE '206 PATENT

1. THE '206 INDEPENDENT CLAIMS ARE ANTICIPATED BY AND/OR ALTERNATIVELY OBVIOUS IN VIEW OF ISDU.

[207]. In my opinion, each of the '206 Independent Claims is anticipated

by and/or alternatively obvious in view of ISDU.

[208]. As discussed in ¶¶[129-31, 141-42, 150-53, 174-75 and 186-88], it is my opinion that ISDU discloses all elements of the '206 Independent Claims and thus anticipates those claims. Should the Board decide the Independent Claims are not expressly or inherently anticipated by ISDU, it would be my further opinion that, at a minimum and alternatively, it would have been obvious to modify the arrangement of the ISDU smoke sensor to position it inside the microwave.

[209]. A POSITA would have understood that the smoke sensor in ISDU would need to be located within the microwave oven which of necessity would need to be a fully self-contained appliance. More importantly, inside the microwave would be the region where the sensor would be well positioned to sense any smoke building up inside the microwave. Thus, if not expressly anticipated by ISDU, the Independent Claims are inherently anticipated by ISDU. *See* Ex. 1012.

[210]. There are numerous reasons why a POSITA would have made a modification to the ISDU appliance so as to position the smoke detection sensor inside the interior of the microwave oven. First, based on the teaching and suggestion provided in ISDU, it would have been obvious to a POSITA to place

the smoke-detection sensor inside the microwave oven, as that is the favorable position for the sensor to detect smoke. In other words, placing the smoke sensor in proximity to the source of smoke (initiating at the food being heated) would have been more likely to lead to quicker detection than a smoke sensor placed outside of the microwave. Additionally, ISDU specifically teaches this approach to smoke sensor placement. Placing the disclosed smoke sensor inside or interior to the microwave would have been a trivial design modification.

[211]. When referring to prior art, ISDU states as follows: "With the introduction of a smoke detection circuit *inside* the microwave the consumer will be alerted, by a louder, more intense alarm, that they have overcooked their food or that there is another cause of smoke *inside* the microwave." Ex. 1012 at 4 (emphasis added). Based on ISDU's teaching and/or the motivation to have the smoke sensor be optimally positioned in a location to detect smoke generated close to its source, a POSITA would have placed, or at least tried to place, the smoke-detection sensor inside the microwave, i.e., in an interior region therein, as opposed to outside/around the microwave. The POSITA would have had a reasonable expectation of success in detecting smoke more quickly compared to attempting to detect smoke using a smoke detector positioned outside the microwave.

[212]. Additionally, it would have been "obvious to try" placing the sensor inside the microwave as opposed to outside/around the microwave oven, as there are only a finite number of identified, predictable solutions (i.e., only two are feasible: inside or outside), with a reasonable expectation for success. ISDU emphasized the market need of the time to prevent fires (as shown in ¶[[96-100] above) but only a finite number of solutions for integrating smoke sensors into microwave ovens. Further, it would have been obvious to integrate any smoke sensor inside a microwave oven to create a commercially integrated package for sale and shipping. A POSITA would have pursued trying to place the smoke detection sensor inside the microwave oven with a reasonable expectation of success which would have been grounded on the disclosures of the prior art.

[213]. Lastly, it would have been obvious to modify any ISDU appliance having its smoke detector outside the microwave by instead physically placing the smoke detection sensor inside the unit. Such a change would have entailed only the substitution of one known element for another (e.g., one of two placement locations for the sensor). Such a substitution would have yielded predictable results, because a POSITA would have chosen to place the smoke detector where it would be most likely to encounter smoke generated by food being heated -- that is inside the microwave -- to obtain a higher sensitivity.

[214]. As discussed above, it was well understood from the art how a microwave oven and a smoke detection sensor work (the smoke detector should be in proximity to the cooking operation to detect the smoke), and a POSITA would have substituted the placement of the smoke sensor inside as opposed to outside/around the microwave oven and would have obtained predictable results.

2. THE '206 INDEPENDENT CLAIMS ARE ANTICIPATED BY AND/OR ALTERNATIVELY OBVIOUS IN VIEW OF UEDA

[215]. In my opinion, all of the Independent Claims are anticipated by and/or alternatively obvious in view of Ueda. As shown in ¶¶[132-33, 143-45, 154-64, 176-79, 189-91], Ueda discloses all the elements of the Independent Claims and thus anticipates those claims.

[216]. Should the Board decide that Ueda does not expressly or inherently anticipate the Independent Claims, then it is my opinion that, at a minimum and alternatively, the Independent Claims are obvious in view of Ueda. A POSITA would have found it obvious to replace the Ueda gas sensor with a sensor specifically labeled as a dedicated smoke sensor -- for example, an SnO_2 sensor for detecting smoke. Ueda on its own teaches and suggests that its microwave/sensor arrangement is designed to receive smoke: "[t]he size of perforations 24 and the slits is such that microwave energy does not leak out of

duct 22 while permitting a **sufficient amount of smoke to** escape through them." Ex. 1013 at 2:17-20 (emphasis added).

[217]. As I have previously opined, a person of ordinary skill in the art would have understood that smoke is a collection of small solid particles, liquid vapor, and gases, such as carbon dioxide, carbon monoxide, and other volatile and involatile gases. *See* ¶[159-62]. It was well understood at the time of filing of the '209 patent that an SnO_2 sensor could be used to detect smoke. As discussed above, the Figaro sensor disclosed in Ueda (and also in Smith) is capable of measuring carbon monoxide, which is a component of smoke, and humidity as well. Thus, the SnO_2 sensor disclosed in Ueda (and in Smith) could detect at least one, if not several, byproducts of smoke-producing combustion. Therefore, a POSITA would have had a reasonable expectation of success by replacing the generic "gas sensor" disclosed in Ueda with an the SnO_2 sensor of Ueda for the detection of smoke. Such a substitution would have had a similar sensor output as the humidity sensor disclosed in the Ueda embodiment as described with reference to FIG. 1. It could have been substituted into the circuit of FIG. 3 as sensor 30 such that the logic flow diagram of FIG. 5 would function similarly in checking for the smoke sensor voltage of block 65.

[218]. Both smoke sensors and the humidity sensor disclosed in Ueda react

to a threshold limit, in that the detection of smoke or humidity above the threshold leads to action by the control circuit (e.g., shutting down the cooking appliance). From a control point of view, this operation would be the same irrespective of whether a smoke or humidity sensor were used for sensor 30, because either type produces a voltage signal representative of the effluent concentration. The control circuit responds to this voltage rising above a known threshold irrespective of what element or gas the sensor is detecting, because the sensor's output will always be a voltage (or a current that the control circuit converts into an equivalent voltage).

[219]. Substituting a known sensor designed to detect the components of smoke for the Ueda humidity/gas sensor would have been nothing more than a substitution of one known element, the smoke sensor, for another, yielding results that would have been predictable to a POSITA. The POSITA could have easily substituted one sensor for another, and the results would have been predictable.

3. THE '206 INDEPENDENT CLAIMS ARE ANTICIPATED BY AND/OR ALTERNATIVELY OBVIOUS IN VIEW OF SMITH.

[220]. In my opinion, all of the Independent Claims are anticipated by and/or alternatively obvious in view of Smith. As shown in ¶¶[134-35,146-47,165-70,180-81,196-97], Smith discloses all the elements of the Independent

Claims and thus anticipates those claims:

[221]. To the extent it is determined that Smith does not explicitly show each and every element of the Independent Claims including, for example, the Reset Enable Function, I believe the Reset Enable Function is inherently disclosed and/or it would have been obvious to modify Smith to include ethe Reset Enable Function. First, based on a teaching suggestion or motivation in Smith, a POSITA would likely have modified Smith to obtain the Reset Enable Function.

[222]. The design of Smith is non-destructive, in that the designed mechanism to shut down the microwave in response to smoke detection is fully reversible. A POSITA would have recognized this fact because Smith's microprocessor-based control circuit shuts down the magnetron either by opening electromechanical relay 68 or turning off TRIAC 140. Shutdown by either or both methods occurs when the sensor detects smoke. As would have been well understood in the art, both types of switches –electromechanical relay or TRIAC – has two states: "on" (conducts electricity) and "off" (does not conduct electricity).[12] As general-purpose switches, these devices are designed

[12] The on/off states of switches such as electromechanical relays and TRIACS are sometimes referred to as "closed" and "open" states, respectively.

to be turned on and off thousands of times, i.e., their on and off states are not permanent. Interrupting the energization of the magnetron by opening either switch would thus be fully reversable by simply closing the switch. This change in state could, in principle, be repeated many, many times with no detrimental effects. This reversable state is in contrast to, for example, the state of fuse 130 shown in Fig. 4. Such a fuse is common, even mandatory, in most electrical appliances to protect the appliance from damage should a component fail or short circuit develop inside the appliance. It is typically connected in series with the L1 input line, as is fuse 130 in Fig. 4. Such a blowout is irreversible, i.e., the fuse must be replaced after the defect inside the appliance is repaired. Relays and TRIACs, however, can be repeatedly switched between on and off states indefinitely for the life of the microwave. It would thus have been understood by a POSITA that the shutdown of the magnetron, via either relay 68 or TRIAC 140 (or both), would not be a permanent shut off of the microwave following the sensor sensing smoke and the microprocessor issuing a shutdown command (at pin R12 or R13).

[223]. Further, Smith teaches that a goal of the Smith smoke sensor is to anticipate fires before they occur. *Id.* at 1:6-9. Resetting the microwave – undamaged upon early detection of a fire in its early stages -- would re-enable the microwave for use again in a subsequent cooking session and would prevent

replacing a costly appliance or scheduling a service call when such replacement or service would not be necessary. Moreover, a POSITA would have understood that modifying Smith to return to a reset state following a shutdown condition and resetting the smoke-detection circuitry would yield an outstanding expectation of success and allow for successive detection of smoke events. Even more so, a POSITA would have understood that a microwave is a commercially sold cooking appliance. It would be problematic to offer for sale a microwave oven that had to be serviced or replaced after just one trip of its smoke detection circuit. Lastly, it would have been "obvious to try" to add a Reset Enable Function as discussed previously, because all of the microwave components disclosed in Smith are non-destructive as I have previously discussed. Thus, there would only be a finite number of potential solutions and conditions for restarting the microwave after the shutdown. A POSITA would have included such a feature with a reasonable expectation of success.

4. THE '206 INDEPENDENT CLAIMS ARE OBVIOUS IN VIEW OF UEDA COMBINED WITH SMITH

[224]. As explained above, it is my opinion that Ueda and Smith each anticipate or as combined with other references render obvious the Independent Claims. Should the Board decide that either Ueda or Smith does not anticipate or render obvious the Independent Claims, under Ground 7, it is my further

opinion that the Independent Claims are obvious in view of Ueda combined with Smith, or Smith combined with Ueda.

[225]. As I have discussed above, the only element that is arguably not expressly described in Ueda is that Ueda's SnO_2 gas sensor is used for sensing smoke. However, Smith discloses using that same sensor for the detection of smoke and subsequent shutting down of the microwave based on its detection. Alternatively, and as discussed above, the only element that is arguably not expressly described in Smith is the Reset Enable Function. However, Ueda discloses enabling the microwave and sensor following an automatic sensor shutdown.

[226]. It would have been obvious to use the described Ueda gas sensor for smoke detection based on the motivation described in Smith to prevent fires, because both Ueda and Smith each use the same or similar sensors, and both are directed toward sensor-based microwave shutdown. Alternatively, it also would have been obvious to use the Reset Enable Function described in Ueda in Smith, because both Ueda and Smith are directed toward sensor-based microwave shutdown. It would thus have been obvious to reinitialize the microwave in Smith following a sensor-induced shutdown as taught by Ueda in order to re-use the Smith microwave as is taught in Ueda.

5. THE '206 INDEPENDENT CLAIMS ARE OBVIOUS IN VIEW OF ISDU, UEDA, OR SMITH, COMBINED WITH BUTT

[227]. In my opinion, each of the '206 Independent Claims is obvious over the following combinations: ISDU with Butt; Ueda with Butt; or Smith with Butt. Because the rationales supporting a conclusion of obviousness based on these combinations are similar, I will discuss them together.

[228]. As discussed above, it is my opinion that the elements of the Independent Claims are fully disclosed or rendered obvious by ISDU combined with Butt, Ueda combined with Butt, or Smith combined with Butt. To the extent it is determined that none of ISDU, Ueda, or Smith explicitly and/or implicitly shows each and every element of the Independent Claims (including, for example, the Reset Enable Function) it would have been obvious to a POSITA to combine any one of them with Butt. Butt teaches a user-enabled reset which can be initiated following detection of smoke by the smoke detector unit. Butt also teaches ceasing the supply of power to the appliance. See ¶[182-85]. The reset function reinitializes the system for further use by checking for a smoke alarm system signal and closing a relay to reconnect the electrical appliance to AC power if no such signal is detected.

[229]. In my opinion, there are numerous reasons why a POSITA would have combined the reset functionality taught in Butt with ISDU or Ueda or

Smith. First, all four of the references Butt, ISDU, Ueda, and Smith relate to sensors used in electrical cooking appliances. Second, as I have explained above, all the claimed elements of the Independent Claims were known in the prior art, and a POSITA would have combined the elements as disclosed by known methods for the purpose of providing Butt's resettable electrical appliance/smoke sensor functionality to either of ISDU, Ueda, or Smith. Such a combination would have yielded nothing more than predictable results to one of ordinary skill in the art. Any inclusion of Butt's smoke-sensor Reset Enable Function into ISDU, Ueda, or Smith would result in such elements merely performing the same function as they do separately, i.e., smoke sensing to subsequently withdraw power from an electrical cooking appliance and then to enable resetting of the electrical cooking appliance after smoke is no longer detected. A POSITA would have recognized that the results of such a combination were predictable, because Butt uses digitally controlled power control circuitry for electrical appliances, based on a sensor input. A POSITA would have considered such an arrangement as being applicable to the electronic controllers of ISDU, Ueda, and/or Smith.

[230]. Third, a POSITA would have been motivated to combine ISDU or Ueda or Smith with Butt based on the teachings of each reference. Specifically, ISDU, Ueda and Smith are each directed towards shutting down a microwave in

response to a smoke sensor output indicative of an unwanted condition. ISDU and Ueda each teach re-enabling the microwave following an automatic sensor shutdown, and Smith inherently teaches a power control relay designed to be power cycled by the controller. *See* ¶ [132]. Butt similarly discloses shutting down electrical cooking appliances in response to receiving a smoke sensor signal, and Butt also discloses resetting the electric power supplied to a cooking appliance following a smoke-triggered shutdown condition and, following that reset, checking for further smoke conditions. It would have been obvious to a POSITA to modify any of the ISDU, Ueda, or Smith microwave appliances to include the Reset Enable Function disclosed by Butt following the clearing of the unwanted condition detected by the smoke sensor in ISDU, Ueda, or Smith. The motivation to do so is provided in Butt, to reset the respective electrical cooking appliances and re-check for smoke conditions with the clear benefit of re-using the microwave. A POSITA would have been able to pursue any of these known potential solutions with a reasonable expectation of success grounded in the disclosures of the prior art.

[231]. Lastly, a POSITA would also have found the asserted combinations of the microwave oven of ISDU or Ueda or Smith with the Reset Enable Function of Butt "obvious to try." As shown in ISDU, Ueda, Smith and Butt, at the time of the invention there was a recognized need in the art to integrate a

smoke sensor into a microwave oven to prevent fires from occurring while cooking. Ex. 1012 at 1; Ex. 1013 at 1:6-16; Ex. 1014 at1:6-40; Ex. 1015 at 1:22-44. Additionally, a POSITA would have been motivated to modify a microwave oven so that, following a smoke-sensor activated shutdown, the microwave oven would be easily re-enabled for cooking. Such a system, as disclosed by the Butt in the context of the [Reset Enable Function], would result in a microwave oven that could be reset without costly replacement or service calls. Further, the potential solutions for continuing to use a microwave oven after the smoke has been eliminated is finite and predictable, i.e., the key action would be resetting the smoke sensor so that it could detect smoke again. A POSITA would have known to modify any smoke-sensor enabled microwave to provide for re-enablement of the microwave after it no longer detected smoke. This modification would have had a reasonable expectation of success grounded on the disclosures of Butt. Ex. 1015.

6. THE '206 DEPENDENT CLAIMS ARE OBVIOUS OVER THE COMBINATION OF EMMA WITH ISDU, UEDA, OR SMITH (WITH THE ALTERNATIVE ADDITIONAL COMBINATION WITH BUTT).

[232]. The Dependent Claims are obvious over the Combination of Emma with, e.g., ISDU, Ueda, or Smith (with the alternative additional combination with Butt). Because the rationales supporting a conclusion of obviousness based on these combinations are similar, I will discuss them together.

[233]. The Dependent Claims each depend from their respective Independent Claims. As discussed above, it is my opinion that the elements of the Independent Claims are fully disclosed or rendered obvious by ISDU, Ueda, and Smith, either alone or in combination with Butt.

[234]. Emma teaches all of the additional elements of the Dependent Claims, i.e., the elements of Power Supply Outlet, Refrigerator, and Withdraw and Deliver Electrical Power:

[235]. Emma is a related parent publication to the '206 Patent that discloses the claim elements discussed above. Emma discloses a microwave oven / refrigerator combination with a power control scheme to prevent an electrical overload of the combined devices: "A combination microwave and refrigerator system is constructed having a single plug input supply." (Emma, Abstract); and: "The current to the low power receptacles and the refrigerator is controlled … to avoid overload conditions. *Id*. It is thus my opinion that the combination of Emma with ISDU, Ueda, and Smith either alone or in combination with Butt teaches all of the elements of the Dependent claims.

[236]. There are numerous reasons why a POSITA would have combined Emma with each of ISDU, Ueda, or Smith, or alternatively, with ISDU, Ueda, or Smith plus Butt. First, all the claimed elements were known in the prior art,

and a POSITA would have easily combined these elements as claimed using known methods. And, doing so would not have resulted in any changes to their respective functions. Thus, the combination would have yielded nothing more than predictable results to one of ordinary skill in the art. While Emma fails to recite shutting down a microwave based on a signal from a smoke sensor, Emma does disclose adding functionality to appliances by cycling power to a refrigerator and auxiliary electrical outlets for the purpose of improving the safety of the Emma appliance (preventing overload conditions). Emma's teaching would motivate a POSITA to look to further microwave functionalities, including those in ISDU, Ueda, or Smith.

[237]. Each prior-art reference also addresses safety or other shutdown conditions for use in electrical cooking appliances to provide added functionality. Additionally, ISDU, Ueda, and Smith explicitly relate to features added to microwave ovens. It would have been obvious to a POSITA to combine the additional microwave oven safety features of any one of ISDU, Ueda, or Smith to the Emma microwave/refrigerator combination appliance to provide the added microwave features discussed in any of ISDU, Ueda and Smith. Further, it would also have been obvious to a POSITA to modify any one of ISDU, Ueda, or Smith with the features of Emma's microwave / refrigerator combination for the purpose and convenience of having an "all-in-

one appliance". This would be in addition to the added safety feature of managing total power draw, as is taught by Emma.

[238]. Similarly, if it is determined that the combinations of ISDU, Ueda, or Smith with Emma fail to teach all of the claim limitations of the Dependent Claims, it would, in my opinion, have been further obvious to a POSITA to combine the [Reset Enable Function] of Butt with Emma (or with any of ISDU, Ueda or Smith, as discussed above). As I have previously explained, Butt and Emma are both directed generally to electrical cooking appliances, and it would have been obvious to a POSITA to incorporate the added safety features of Butt's smoke-detector shutdown device into Emma for the purpose of preventing fires as disclosed by Butt.

[239]. Each component of the combination would have performed the same function as it would have done separately. Thus, the results of using a smoke-detector electrical shutoff device for a cooking appliance with the Emma microwave/refrigerator would have been predictable to a POSITA, because the safety design considerations for the combination of a microwave oven and refrigerator were well understood and would have yielded predictable results.

[240]. The Dependent Claims are also obvious, because a POSITA, faced with the problem described in ISDU or Ueda or Smith or Butt, would have had

good reason to try various combinations of these latter references with Emma. A POSITA would have found these combinations obvious to try, because each of these cooking-appliance references separately addresses the issue of either appliance safety or the detection of smoke and gases from electric cooking appliances. A POSITA would have known to pursue any of these known potential solutions with a reasonable expectation of success grounded on their successful use in the prior art.

[241]. As explained above, ISDU, Smith, and Butt are generally directed toward electric cooking appliances with attention given to the issue of fire safety in such appliances. As explained above *supra,* the Title and Abstract of ISDU disclose an "integrated smoke detector unit" for "range ovens and microwaves, the leading causes of domestic structure fires" (Ex. 1012 at 1). Smith similarly addresses "**improvements …** to an arrangement for anticipating the occurrence of combustion in the cooking cavity of a microwave oven." *Id.,* 1:6-9; (emphasis added), while Butt discloses, "A controller for a …system that interrupts a supply of electricity to an electrical appliance upon detecting a trigger, such as smoke." (1:15-18). Ueda similarly describes methods to detect gasses and vapors from foodstuff. As I have discussed above, a POSITA would also have known these gasses and vapors to be components of smoke from unwanted combustion. *See* ¶[216-19].

[242]. A POSITA would thus have been motivated to combine ISDU, Ueda, or Smith with Emma, either alone or with Butt, based on the teachings in each of these references, and there would have been a reasonable expectation of success in doing so.

X. OPINIONS ON INVALIDITY OF THE '374 PATENT

[243]. In my opinion, all of the features and elements of the '374 Challenged Claims were well known in the art as of the Effective Filing Date. In performing my analysis, I have considered and cited only references that are prior art to the '374 patent.

A. THE PRIOR ART REFERENCES TEACH ALL OF THE ELEMENTS OF THE '374 CHALLENGED CLAIMS

1. THE '374 INDEPENDENT CLAIMS (CLAIMS 9 AND 17)

[244]. As discussed above, claims 9 and 17 of the Challenged '374 claims contain the same basic elements of the Microwave Oven, Control Circuit, plus a Smoke Sensor, Shutdown Function, and Reset Enable Function described previously with respect to the '206 Patent. The teachings of those elements are described above in ¶[128-97] and are incorporated herein by reference. To the extent there are differences between the '206 Independent Claims and the '374 Independent Claims, the following additional teachings of the prior art are relevant:

a. "'374 Smoke Sensor" or "Smoke Sensor"

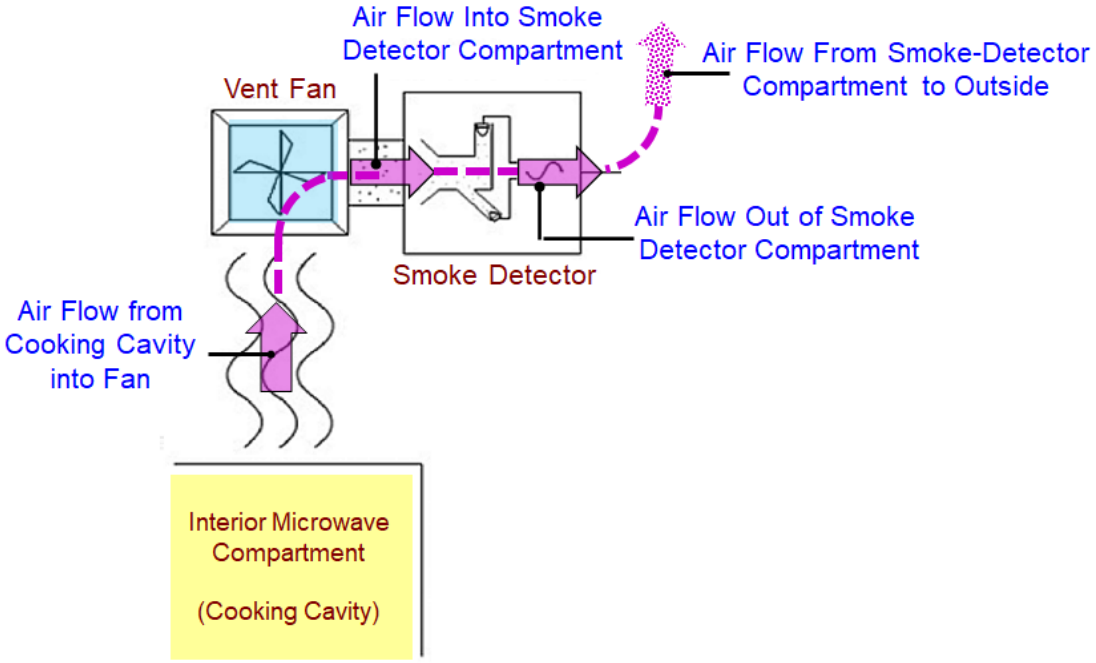
[245]. Claim 9 recites "a smoke sensor, wherein the smoke sensor is positioned in an air passage that extends between a cooking area inside the microwave oven and air outside the microwave oven, wherein the smoke sensor is in operative connection with the control circuit…" Claim 17 recites "wherein the microwave oven includes an interior area, wherein the microwave oven includes an air passage that extends between the cooking area and outside the microwave oven, a smoke sensor, wherein the smoke sensor is positioned in the air passage,"

[246]. As noted above, the elements of the '206 Smoke Sensor are discussed with reference to the '206 Challenged Claims and are incorporated by reference into this section. Only additional teachings related to the position of the smoke sensor (i.e., "positioned in an air passage that extends between a cooking area inside the microwave oven and air outside the microwave oven") are further discussed here.

i. ISDU

[247]. As shown in FIG. 4, ISDU discloses a microwave oven that has an interior microwave compartment as the cooking cavity and a smoke detector positioned in an air passage that extends between a cooking area inside the microwave oven and air outside the microwave oven "First and foremost will be the smoke detection device that will receive a steady influx of air from the

cooking cavity." Ex. 1012 at 20. ISDU explains the following: "As food within the microwave is heated past the smoking point, the particulate released into the air will be transferred to a secondary housing, via a small fan, containing the smoke detection unit." *Id.* at 20. The figure below depicts just the left-hand side of ISDU Fig. 4. (The portions showing the control circuit have been omitted). Shown is the path of the air flow out of the cooking cavity, through the vent fan, into the smoke detector, and to the outside air:



Id. at Fig. 4 showing air-flow portions only. The control circuit has been omitted (emphasis added).

[248]. ISDU specifically states that "…smoke detection devices be integrated into range ovens and microwaves, the leading causes of domestic

structure fires." *Id.* at 1. "We have decided to invest our time and effort towards integrating a smoke detection device into a microwave." *Id.* at 3. Additionally, ISDU, when discussing Figure 4 (reproduced above), explains that "the smoke detection device that will receive a steady influx of air from the cooking cavity." *Id.* at 20.

[249]. As shown in FIG 4, the smoke detector is integrated into the microwave, i.e., positioned in an air passage that extends between a cooking area inside the microwave oven and the air outside the microwave oven. The complete Fig. 4, previously presented, shows that the smoke detection unit is in operative connection with the circuit (i.e., "control circuit"). As explained by ISDU, the integrated smoke detection unit interfaces with the microwave logic to control shutting down and alerting the user. ISDU specifically states that:

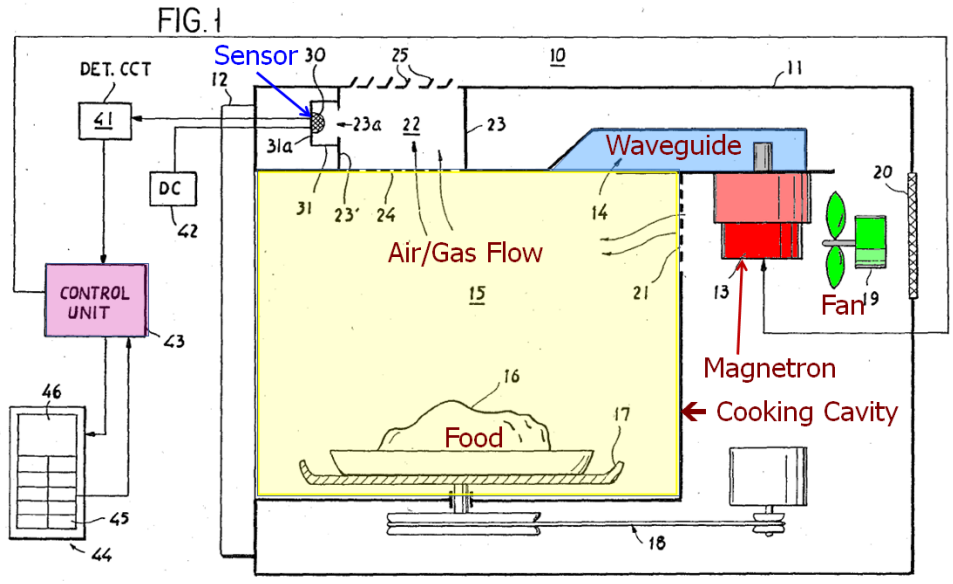
> …we plan to have the smoke detector powered by the integrated low-voltage power supply. Once smoke is detected, we will send a signal that lets a circuit interrupt the power to the microwave through the use of a 'soft' power-off function already in use by the microwave logic. This will stop the microwave while simultaneously sounding an alarm.

Id. at 6.

ii. Ueda

[250]. Ueda discloses a microwave oven that has an interior microwave

compartment as its cooking cavity plus a gas sensor 30 positioned in an air passage, e.g., duct 22. This duct extends between the cooking area inside the microwave oven and the air outside For example, as shown in Fig, 1 below, the microwave includes a housing 10, and a gas sensor 30 is located within the housing 10 but outside of the heating chamber 15 within a duct 22 extending between the heating chamber ("cooking cavity") and the air outside (e.g., the area surrounding housing 10 is connected to duct 22 through overlapping slats 25; the sensor 30 is thus positioned in an air passage that extends between the cooking area inside the microwave and the air outside the microwave.



Id. at Fig. 1 (annotated) showing microwave 10 with air flow from the cooking cavity into duct 22 where gas sensor 30 is located.

[251]. The gas sensor 30 is mounted in a position to detect the concentration of gases inside the microwave housing 10:

> A side wall 23 of the duct 22 is formed with an opening 23a which is closed by an enclosure 31 on the outside duct 22. A humidity/gas sensor 30 is mounted on a vertical wall 31a of enclosure 31 opposite from opening 23a, Because humidity/gas sensor 30 is located away from the path of the bulk of exhausted moisture-laden laminar airflow, the sensor responds only to the diffusing water vapor or gas; the vapor or gas diffuses at a speed proportional to the gradient of vapor/gas concentration between duct 22 and enclosure 31.

Ex 1013 at 2:25-34.

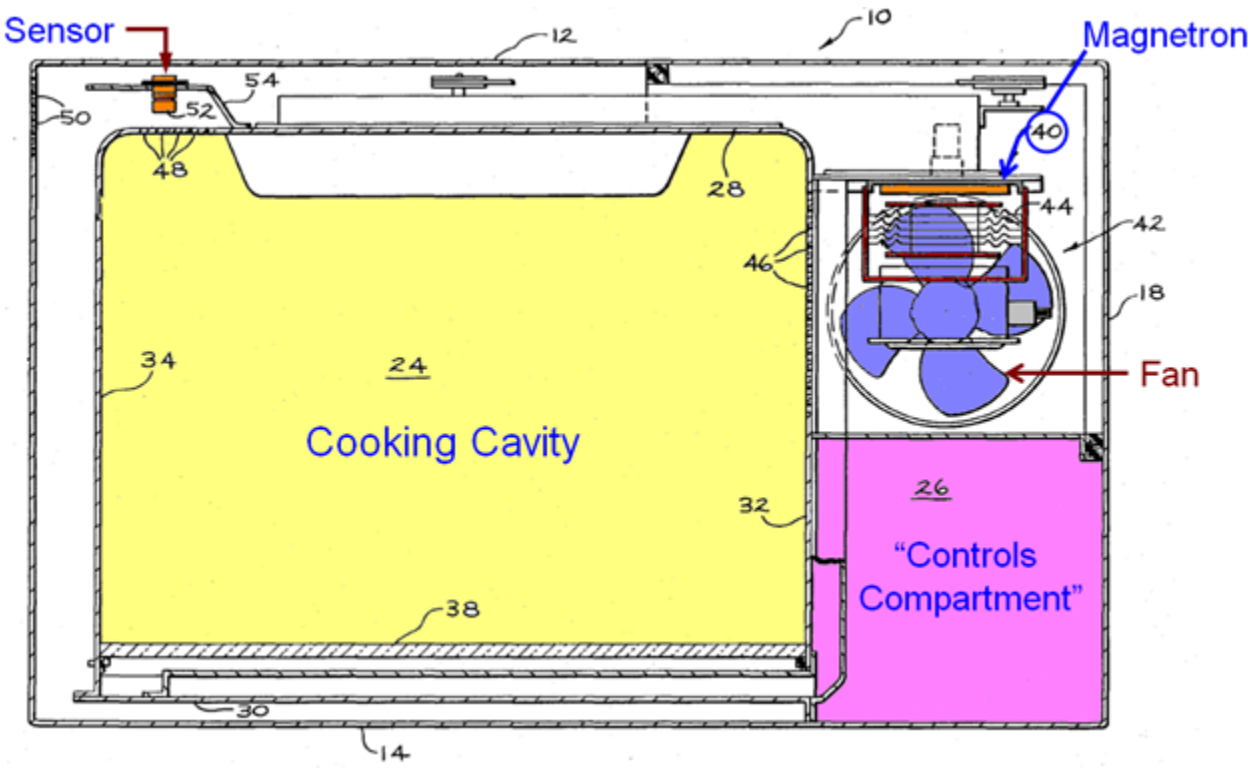
iii. Smith

[252]. Smith discloses a microwave oven that has an interior microwave compartment as its cooking cavity, a gas sensor (i.e., "smoke sensor") positioned in an air passage that extends between the cooking area inside the microwave oven and the air outside the microwave oven, both operating in connection with a microprocessor (i.e., a "control circuit"). Referring to Smith Fig. 2 below, which is a schematic view from the rear of the microwave oven, Smith discloses a gas sensor 52 (i.e., "smoke sensor") positioned in the exterior of the cooking area 24 in an air passage (the space between perforations in the cavity wall 48 and the vent opening 50) that extends between the cooking area inside the microwave oven 24 and the air outside of the microwave oven:

> Means for sensing the concentration level of such gases in the air leaving the [cooking area] cavity is provided in the form of a gas

sensor 52 disposed ***in the air flow path between perforations 48 in cavity wall 28 and vent openings 50 in cabinet wall 20. Sensor 52 is supported proximate perforations 48 by mounting bracket 54 which is suitably secured to cavity wall 28.*** Sensor 52 in the illustrative embodiment of FIG. 2 is a gas sensor readily commercially available from Figaro Engineering, Inc., identifiable as Model TGS No. [816][13]. This sensor is responsive to the cumulative concentration of water vapor and various organic gases.

Id. at 3:6-18 (emphasis added).



Id. at Fig. 2 (annotated).

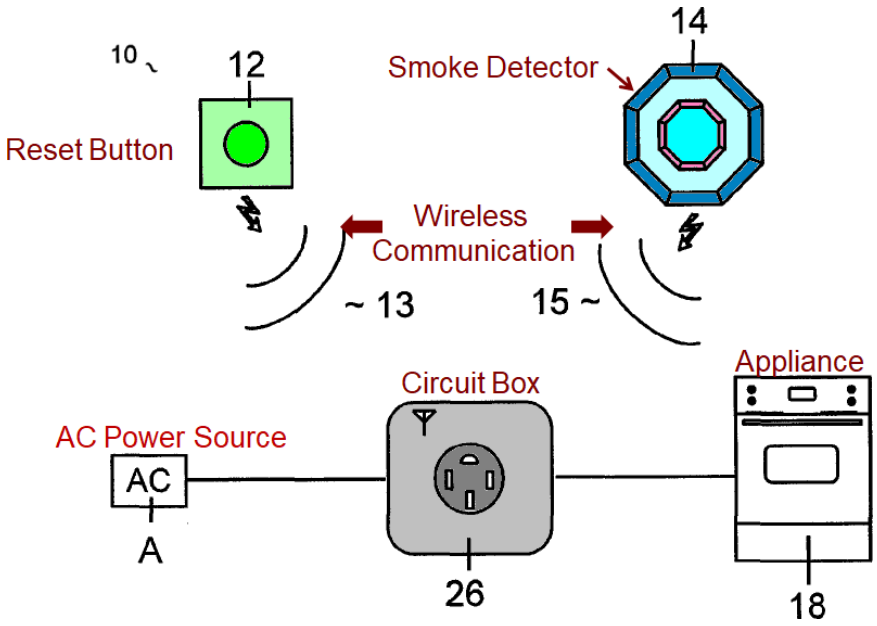
[13] As described above, it is my Opinion this was as typographical error.

iv. Butt

[253]. Butt discloses a smoke sensing device 14 outside of a cooking range positioned to detect smoke. In other words, the smoke detector to operate, must be positioned in air between the cooking range and the surrounding air (i.e., in an air passage that extends between a cooking area and the air outside the cooking area). As explained below, the system taught by Butt controls power to an electrical kitchen appliance coupled to a controller 26, where the Butt system includes a smoke detector 14, panic/reset button and a wireless transmitter:

> In the embodiment of FIG. 1A, the system 10 comprises a smoke detector 14 and a wireless transmitter housed therein (not shown), a panic/ reset button 12 and a wireless transmitter housed therein (not shown), a standard circuit box 26 and a controller 20 housed therein, an AC power source A, and an electric appliance 18.

Id. at 4:29-34.



Id. at Fig. 1A (annotated).

[254]. In order to detect smoke, the detector 14 in Butt would need to be positioned outside of the cooking area where the venting from the range would occur or, in other words, necessarily in an air passage extending from the cooking area of the appliance 18 to the outside air.

2. THE '374 DEPENDENT CLAIMS (CLAIMS 10, 11, 18, 19 AND 20)

[255]. As discussed above, Claims 10 and 18 of the Challenged '374 Claims contain the same basic elements of the Power Supply Outlet, Refrigerator, and Withdraw and Deliver Electrical Power function described above with respect to the '206 Patent. The teachings of those elements are described above in ¶[198-206] and are incorporated herein by reference. To the extent there are differences between the '206 Dependent Claims and the '374

Dependent Claims, the following additional teachings of the prior art are relevant:

a. Auxiliary Output Device

i. Emma

[256]. Emma discloses a microwave oven that includes at least one auxiliary low power receptacle (i.e., "output device including at least one of a USB port, an inductance charging pad, or ***an auxiliary electrical outlet***") which is in operative connection with the control circuit, and wherein the microcontroller (i.e., "control circuit") is operative to cause the at least one output device to be inoperative when the microwave oven demands cooking power. Emma recites the following in Claim 1:

> wherein the control processor is configured to enable or disable power to the microwave oven, the first power Supply outlet and the second power Supply outlet, according to an algorithm in the control processor, and wherein the algorithm causes the control processor to: disable the refrigerator ***and the second power Supply outlet***, when the microwave demands power; ***and enable the second power supply outlet*** when the microwave is off.

Ex. 1011 at Claim 1 (emphases added).

[257]. Figure 3 in Emma is a hierarchical block diagram showing the power distribution, and Fig. 4 is a combined circuit and block-diagram drawing of the components of the control system, including current sensors 17 and 18

used monitor power flow within the device. These figures are reproduced below. As shown in these figures, Emma uses current-sensing circuits (e.g., 17 and 18) to monitor the current to the appliances and to the auxiliary receptacles at each outlet:

> As shown in FIG. 4, in order to control the power to the microwave 2, refrigerator 3 and receptacles 11 and 12, sensing circuits may be coupled to the controller to monitor current to the appliances and the auxiliary receptacles. A relay 20 is connected in the power line to the refrigerator and may be actuated by signals from controller 4. In particular, according to an embodiment of this application, sensing circuits 16, as shown in FIG. 4, have [current] sensors 17 and 18 coupled to the power line of the auxiliary outlets 11 and 12 to monitor the current being used by a connected device.

Id. at [0029].

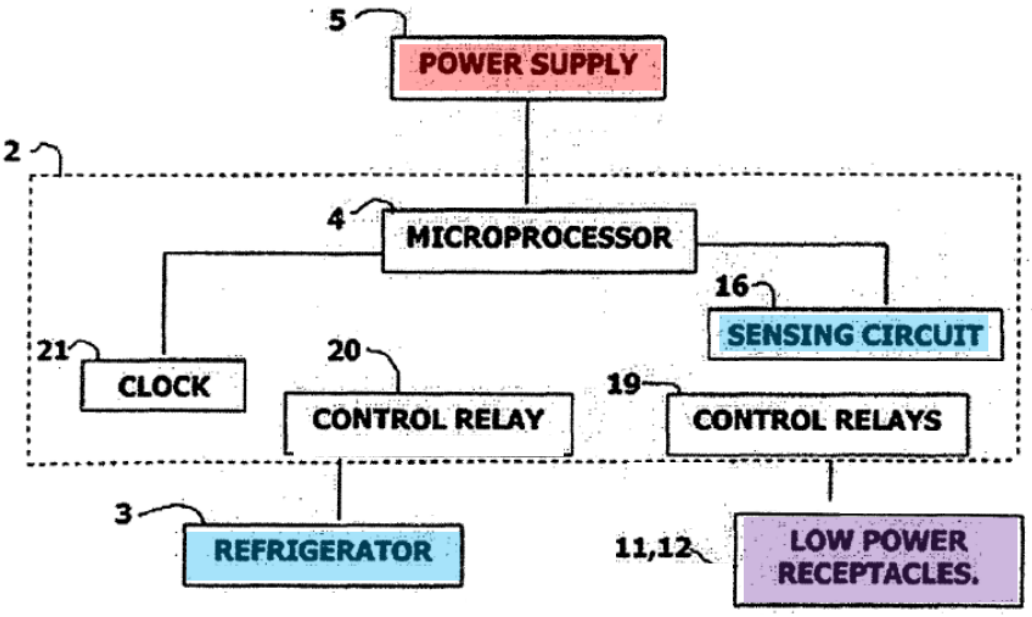
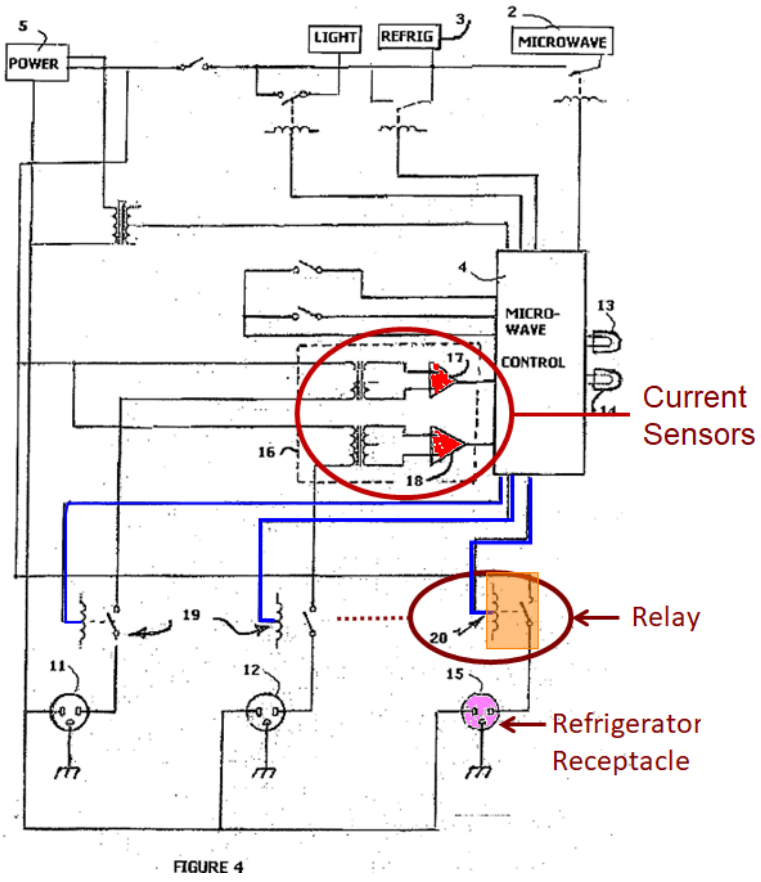


FIGURE 3

Id. at Fig. 3 (annotated).



Id. at Fig. 4 (annotated).

[258]. Lastly, in the embodiment of FIG. 7 (reproduced below) Emma teaches that priority is given to the power demands of the microwave oven. "***Use of the receptacles 11, 12, and 15 are, therefore, disabled during microwave operation. The operational models…may be established by algorithms that are programmed or imbedded in controller 4***." *Id.* at [0038] (emphasis added). Annotated Fig. 7 shows the pathway by which the controller disables the refrigerator and auxiliary outlets and enables power to the microwave:

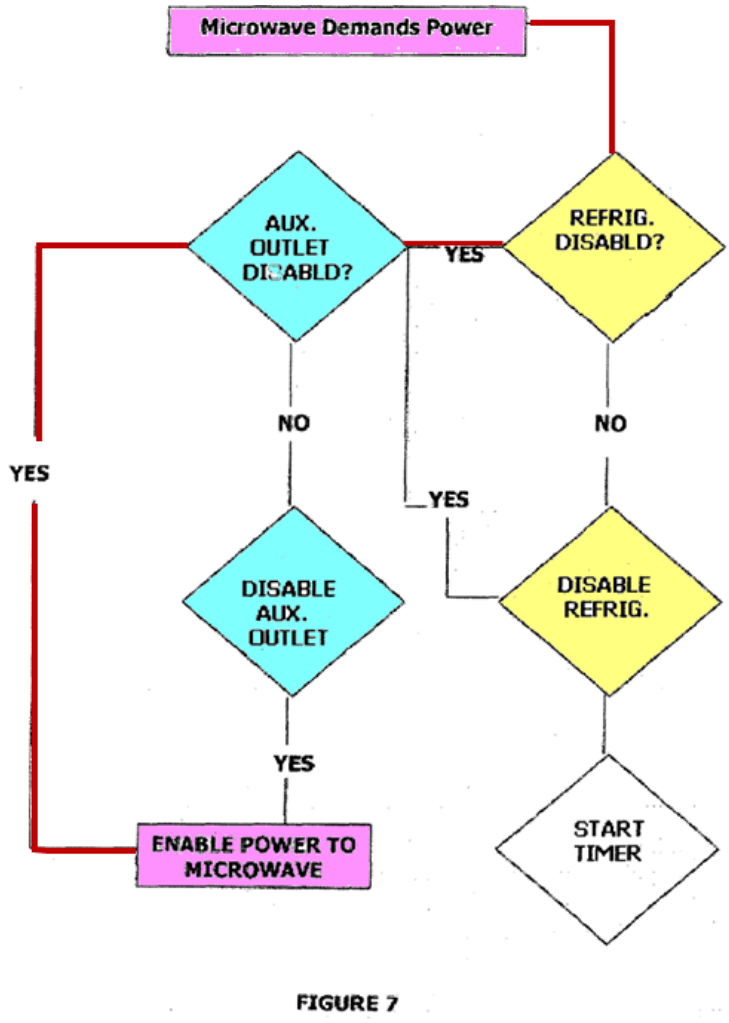


FIGURE 7

Id. at Fig. 7 (annotated).

b. VOC Sensor

[259]. Claim 11 recites: "The apparatus according to claim 10, wherein the smoke sensor includes at least one of a photosensor, a motion sensor, an ionization sensor, a VOC sensor, a sensor including a radiation emitter and a radiation receiver." Ex. 1001 at claim 11. Claim 19 recites: "The apparatus according to claim 18, wherein the smoke sensor includes at least one of a

radiation emitter and radiation receiver, a photosensor, a motion sensor, an ionization sensor, a VOC sensor." Ex. 1001 at claim 19. Claims 11 and 19 are identical in their wording in that they both claim an enhancement to an existing smoke sensor.

i. ISDU

[260]. ISDU discloses both ionization and photoelectric smoke detectors:

> "Smoke is primarily composed of carbon dioxide, water vapor, and particulates…There are two core systems designed for detecting evidence of smoke as a means of fire alarms. These two detectors are commonly known as **ionization and photoelectric smoke detectors**." Ex. 1012 at 9 (emphasis added)

ii. Ueda

[261]. As discussed above, Ueda discloses a microwave oven which includes a gas sensor. *See* ¶[154-70]. The Ueda gas sensor is adapted to detect VOCs and is thus a VOC sensor.

iii. Smith

[262]. As discussed above, Smith discloses a microwave oven which includes a smoke /gas sensor. *See* ¶[165]. The Smith gas sensor is the same as that disclosed in Ueda (*See* ¶[154-70]) and is adapted to detect VOCs, and is thus a VOC sensor.

3. **THE DEPENDENT TEMPERATURE CLAIM (CLAIM 15)**

a. Temperature Sensor

Claim 15 recites:

> The apparatus according to claim 10 and further including a temperature sensor, wherein the temperature sensor is operative to sense a temperature corresponding to temperature in the cooking area, wherein the temperature sensor is in operative connection with the smoke sensor, wherein the control circuit is operative to cause cooking power to the microwave oven to be withdrawn prior to the set end time of the current cooking session, responsive to the smoke sensor sensing smoke indicative of the dangerous condition and the temperature being sensed above a temperature level during the cooking session.

Ex. 1001 at claim 15.

i. Smith

[263]. As discussed above, Smith discloses a microwave oven that utilizes a smoke sensor condition to shut down the microwave. *See* ¶[180-81]. Smith also teaches that it was known in the art to use both a temperature sensor and a humidity sensor to deenergize a microwave based on both sensors:

> …a humidity sensor and a temperature sensor are employed to monitor the relative humidity and temperature in the cavity. A

microprocessor is programmed to detect a fire condition when both the temperature rises and the humidity falls by predetermined amounts . . . and to de-energize the oven upon detecting such a condition.

Ex. 1014 at 1:31-40.

A. REASONING SUPPORTING OPINIONS ON INVALIDITY OF THE '374 PATENT

1. THE '374 INDEPENDENT CLAIMS ARE ANTICIPATED BY AND/OR ALTERNATIVELY OBVIOUS IN VIEW OF ISDU.

[264]. In my opinion, each of the '374 Independent Claims is anticipated by and/or alternatively obvious in view of ISDU. As discussed in ¶[244];¶[207-14], it is my opinion that ISDU discloses all the elements of the '374 Independent Claims and thus anticipates those claims.

[265]. The only element of the Independent Claims which one might argue is not expressly recited in ISDU is the placement of the smoke sensor, i.e., its placement in an air passage that extends between a cooking area inside the microwave oven and the air outside the microwave oven ("Air Passage"). The Smoke Sensor limitation does not require any particular placement or location of the smoke sensor as long as it is in the Air Passage. In other words, as so long as the sensor is located between a cooking area inside the microwave oven and the air outside, the limitation is met.

[266]. Accordingly, there is no requirement that the smoke sensor mounted within the air passage be within the confines of the external shell of the microwave oven. However, should the Board determine that the entirety of the air passage and /or the smoke sensor must be located within the microwave, and that this element is not shown either expressly or inherently in ISDU, I believe it would have been obvious to a POSITA to modify the placement of the ISDU smoke sensor to be in an air passage between the cooking area and the air outside the microwave oven..

[267]. There are numerous reasons why a POSITA would have made a modification to ISDU so as to position the smoke detection sensor in the Air Passage. First, based on the teaching and suggestion provided in ISDU, it would have been obvious to the POSITA to place the smoke sensor in the Air Passage of the microwave because that would place it in closer proximity to the source of smoke, namely the food being heated. Placing the disclosed smoke sensor inside or interior to the microwave would have been a trivial design modification. Such a modification also would have been consistent with the express teaching of ISDU that the sensor be integrated with the microwave appliance. ISDU teaches this concept when referring to the prior art. Specifically, it states as follows: "[w]ith the introduction of a smoke detection circuit *inside* the microwave the consumer will be alerted, by a louder more

intense alarm, that they have overcooked their food or that there is another cause of smoke *inside* the microwave." Ex. 1012 at 4.

[268]. Based on the teaching in ISDU and/or the motivation that a POSITA would have had to make sure the smoke sensor was optimally positioned in a location to detect generated smoke close to its source, a POSITA would have placed, or at least tried to place, the smoke-detection sensor inside the microwave, i.e., in the air passage therein, as opposed to outside/around the microwave. The POSITA would have had a reasonable expectation of success in detecting smoke more quickly compared to attempting to detect smoke using a smoke detector positioned further away from the inside of the microwave.

[269]. Additionally, it would have been "obvious to try" placing the sensor inside the microwave and in the air passage, as opposed to outside/around the microwave oven, as there would have been only a finite number of identified, predictable solutions (i.e., just two feasible: inside or outside), with a reasonable expectation for success. ISDU emphasized that at the time there was a market need to prevent fires (as shown in ¶[96-100]) but only a finite number of solutions for integrating smoke sensors into microwave ovens. Further, it would have been obvious to a POSITA to integrate any smoke sensor inside a microwave oven to create a commercially integrated package for

sale and shipping. A POSITA would have pursued trying to place the smoke-detection sensor inside the microwave oven with a reasonable expectation of success grounded on the disclosures of the prior art.

[270]. Lastly, it would have been obvious to modify any embodiment in ISDU having the smoke detector outside the microwave by physically placing the smoke detection sensor unit inside, as doing so would have entailed only the substitution of one known element for another (e.g., placing the sensor either inside or outside the microwave and close to the source of the smoke). This substitution would have yielded predictable results, because a POSITA would have expected to obtain a higher sensitivity with faster detection by placing the smoke detector closer to the source of the smoke, namely inside the microwave.

[271]. As discussed above, it is well understood from the art how a microwave oven and a smoke detection sensor work (the smoke detector should be in proximity to the cooking operation to best detect the smoke). A POSITA would have substituted the placement of the smoke sensor inside as opposed to outside.

2. The '374 Independent Claims Are Anticipated by and/or Alternatively Obvious in View of Ueda

[272]. In my opinion, all of the '374 Independent Claims are anticipated by and/or alternatively obvious in view of Ueda. As shown in ¶[244]; ¶[215-

19], Ueda discloses all the elements of the '374 Independent Claims and thus anticipates those claims. The only element that arguably might not expressly be described is the claimed smoke sensor. However, Ueda either inherently discloses this limitation or, alternatively, it would have been obvious to include a smoke sensor in view Ueda, as discussed above in ¶[215-19], with respect to the '206 Independent Claims. Those reasonings are incorporated by reference herein.

3. THE '374 INDEPENDENT CLAIMS ARE ANTICIPATED BY AND/OR ALTERNATIVELY OBVIOUS IN VIEW OF SMITH.

[273]. In my opinion, all of the '374 Independent Claims are anticipated by and/or alternatively obvious in view of Smith. As shown in ¶[244];¶[220-23], Smith discloses all the elements of the '374 Independent Claims and thus anticipates those claims. The only element that arguably might not expressly be described is the claimed Reset Enable function. However, Smith either inherently discloses this limitation or, alternatively, it would have been obvious in view Smith, as discussed above in ¶[220-23], with respect to the '206 Independent Claims. Those reasonings are incorporated by reference herein.

4. THE '374 INDEPENDENT CLAIMS ARE OBVIOUS IN VIEW OF UEDA COMBINED WITH SMITH

[274]. It is my opinion that Ueda and Smith each anticipate, or if combined, render obvious the Independent Claims. Should the Board decide

either of Ueda or Smith does not anticipate or render obvious the Independent Claims, then these claims would be obvious in view of Ueda combined with Smith, or alternatively, Smith combined with Ueda. As I have discussed above, the only element that is arguably not expressly described in Ueda is the use of Ueda's SnO_2 gas sensor to sense smoke. However, Smith discloses using that same sensor for the detection of smoke and the subsequent shutting down of the microwave based on its detection. Alternatively, and as discussed above, the only element that is arguably not expressly described in Smith is the Reset Enable Function. However, Ueda discloses enabling the microwave and sensor following an automatic sensor shutdown. Thus, the combination of Smith and Ueda disclosed both these claim elements.

[275]. As discussed above in ¶[224-26], with respect to the '206 Independent Claims, it would have been obvious to combine Ueda and Smith. Those reasonings are equally applicable to render obvious the '374 Independent Claims and are incorporated by reference herein.

5. THE '374 INDEPENDENT CLAIMS ARE OBVIOUS IN VIEW OF ISDU, UEDA, OR SMITH COMBINED WITH BUTT

[276]. It is my opinion that each of the '374 Independent Claims is obvious over the following combinations: ISDU with Butt; Ueda with Butt; or Smith with Butt. Because the rationales supporting a conclusion of obviousness

based on these combinations are similar, I will discuss them together.

[277]. As discussed above in ¶[276], ISDU with Butt; Ueda with Butt; or Smith with Butt, respectively disclose all elements of the '374 Independent Claims. As discussed above in ¶[227-31], with respect to the '206 Independent Claims, it would have been obvious to combine ISDU with Butt; Ueda with Butt; or Smith with Butt. Those reasonings are equally applicable to render obvious the '374 Independent Claims and are incorporated by reference herein.

6. THE '374 DEPENDENT CLAIMS AND THE DEPENDENT TEMPERATURE CLAIM ARE OBVIOUS OVER THE COMBINATION OF EMMA WITH ISDU, UEDA, OR SMITH (WITH AN ALTERNATIVE ADDITIONAL COMBINATION WITH BUTT).

[278]. In my opinion, all of the '374 Dependent Claims are obvious over the combination of Emma with ISDU; all of the '374 Dependent Claims are obvious over the combination of Emma with Ueda; all of the '374 Dependent Claims and the '374 Dependent Temperature Claim are obvious over the combination of Emma with Smith; all of the '374 Dependent Claims are obvious over the combination of Emma with ISDU and Butt; all of the '374 Dependent Claims are obvious over the combination of Emma with Ueda and Butt; all of the '374 Dependent Claims and the '374 Dependent Temperature Claim are obvious over the combination of Emma with Smith and Butt. Because the rationales supporting a conclusion of obviousness are very similar,

they are discussed together.

[279]. The '374 Dependent Claims and the '374 Dependent Temperature Claim each depend from their respective '374 Independent Claim. As discussed above, the elements of the '374 Independent Claims are fully disclosed or rendered obvious by ISDU, Ueda, and Smith, either alone or in combination with Butt. The '374 Dependent Claim element of a VOC Sensor is also fully disclosed by ISDU, Ueda, and Smith. *See* ¶[259-95]. The '374 Dependent Temperature Sensor Claim element or a Temperature Sensor is fully disclosed in the Smith specification. *See* ¶[263]. The remaining claim elements of the '374 Dependent Claims are all fully disclosed by Emma. *See* ¶[198-206].

[280]. As discussed above (*See* ¶[232-42]) with respect to the '206 Dependent Claims, it would have been obvious to combine Emma with ISDU, Ueda, or Smith (with the alternative additional combination with Butt). Those reasonings are equally applicable to render obvious the '374 Dependent Claims and '374 Dependent Temperature Claim and are incorporated by reference herein.

[281]. If it is determined that Smith fails to teach the Temperature Sensor claim element, in my opinion it would have been obvious based on Smith's teaching to add the Temperature Sensor element to the Smith microwave, and

thus to any of the above Smith combinations. For example, as disclosed above (*See* ¶[252]) Smith teaches utilizing a smoke sensor to shut down a microwave. Smith also teaches that it was known in the art to use both a temperature sensor and a humidity sensor to deenergize a microwave based on both sensors. It would have been obvious to a POSITA to pair the Smith smoke sensor (which is also sensitive to humidity) with the known temperature sensor to provide an additional means for detecting fires according to the teaching of Smith. Substituting the Smith smoke sensor into the combination humidity/temperature shutdown configuration would have been nothing more than a substitution of one known gas/humidity sensor for another known gas/humidity sensor which would have yielded predictable results to a POSITA.

XI. OPINIONS ON INVALIDITY OF THE '876 PATENT

[282]. In my opinion, all of the features and elements of the '876 Challenged Claims were well known in the art as of the Effective Filing Date. In performing my analysis, I have considered and cited only references that are prior art to the '876 patent.

A. THE PRIOR ART REFERENCES TEACH ALL OF THE ELEMENTS OF THE '876 CHALLENGED CLAIMS

1. THE '876 INDEPENDENT CLAIMS (CLAIMS 1 AND 21)

[283]. As discussed above, claims 1 and 21 of the Challenged '876 claims contain the same basic elements of the Microwave Oven, Control Circuit, a

Smoke Sensor, a Shutdown Function, and a Reset Enable Function described above with respect to the '206 and '374 Patents. The teachings of those elements are described above in ¶¶[127-206 and 243-63] and are incorporated herein by reference. To the extent there are differences between the '206 and '374 Independent Claims and the '876 Independent Claims, the following additional teachings of the prior art are relevant:

a. "'876 Microwave oven" or "Microwave oven"

[284]. Claims 1 and 21 recite "an appliance including…a microwave oven, wherein the microwave oven…includes an interior cooking area." '876 petition Ex. 1001('876 patent) at claim 1.

[285]. As noted above, the elements of the '206 and '374 Microwave Oven are discussed with reference to the '206 and '374 Challenged Claims and are incorporated by reference into this section. Only additional or different elements related to the microwave oven in the '876 Patent, including an interior cooking area, are further discussed here.

i. Emma

Emma discloses a microwave oven with an interior cooking area: "A system of linked appliances comprising: a microwave oven connected to a source of power." *See, e.g.*, Ex. 1011 at Claim 1. As shown below in Figure 2, the microwave oven 2 is connected to power source 5.

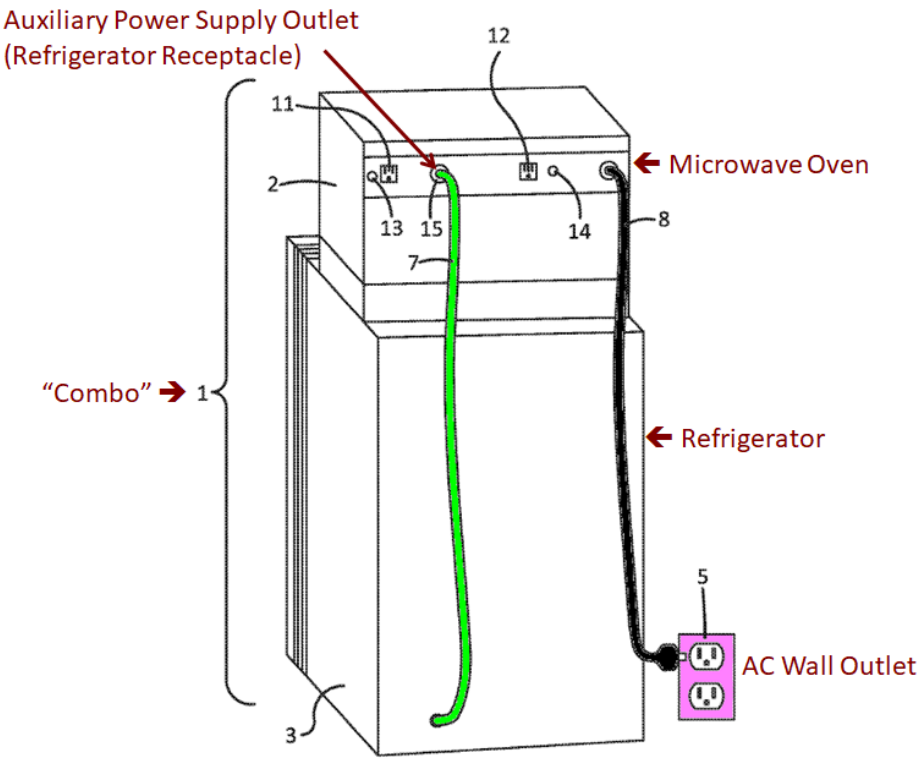


FIGURE 2

Id. at Fig. 2 (annotated).

Additionally, Emma states that: "The appliances (microwave and refrigerator) may be of standard design with features commonly available. The internal components of the appliances are well known and do not need to be described herein." Ex. 1011 at [0026]. It is inherent that the microwave oven must contain an interior cooking area based on this teaching.

ii. ISDU

As shown in FIG 4 below, the microwave oven contains an interior cooking area (yellow):

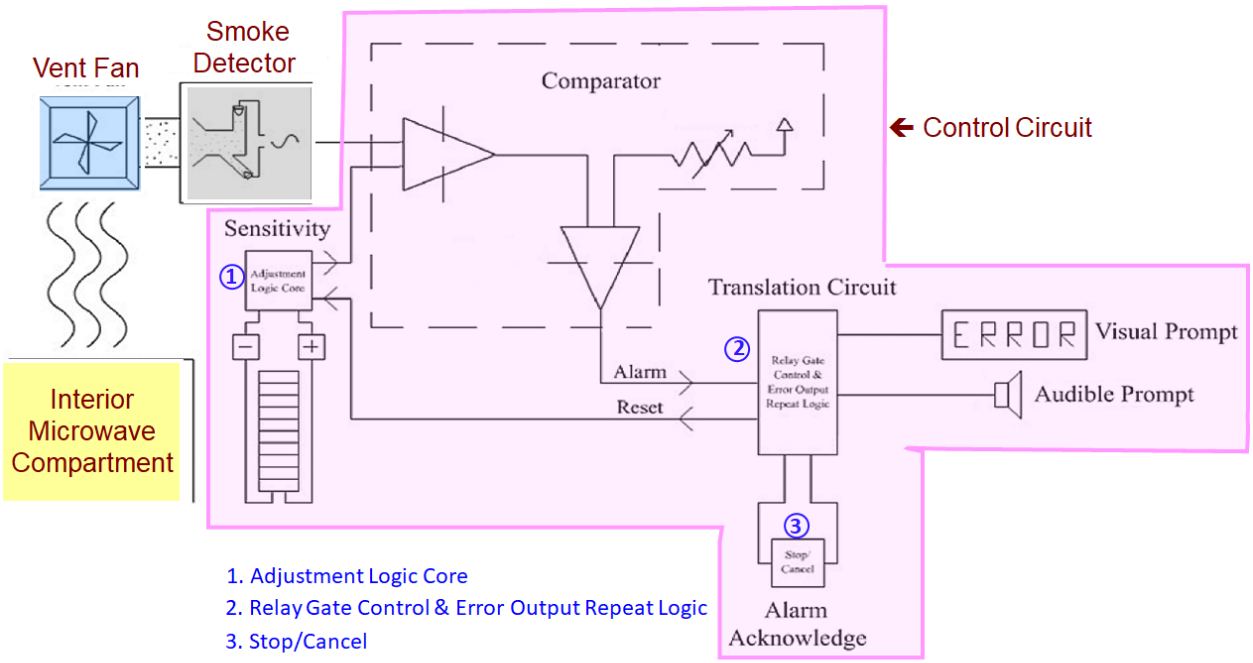


Figure 4

Ex. 1012 at Fig. 4 (annotated).

a. "'876 Refrigerator" or "Refrigerator"

[286]. Claim 21 recites "a refrigerator, wherein the refrigerator is in operative electrical connection with the at least one electrical power control circuit, wherein the refrigerator includes a plurality of electrically powered refrigerator components…"

[287]. As noted above, the elements of the '206 and '374 refrigerator are discussed with reference to the '206 and '374 Challenged Claims and are incorporated by reference into this section. Only additional teachings related to

the plurality of refrigerator components (i.e., "plurality of electrically powered refrigerator components") are further discussed here.

i. Emma

[288]. When discussing the different components of the refrigerator (i.e., plurality of components) Emma states: "The appliances (microwave and refrigerator) may be of standard design with features commonly available. The internal components of the appliances are well known and do not need to be described herein." Ex. 1011 at [0026]. It would have been inherent that a refrigerator of the design disclosed in Emma contain a plurality of electrically powered components based on this teaching, for example at least an electrical compressor and a compressor fan. As a POSITA would have known, in fact, these components would have been necessarily found in all consumer-based commercial refrigerators. Additionally, Emma also discloses an electrical compressor. "When power to the microwave is demanded, **the compressor** is disabled for a preset minimum period." *Id.* at [0011] (emphasis added). Even more so, Emma discloses a refrigerator temperature sensor that may be used to monitor its status:

> "Under some circumstances, it may be necessary to give the refrigerator priority to prevent an undesirable drop in temperature. In the latter instance, microcontroller can be coupled to the **refrigerator temperature sensor** to execute a time sequence during which the

microwave will be disabled to allow the refrigerator to return to proper operating temperatures."

Id. at [0037] (emphasis added).

Emma Figs. 10 and 11 (reproduced below) provide additional support for the invalidity of the '876 claims. Figure 10 is a schematic diagram showing current sensors 117 and 118 that monitor the current to various components of microwave/refrigerator combination. (These are the same current sensors 17 and 18 shown in Emma Fig. 4) Figure 11 shows the control panel on the microwave oven used to program its operation. As can be seen in Fig. 10, an electrically powered light-emitting diode "LED" labeled "Refrigerator" is part of control panel 122. The refrigerator may use an LED indicator light to let the user know the status of its operation. As Emma states:

"Refrigerator outlet 115 is also shown to be accessible from the front panel [figure 11] and is associated with an LED indicator and reset button 114. Similarly, LED indicator 114 is controlled to be on during use of the refrigerator and to switch to a flashing mode when the microwave is operating."

Id. at [0036].

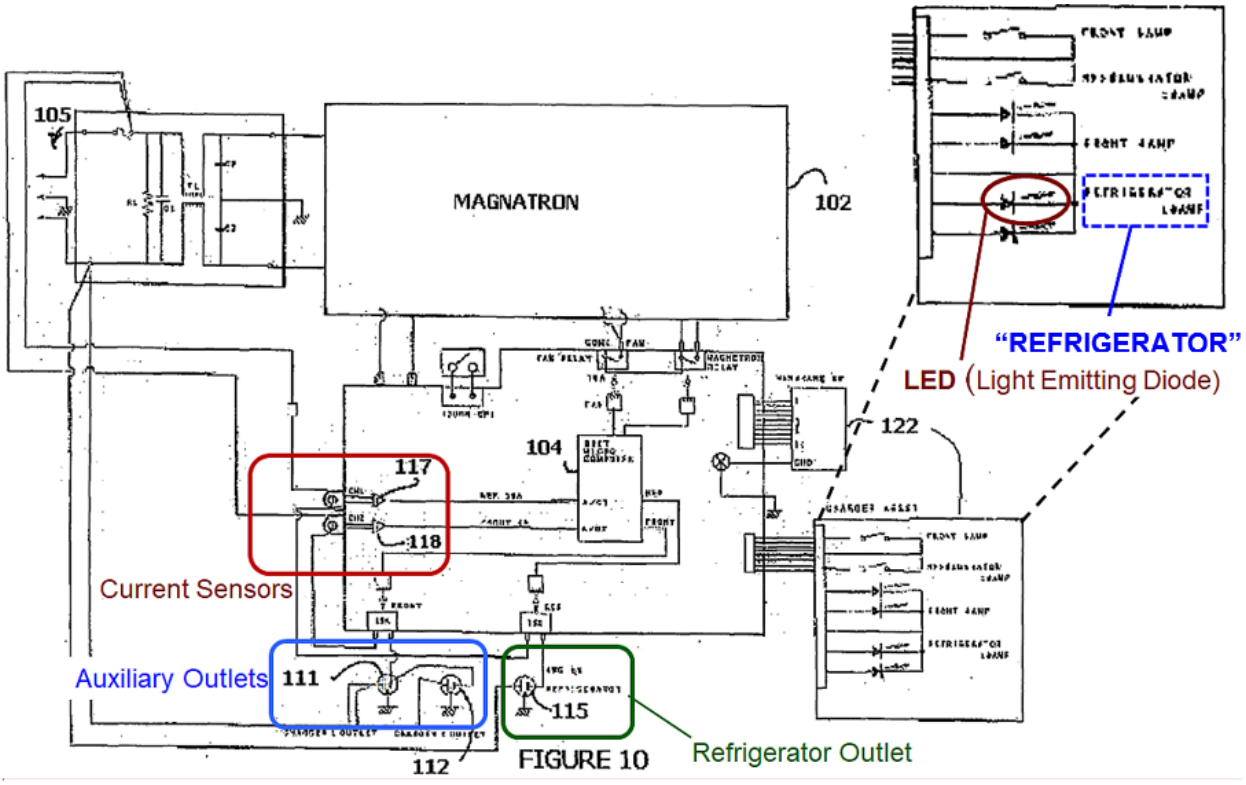


FIGURE 10

Id. at Fig. 10 (annotated).

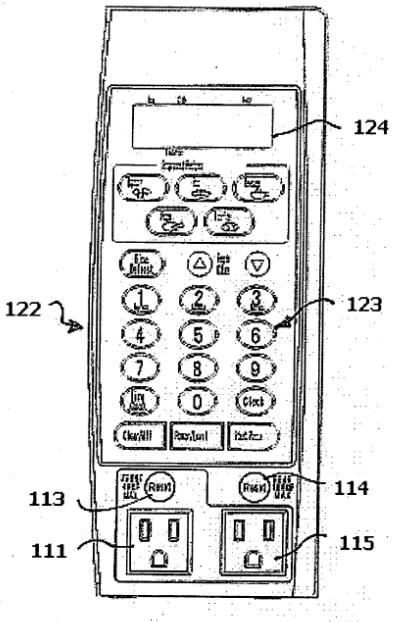


FIGURE 11

Id. at Fig. 11.

b. "'876 Smoke Sensor" or "Smoke Sensor"

Claim 1 recites: "wherein the microwave oven includes a smoke sensor, *wherein the smoke sensor is positioned in operative connection with a cooking area inside the microwave oven*..." Claim 21 similarly recites: "a smoke sensor, *wherein the smoke sensor is positioned in operative connection with the cooking area*, wherein the smoke sensor is in operative connection with the at least one electrical power control circuit."

[289]. As noted above, the elements of the '206 and '374 Patents are discussed with reference to the '206 and '374 Challenged Claims and are incorporated by reference into this section. Only additional teachings related to the position of the smoke sensor (i.e., "*wherein the smoke sensor is positioned in operative connection with a cooking area inside the microwave oven*") are further discussed here.

i. ISDU

[290]. ISDU discloses a smoke sensor positioned in operative connection with the cooking area inside the microwave oven: Specifically, ISDU states that "…smoke detection devices be integrated into range ovens and microwaves, the leading causes of domestic structure fires." Ex. 1012 at 1. "We have decided to invest our time and effort towards integrating a smoke detection device into a microwave." *Id.* at 3. Additionally, ISDU states, when

referring to Figure 4 (reproduced below), as follows: "the smoke detection device that will receive a steady influx of air from the cooking cavity." *Id.* at 20. As shown in FIG 4, the smoke detector is in operative connection with the cooking area inside microwave oven through a vent fan.

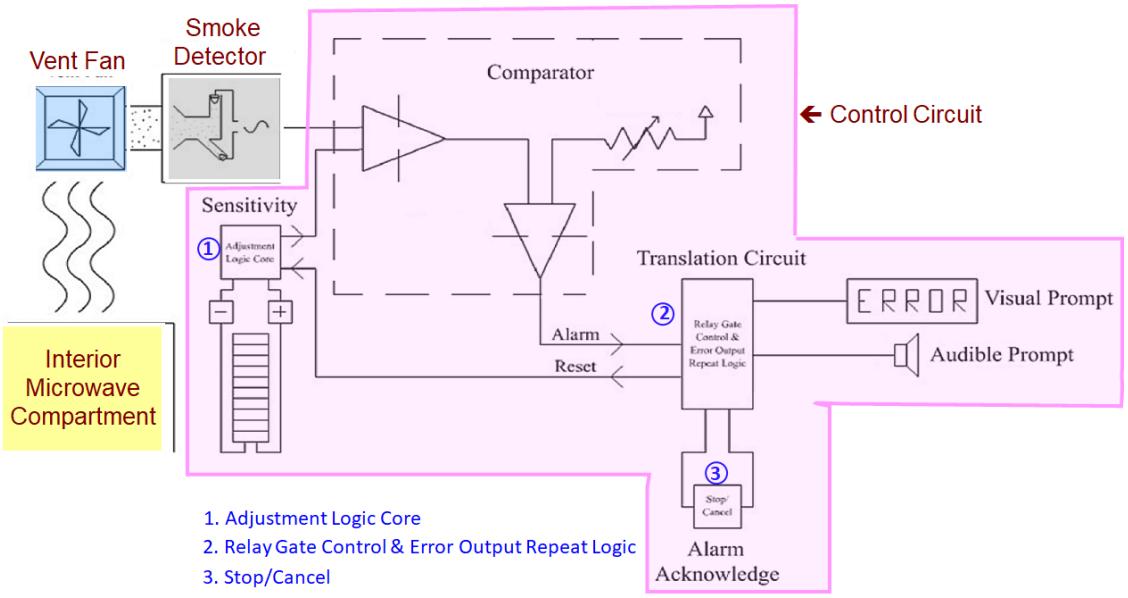


Figure 4

Id. at Fig.4 (annotated).

ii. Smith

Smith discloses a gas sensor (i.e., "smoke sensor") positioned in operative connection with a cooking area inside a microwave oven. Smith describes the need to detect smoke and increasing gas concentration prior to combustion: "However, before actually reaching the ignition point, the food begins

to char, smoke or smolder, resulting in a second period of relatively rapidly increasing gas concentration in the circulating air, comparable to that rate of increase which characterizes the normal cooking period." *Id.* at 3:51-54. Referring to Figures 1 and 2 below, which comprise different viewing angles of the microwave oven, Smith discloses a gas sensor 52 (i.e., "smoke sensor") positioned in operative connection with a cooking area inside the microwave oven:

> Means for sensing the concentration level of such gases in the air leaving the cavity is provided in the form of a gas sensor 52 disposed in the air flow path between perforations 48 in cavity wall 28 and vent openings 50 in cabinet wall 20. Sensor 52 is supported proximate perforations 48 by mounting bracket 54 which is suitably secured to cavity wall 28. Sensor 52 in the illustrative embodiment of FIG. 2 is a gas sensor readily commercially available from Figaro Engineering, Inc., identifiable as Model TGS No. [816][14]. This sensor is responsive to the cumulative concentration of water vapor and various organic gases.
>
> *Id.* at 3:6-18.

[14] *See* ¶[167-69].

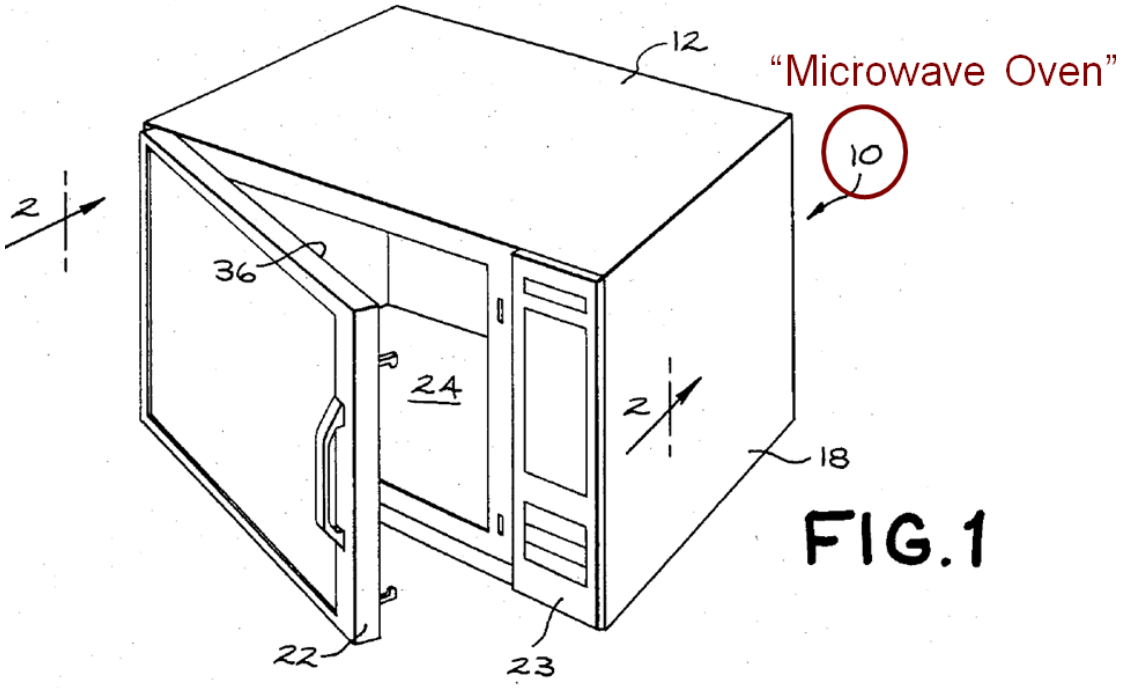


FIG. 1

Id. at Fig. 1 (annotated).

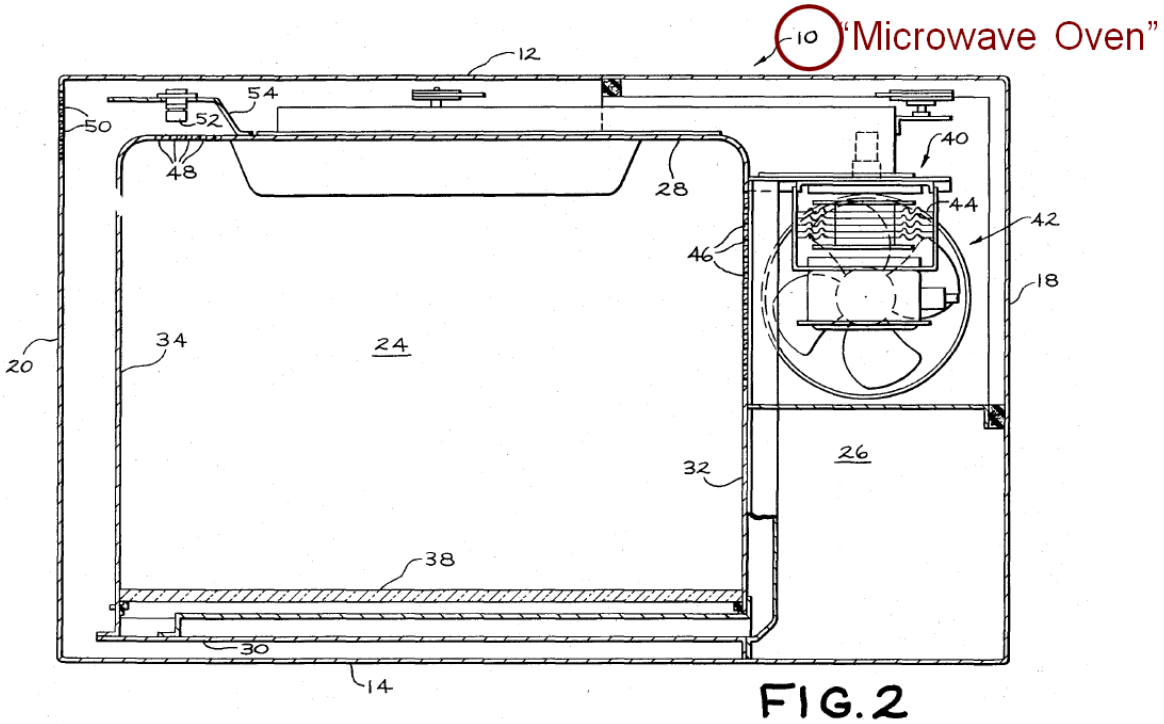


FIG. 2

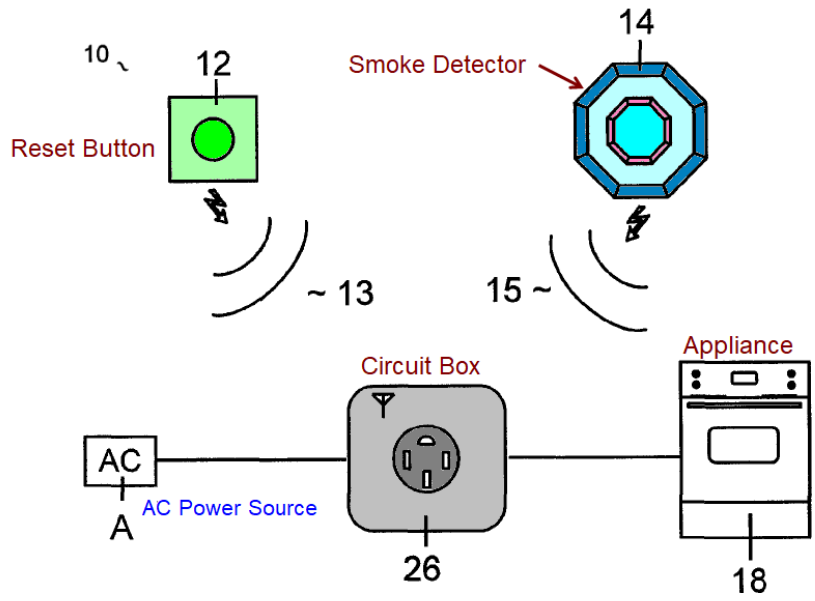
Id. Fig. 2 (annotated).

iii. Butt

As explained below, the system taught by Butt includes a smoke sensor in operative connection with the cooking area of a cooking range. Butt's device controls power to an electrical kitchen appliance coupled to a controller, where the Butt system includes a smoke detector, panic/reset button and a wireless transmitter:

> "In the embodiment of FIG. 1A [shown below], the system 10 comprises a smoke detector 14 and a wireless transmitter housed therein (not shown), a panic/ reset button 12 and a wireless transmitter housed therein (not shown), a standard circuit box 26 and a controller 20 housed therein, an AC power source A, and an electric appliance 18."

Id. at 4:29-34.



Butt at Fig. 1A (annotated).

2. **THE '876 DEPENDENT CLAIMS (CLAIMS 26 AND 28)**

a. Auxiliary Output Device (Claim 26)

[291]. Claim 26 of the '876 Patent recites an Auxiliary Output Device: "wherein the microwave oven further includes at least one output device including at least one of . . . an auxiliary electrical outlet, wherein the at least one output device is in operative connection with the control circuit, and wherein the control circuit is operative to cause the at least one output device to be inoperative when the microwave oven demands cooking power."

i. Emma

[292]. Emma discloses a microwave oven that includes at least one auxiliary low-power receptacle (i.e., "an auxiliary electrical outlet") which is in operative connection with the control circuit, and wherein the microcontroller is

operative to cause the auxiliary low power receptacle to be inoperative when the microwave oven demands cooking power. Emma describes enabling and disabling power to the microwave oven as well as its first and second power-supply outlets based on the control algorithm in the processor:

> "wherein the control processor is configured to enable or disable power to the microwave oven, ***the first power Supply outlet and the second power Supply outlet***, according to an algorithm in the control processor, and wherein the algorithm causes the control processor to: disable the refrigerator and the second power Supply outlet, when the microwave demands power; and enable the second power supply outlet when the microwave is off."

Ex. 1011 at Claim 1 (emphasis added).

[293]. As shown in the below diagram of the control circuit (Figure 4), Emma discloses a control circuit that provides for digitally operating relays 19, 20 for controlling the low-power auxiliary outlets 11 and 12 and the refrigerator receptacle 15:

> As shown in FIG. 4, in order to control the power to the microwave 2, refrigerator 3 and receptacles 11 and 12, sensing circuits, may be coupled to the controller to monitor current to the appliances and the auxiliary receptacles. A relay 20 is connected in the power line to the refrigerator and may be actuated by signals from controller 4. In particular, according to an embodiment of this application, sensing circuits 16, as shown in FIG. 4, have sensors 17 and 18

coupled to the power line of the auxiliary outlets 11 and 12 to monitor the current being used by a connected device.

Id. at [0029].

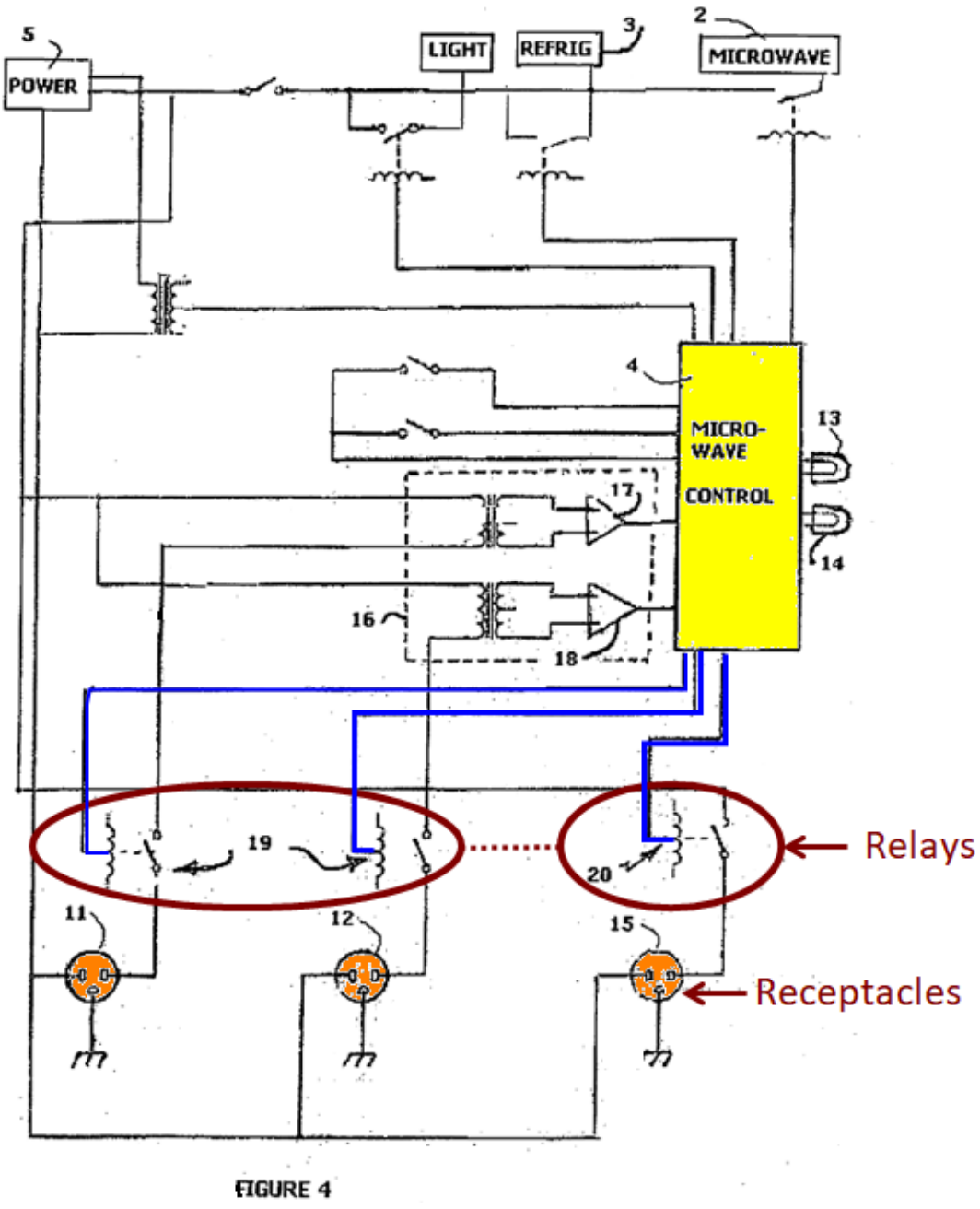


FIGURE 4

Id. at Fig. 4 (annotated).

[294]. Lastly, as Emma teaches in the embodiment of FIG. 7 (reproduced below), priority is given to the power demands of the microwave oven. "Use of the receptacles 11, 12, and 15 are, therefore, disabled during microwave operation. The operational models…may be established by algorithms that are programmed or imbedded in controller 4." *Id.* at [0038].

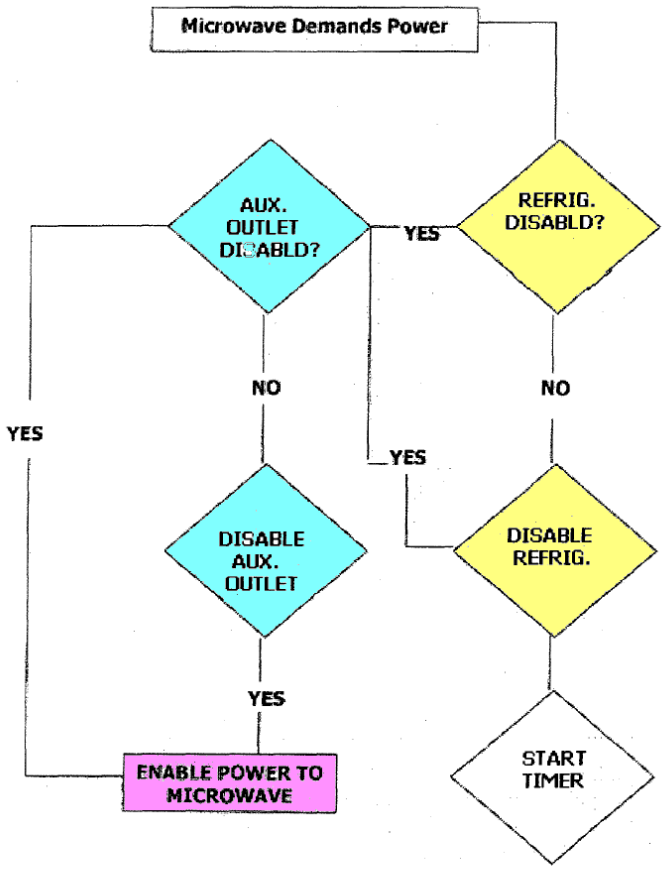


FIGURE 7

Id. at Fig. 7 (annotated).

b. VOC Sensor (Claim 28)

i. ISDU

[295]. ISDU discloses both "ionization and photoelectric smoke detectors." Ex. 1012 at 9.

ii. Smith

[296]. As discussed above, Smith discloses a microwave oven which includes a smoke /gas sensor. *See* ¶[165-70]. The Smith gas sensor is adapted to detect VOCs and is thus a VOC sensor.

iii. Butt

[297]. Butt's exemplary smoke detectors include: "ADEMCO 5806 detector, the SecureLinc (73942) detector, and the Wisdom 433 MHz Wireless Smoke Detector." Ex. 1015 at 4:49-52. The ADEMCO 5806 is a photoelectric smoke detector. The ADEMCO 5806 installation instructions[15] are included as Appendix E. Reviewing these instructions reveals that the ADEMCO 5806 smoke detector is a "Photoelectric Smoke Detector/Transmitter." Accordingly, it is my opinion that Butt discloses a photosensor type of smoke sensor.

B. REASONING Supporting Opinions on Invalidity of the'876 PATENT

1. THE '876 CHALLENGED CLAIMS ARE OBVIOUS IN VIEW OF EMMA COMBINED WITH ISDU

[298]. In my opinion, each of the '876 Challenged Claims is obvious in

[15] See, for example: https://advancedsecurityllc.com/wp-content/uploads/Honeywell%205806%20Installation-Instructions-Manual.pdf

view of Emma combined with ISDU. To the extent the Board determines that the combination does not expressly recite a "plurality of electrically powered refrigerator components," and "the smoke sensor is positioned in operative connection with a cooking area inside the microwave oven", it is my opinion that it would have been obvious to do so. First, it would be obvious to a person of ordinary skill in the art that in order for the refrigerator discussed in Emma to operate properly, there would have to have been more than one electrically powered refrigerator component (i.e., "a plurality"). Emma teaches "The appliances (microwave and refrigerator) may be of standard design with features commonly available. The internal components of the appliances are well known and do not need to be described herein." Ex. 1011 at [0026]. In my opinion, a POSITA would understand this to mean that Emma contained at least a plurality of electrically powered refrigerator components or, alternatively, it would have been obvious to include a plurality of electrically powered refrigerator components. Some examples of the latter would have included a compressor (explicitly disclosed), an indicator light (expressly disclosed), control circuitry (expressly disclosed), a compressor fan, an internal light, and/or a circulating fan.

[299]. Further, the '876 Challenged Claims recite that "the smoke sensor is positioned in operative connection with a cooking area inside the microwave

oven". In my opinion, ISDU meets this limitation, because it operates in response to conditions in the microwave. However, to the extent the Board determines there is a positioning requirement in the claims, and ISDU's smoke sensor is not in "operative connection with the cooking area inside the microwave oven". In my opinion, however, it would have been obvious to do so. Based on the teaching and suggestion provided in ISDU, I believe it would have been obvious to a POSITA to place the smoke sensor to be in sufficient position to the cooking area for it to operate with respect to the source of smoke (initiating at the food being heated). In my opinion, it is consistent with the express teaching of ISDU that the sensor be integrated with the microwave oven. Additionally, ISDU specifically teaches this concept. When referring to prior art, ISDU states as follows: "[w]ith the introduction of a smoke detection circuit *inside* the microwave the consumer will be alerted, by a louder more intense alarm, that they have overcooked their food or that there is another cause of smoke *inside* the microwave." Ex. 1012 at 4.

[300]. Based on ISDU's teaching and/or the motivation to have the smoke sensor be optimally positioned in a location to detect generated smoke close to its source, I believe a POSITA would have placed, or at least tried to place, the smoke detection sensor in operative connection with the cooking area of the microwave oven; otherwise, it would not have functioned as intended. In my

further opinion, the POSITA would have had a reasonable expectation of success in detecting smoke more quickly compared to attempting to detect smoke using a smoke detector positioned further away from the cooking area.

[301]. Additionally, it would have been "obvious to try" placing the sensor in operative connection with the cooking area of the microwave as opposed to outside/around the microwave oven, as there are only a finite number of identified, predictable solutions (i.e., just two feasible: inside or outside), with a reasonable expectation for success. ISDU emphasized that at the time there was a market need to prevent fires (as shown in Ex. 1012 at 1) but only a finite number of solutions for integrating smoke sensors into microwave ovens. Further, it is my opinion it would have been obvious to integrate any smoke sensor inside a microwave oven to create a commercially integrated package for sale and shipping. I believe a POSITA would have pursued trying to place the smoke detection sensor inside the microwave oven with a reasonable expectation of success which would have been grounded on the disclosures of the prior art.

[302]. Should the Board decide that "operative connection" requires close proximity, ISDU teaches this as well. *See* ¶[290]. Further,, it would have been well understood by a POSITA, based on the art, how a microwave oven and a

smoke-detection sensor work (the smoke detector should be in proximity to the cooking operation to detect the smoke) A POSITA would have substituted the placement of the smoke sensor inside, as opposed to outside/around the microwave oven, and would have obtained predictable results.

[303]. In my opinion, there are numerous reasons why a POSITA would have combined the microwave/refrigerator combination of Emma with the smoke sensor of ISDU. First, all the claimed elements were known in the prior art, and a POSITA would have combined the elements as claimed by known methods, with no change in their respective functions. Such a combination would have yielded nothing more than results that would have been predictable to one of ordinary skill in the art. While Emma fails to recite a smoke sensor, Emma does disclose adding functionality to appliances by cycling power to a refrigerator and auxiliary electrical outlets for the purpose of improving the safety of the Emma appliance (e.g., preventing overload conditions). Emma's teaching would have motivated a POSITA to look to further microwave functionalities, including those in ISDU.

[304]. Both Emma and ISDU disclose shutdown conditions while using electrical cooking appliances that provide added functionality. Additionally, ISDU explicitly relates to added features of microwave ovens. *See* ¶[96-100]. I

believe it would have been obvious to a POSITA to combine the additional microwave oven safety features of ISDU with the Emma microwave/refrigerator combination appliance to provide the added microwave features discussed in ISDU, namely to enable the Emma microwave to shut down upon the detection of smoke, and to reenable the Emma microwave for a further cooking session when the smoke had cleared. Further, it would have also been obvious to a POSITA to modify ISDU with the features of the microwave / refrigerator combination of Emma for the purpose and convenience of having an "all-in-one appliance" in addition to the safety feature of managing total power draw, as is taught by Emma.

2. THE '876 CHALLENGED CLAIMS ARE OBVIOUS IN VIEW OF EMMA COMBINED WITH SMITH

[305]. In my opinion, each of the '876 Challenged Claims is obvious in view of Emma combined with Smith. As discussed above, Emma discloses a microwave refrigerator combination. Smith teaches a microwave oven that is designed to shut down the microwave based on a smoke sensor positioned inside the microwave oven and in operative connection with the cooking area detecting the food being coed, almost reaching its combustion point. *See* ¶[180-81]. The only element of Smith which might be argued is not expressly recited is the Reset Enable Function. Nevertheless, I believe it would have been obvious to a POSITA to modify Smith and/or the Smith-Emma combination to

reset the microwave oven following the smoke sensor no longer sensing smoke. First, based on a teaching suggestion or motivation in Smith, a POSITA would modify Smith and/or the Smith-Emma combination to obtain the Reset Enable Function.

[306]. The design of Smith and/or the Smith- Emma combination is non-destructive in that the designed mechanism to shut down the microwave during a smoke-sensor event is configured to be reversible by the microcontroller control circuit of Smith and/or the Smith-Emma combination via the use of an electronically-controlled relay. Further, Smith and/or the Smith-Emma combination teaches that a goal of the Smith smoke sensor is to anticipate fires before they occur. Ex. 1014 at 1:6-9. Resetting the microwave – undamaged upon early detection of a fire in its early stages – would re-enable the microwave for use again in a subsequent cooking session and would prevent replacing a costly appliance or arranging a service call when such replacement or service call would be unnecessary. Moreover, a POSITA would have understood that modifying Smith and/or the Smith- Emma combination to return to a reset state following a shutdown condition and resetting the smoke detection circuitry would yield a reasonable expectation of success and allow for successive detection of smoke events. A POSITA would have understood, for example, that a microwave is a commercially sold cooking appliance. It

would be problematic to offer for sale a microwave oven that had to be serviced or replaced after just one trip of its smoke-detection circuit. Lastly, as discussed previously, it would have been "obvious to try" to add a Reset Enable Function because all of the microwave components disclosed in Smith and/or the Smith-Emma combination are non-destructive, as discussed above, and are designed to be power cycled. Thus, there would only be a finite number of potential solutions and conditions for restarting the microwave after the shutdown. A POSITA would have included such a feature with a reasonable expectation of success.

[307]. There are numerous reasons why a POSITA would have combined the microwave refrigerator combination taught in Emma with the Smoke Sensor operatively placed inside the microwave oven in Smith.

[308]. First, Emma and Smith each relate to optimizing electric cooking appliances. Second, all the claimed elements of the Challenged Claims were known in the prior art, and a POSITA would have combined the elements as disclosed by known methods for the purposes of providing Emma's microwave / refrigerator combination with Smith's smoke sensor operatively connected with the cooking area. I believe that such a combination would have yielded nothing more than predictable results to one of ordinary skill in the art. While

Emma fails to recite a smoke sensor, Emma does disclose adding functionality to appliances by cycling power to a refrigerator and auxiliary electrical outlets for the purpose of improving the safety of the Emma appliance (preventing overload conditions). Emma's teaching would motivate a POSITA to look to further microwave functionalities, including those in Smith.

[309]. Any inclusion of Smith's smoke sensor, operatively connected with the cooking area, with Emma would have resulted in such elements merely performing the same function as they do separately, i.e., sensing smoke to withdraw electrical power from an electrical cooking appliance, and then enabling the resetting of the electrical cooking appliance. A POSITA would have recognized that the results of said combination were predictable, because Emma and Smith function to digitally control power-control circuitry for an electrical appliance based on a sensor input.

[310]. Third, a POSITA would have been motivated to combine Emma and Smith based on the teachings of each reference. Specifically, Emma and Smith are each directed towards shutting down a component of the device in response to a sensor output indicative of an unwanted condition. Emma teaches a withholding of power based on the power demands of the microwave oven. I believe that Smith inherently teaches a power-control relay designed to be

power cycled by the controller. It would have been obvious to a POSITA to modify Emma with Smith to include the smoke sensor in operative connection with the microwave oven following the elimination of the unwanted condition that had been detected, and then re-check for smoke condition for the added benefit of reusing the microwave oven. In my opinion, a POSITA would have been able to pursue any of these known potential solutions with a reasonable expectation of success grounded in the disclosures of the prior art.

[311]. Lastly, a POSITA would also have found the asserted combinations of Emma and Smith "obvious to try". As shown in Emma and Smith, at the time of the invention there was a recognized need in the art to optimize microwave ovens. Ex. 1011 at [0007] 1014 at 1:6-40. Therefore, it would have been obvious to a POSITA to try this combination.

3. THE '876 CHALLENGED CLAIMS ARE OBVIOUS IN VIEW OF EMMA COMBINED WITH BUTT, AND ALTERNATIVELY, WITH BUTT AND SMITH

[312]. In my opinion, each of the '876 Challenged Claims are obvious in view of Emma combined with Butt or, alternatively, with Butt and Smith. It would have been obvious to combine the microwave / refrigerator combination of Emma with the smoke sensor taught in Butt. The only element of an Emma/Butt combination which one might argue is not expressly recited is "wherein the smoke sensor is positioned in operative connection with a cooking

area inside the microwave oven." Nevertheless, it would have been obvious to a person of ordinary skill in the art to modify the Emma/Butt combination to teach a smoke sensor in operative connection with a cooking area inside a kitchen appliance -- in this case a microwave oven. As discussed above, Butt teaches a user-enabled reset device which can be initiated following the smoke detector unit detecting smoke and ceasing the supply of power to the appliance. *See* ¶[105-08]. Butt's reset function reinitializes the system for further use by checking for a smoke-alarm system signal and then closing a relay to reconnect the electrical appliance to AC power if no such signal is detected. *See* ¶[192-95]. As discussed above, there are numerous reasons why a POSITA would have made a modification to the Emma/Butt combination so as to position the smoke-detection sensor in operative connection with the inside of the microwave oven. First, based on the teaching and suggestion provided in the Emma/Butt combination, it would have been obvious to a POSITA to place the smoke sensor to be in operative connection with the cooking area inside the microwave oven, because doing so would place the sensor in closer proximity to the source of smoke (initiating at the food being heated). The smoke detector would need to be in operative connection for it to function as a smoke detector. It would have been consistent with the express teaching of Butt that the sensor be integrated with the kitchen appliance.

[313]. Based on Butt's teaching and/or the motivation to have the smoke sensor be positioned in a location to detect generated smoke close to its source, a POSITA would have placed, or at least tried to place, the smoke-detection sensor in operative connection with the cooking area of any kitchen appliance -- in this case a microwave oven. The POSITA would have had a reasonable expectation of success in detecting smoke more quickly compared to attempting to detect smoke using a smoke detector positioned further away from the cooking area.

[314]. There are numerous reasons why a POSITA would have combined the microwave / refrigerator combination of Emma with the smoke sensor of Butt. First, all the claimed elements were known in the prior art, and a POSITA would have combined the elements as claimed by known methods, with no change in their respective functions. The combination would have yielded nothing more than predictable results to one of ordinary skill in the art. While Emma fails to recite a smoke sensor, Emma does disclose adding functionality to appliances by cycling power to a refrigerator and auxiliary electrical outlets for the purpose of improving the safety of the Emma appliance (preventing overload conditions). Emma's teaching would have motivated a POSITA to look to further microwave functionalities, including those in Butt.

[315]. Both Emma and Butt disclose shutdown conditions while using electrical cooking appliances that provide added functionality. Additionally, Butt explicitly relates to added features of kitchen appliances. *See* ¶[105-08]. It would have been obvious to a POSITA to combine the additional kitchen-appliance safety features of Butt with the Emma microwave / refrigerator combination so as to enable the Emma microwave to shut down upon the detection of smoke, and to reenable the Emma microwave for a further cooking session when the smoke had cleared. Further, it would have also been obvious to a POSITA to modify Butt with the features of the microwave / refrigerator combination of Emma for the purpose and convenience of having an "all-in-one appliance" in addition to the safety feature of managing total power draw as taught by Emma.

[316]. To the extent the Board determines that the combination of Emma and Butt does not render obvious the Challenged Claims, it would have been obvious to a POSITA to combine Emma with Butt and Smith.

[317]. Emma, Butt and Smith each relate to optimizing electric cooking appliances. Second, all the claimed elements of the Challenged Claims were known in the prior art, and a POSITA would have combined the elements as disclosed by known methods for the purposes of modifying Emma's microwave

refrigerator combination to include Smith's smoke sensor to be operatively connected with its cooking area and to include Butt's smoke sensor and reset functionality. Such a combination would have yielded nothing more than predictable results to one of ordinary skill in the art. Any inclusion of Butt's reset functionality with Smith's smoke sensor operatively connected with the cooking area into Emma would result in such elements merely performing the same function as they do separately, i.e., sensing smoke to withdraw electrical power from an electrical cooking appliance and then re-enabling the electrical cooking appliance. A POSITA would have recognized that the results of said combination were predictable, because Emma, Butt and Smith function to digitally control power-control circuitry for an electrical appliance based on a sensor input.

[318]. Third, a POSITA would have been motivated to combine Emma Butt and Smith based on the teachings of each reference. Specifically, Emma, Butt and Smith are each directed towards shutting down a component of the device in response to a sensor output indicative of an unwanted condition, Emma teaches the withholding of power based on the power demands of the microwave oven. Butt discloses shutting down electrical cooking appliances in response to a smoke sensor, and also discloses resetting the electrical power supply to the cooking appliance after a smoke-triggered shutdown condition.

See ¶[182-85]. Similarly, Smith inherently teaches a power-control relay for the microwave magnetron designed to be power cycled by the controller. *See* ¶[104]. It would have been obvious to a POSITA to modify Emma with Butt and Smith to include the smoke sensor in operative connection with the microwave oven with the reset functionality disclosed by Butt for the added benefit of reusing the microwave oven. A POSITA would have been able to pursue any of these known potential solutions with a reasonable expectation of success grounded in the disclosures of the prior art.

[319]. Further, a POSITA would also have found the asserted combinations of Emma and Butt with Smith "obvious to try." As shown in Emma, Butt, and Smith, at the time of the invention there was a recognized need in the art to optimize microwave ovens. Ex. 1011 at [0007]; Ex. 1015 at 1:22-44 and Ex. 1014 at 1:6-40. Therefore, it would have been obvious to a POSITA to try this combination.

[320]. Lastly, if it is determined that Butt fails to teach the VOC Sensor claim element, it would have been obvious to a POSITA to use either a photoelectric or ionization smoke sensor as the smoke sensor in Butt, because photoelectric and ionization smoke sensors were common smoke-detector designs that would have been known to a POSITA. Such designs are further

evidenced by ISDU which discusses both ionization and photoelectric smoke detectors. Ex. 1012 at 9.

XII. CONCLUSION

[321]. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code. I further declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Date: June 7, 2003



Mark N. Horenstein, Ph.D.

Appendix A

MARK N. HORENSTEIN, Ph.D.
40 Hastings St., West Roxbury, MA 02132
Tel: (617)-792-4095 mhoren@mhoren.net

Areas of Expertise

Electric Power Systems, Applied Electromagnetics, Analog and Digital Circuits, Power Electronics, Radio Communications, Electrical Wiring for Building Applications (National Electric Code)

Education

Massachusetts Institute of Technology Ph.D. Electrical Engineering 1978
(Electric Power Systems Engineering Laboratory)
Thesis Area: High-Voltage (800 kV) DC Insulators

University of California at Berkeley M.S. Electrical Engineering 1975
Research Area: Beam Plasma Interactions
(Solid State Optics Laboratory)

Massachusetts Institute of Technology S.B. Electrical Engineering 1973

Employment History

Boston University

Professor, Dept. of Electrical and Computer Engineering*	2000 - 2020
Associate Chair for Undergraduate Programs - ECE Department	2011 - 2015
Associate Dean for Graduate Programs and Research, Engineering	1999 - 2007
Associate Professor, Dept. of Electrical and Computer Engineering	1985 - 2000
Assistant Professor, Dept. of Electrical and Computer Engineering	1979 - 1985

*Professor Emeritus as of 1/2021

Spire Corporation

Research Scientist 1978 – 1979
High-Voltage Transmission Line Pulsed-Power Division.
Worked on 400-kV energy systems for rapid deployment of stored energy.

Professional Affiliations

- Institute of Electrical and Electronic Engineers (IEEE) Life Fellow
- Electrostatics Society of America (Past President and Life Member)
- European Federation of Chemical Engineers, International Fellow in Electrostatics
- National Association of Radio and Telecommunications Engineers: Certified Electrostatic Discharge Engineer
- Registered Professional Engineer - Electrical (previously) Commonwealth of Massachusetts
- Journal of Electrostatics (Editor Emeritus; Editor for 14 years)

Current Research Activities

Self-Cleaning Solar Panels via Traveling Wave Electrodynamic Screen: Modeling and

Commercialization

Teaching Experience

Electric Circuits, Power Electronics, Integrated Circuit Electronics Electromagnetics, Antennas and Propagation, Engineering Design.

Prior Expert Witness & Litigation Work in Which Testimony Given

(Past 5 years - full list available upon request)

Present:

Bel Power Solutions v Monolithic Power Systems
United States District Court for the Western District of Texas
Case No. No. 6:21-cv-00655-ADA
Working on Behalf of Bel Power
Matter: Distributed DC Power Integrated Circuits
Expert Reports, Deposition
Status: Ongoing

Polaris Power LED Technologies v. Nintendo of America.
Nidec Motor Corporation v Broad Ocean Motor, LLC.
United States District Court for the Western District of Washington at Seattle
Case No. 2:22-cv-00386-JLR
Working on Behalf of Nintendo.
Matter: Brightness Control of LED Lighting
Declaration
Status: Ongoing

NOCO Company vs Horizon Brands Europe GmbH
Düsseldorf District Court, Germany
Docket No.: 4a O 18/21
Working on Behalf of Horizon Brands
Matter: Battery Power Packs for Vehicle Starting
Expert Report
Status: Ongoing

November 2022:

Ampt v. Solar Edge, Inc.
U.S. International Trade Commission
Inv. No. 337-TA-1327
Working on Behalf of Solar Edge
Matter: Grid Interfaces for Solar Panels
Microcontroller Source Code Analysis, Report
Status: Settled

June 2022:

Ericsson Inc. v Apple Inc.
U.S. International Trade Commission
Inv. No. 337-TA-1300
Worked on Behalf of Ericsson, Inc.
Matter: Smartphone Electronics
Declaration, Deposition
Status: Settled

Owl v SnapPower
U.S. District Court for the Northern District of Texas, Dallas Division
Civil Action No. 3:21-cv-02719-N
Worked on Behalf of SnapPower
Matter: Active LED Cover Plates for Receptacles and Light Switches
Expert Report (Claim Construction)
Status: Pending

January 2022:

T*he NOCO Company vs. Winplus North America, Inc.*
U.S. International Trade Commission
Inv. No. 337-TA-1256
Worked on Behalf of Respondent Winplus
Matter: Battery Power Packs for Vehicle Starting
Declarations, Deposition, Hearing Testimony
Status: ITC Decision on behalf of Winplus

May 2021:

Analog Devices, Inc. vs. Xilinx, Inc.
U.S. Patent and Trademark Office
Case IPR2020-01606
Request for *Inter Partes* Review of US Patent 7,280,590
Worked on behalf of Patent Owner Xilinx
Matter: Integrated Circuit Architectures
Declarations, Deposition
Status: Settled

December 2021

CFL Technologies LLC v. Osram Sylvania, Inc. and Ledvance, LLC.
United States District Court for the District of Delaware
C.A. No. 18-1445 (RGA)
Worked on behalf of Defendant Ledvance
Matter: Compact Fluorescent Lamps
Declarations on Claim Construction
Status: Settled

October 2021:

Astronic Test Systems, Inc. v. Teradyne, Inc
US Patent and Trademark Office
Case IPR2021-00350
Request for *Inter Partes* Review of U.S. Patent 7,395,479
Worked on behalf of Patent Owner Teradyne
Matter: Automated Test Equipment
Declaration, Deposition
Status: Markman Decision in favor of Astronic

September 2021

Samsung Electronics Co. Ltd. and Samsung Electronics America, Inc. v. Gui Global Products, Ltd.
U.S. Patent and Trademark Office
Case IPR2021-00338
Request for *Inter Partes* Review of US Patent 10,589,320
Matter: Wireless Earbuds and Devices
Declaration, Deposition
Status: On hold

January 2021:

MAGicALL vs. Advanced Energy and Eaglerise
United States District Court, District of Colorado
1:17-cv-02582-DDD-NRN
Matter: Inductors for Solar Energy Transfer
Worked on behalf of MAGicALL
Deposition
Status: On hold

December 2020:

Voltstar Technologies, Inc. vs. Superior Communications and AT&T Mobility, Inc.
United States District Court, Central District of California
2:19-CV-07355-JAK-E
Matter: Qi Wireless Charging Systems
Worked on behalf of Superior/ATT
Declaration, Deposition
Status: Settled

January 2020:

Bell Northern Research vs. Coolpad Technologies et. al.
United States District Court, District of Southern California
3:18-cv-01784-CAB-BLM
Matter: Mobile Phones
Worked on behalf of Bell Northern Research
Opening Report, Code Analysis, Product Testing, Rebuttal Report, Deposition

Status: Settled

January 2020:

Bell Northern Research vs. ZTE et. al.
United States District Court, District of Southern California
Matter: Mobile Phones
Worked on behalf of Bell Northern Research
Opening Report, Code Analysis, Product Testing, Rebuttal Report, Deposition
Status: Settled

January 2019:

SnapRays LLC v. AllTrade, Enstant, et al.
U.S. International Trade Commission - Inv. No. 337-TA-1124
Matter: Active Electric Cover Plates
Worked on behalf of Complainant SnapRays
Opening Report, Product Testing, Rebuttal Report, Deposition
Status: Appeared before the ITC. Settled

April 2018:

Lincoln Electric Company v. Harbor Freight Tools
U.S. District Court for Northern District of Ohio, Eastern Division
Case No. 1:17-cv-02329
Matter: Driving Circuits for Welding Machines
Worked on behalf of Defendant Harbor Freight
Opening Report, Product Testing, Rebuttal Report, Deposition
Status: Settled

July 2018

RB-TPG San Jose v Tyco Fire Products
U.S. District Court for the Northern District of California,
Case No: 5:17-cv-03655
Matter*: RF* Interference with Wireless Fire Alarm Systems
Worked on behalf of Plaintiff RB-TPG
Opening Report, Rebuttal Report, Deposition, Jury Trial
Status: Jury finding for Defendant

September 2018:

UPI v. Richtek Corp.
U.S. International Trade Commission Inv. No. 337-TA-698
Matter: Integrated Circuits for Power Applications
Worked on behalf of Richtek USA
Expert report, Rebuttal Report, Deposition, Testimony at ITC Hearing
Status: Decision in favor of Richtek

November 2018:

Broad Ocean LLC v. Nidec Corp

Request for *Inter Partes* Review of US Patent 7,990,092
Matter: Electric Motors for HVAC Control
Worked on Behalf of Patent Owner Nidec
Declaration, Deposition.
Status: Settled

Technical Consulting

Griswold Corporation (Nov 2015 – Nov 2016)
Electric Water Treatment Devices
WAVE Reaction Chamber Design Review

CSL Consulting/Harvard Business School (Aug 2018)
Evaluation of Electrostatic Fields on LED Screen

Research Grants (Under Boston University)

Development of Prototype Self-Cleaning Solar: Massachusetts Clean Energy Center
(Subject: Self-Cleaning Solar Collectors)

Self-Cleaning Solar Panels: US–Israel Binational Science Foundation
(Subject: Self-Cleaning Solar Collectors)

Enhancement of Optical Efficiency of CSP – U.S. Dept. of Energy
(Subject: Self-Cleaning Solar Collectors)

In-Air Electric-Field Sensor Circuit for Airborne Applications - U.S. Navy STTR Phase I: N68335-15-C-0271 via White River Technologies. (Subject: Electric Field-Mill UAV Sensor)

Compact Low-Power Driver for Deformable Mirror – NASA via Boston Micromachines
(Subject: High Voltage MEMS Driver for Adaptive Optics)

Publications

Books:

M. N. Horenstein, *Design Concepts for Engineers, 5thEd.*, Upper Saddle River, NJ: Prentice Hall, 2015.

M. N. Horenstein, *Microelectronic Circuits and Devices, 2nd Ed.* Upper Saddle River, NJ: Prentice Hall, 1995

Journals Articles and Conference Papers (partial list):

Bernard, A.A.R, Horenstein, M.N.; Mazumder, M.K, et al, Optimization of optical performance and dust removal efficiency of electrodynamic screen (EDS) films for

improving energy-yield of solar collectors, 2018 IEEE 7th World Conference on Photovoltaic Energy Conversion (WCPEC) (A Joint Conference of 45th IEEE PVSC, 28th PVSEC & 34th EU PVSEC), p 3451-4, 2018

Morales, C., Horenstein, M.; Mazumder, M., et al, Field-evaluation of electrodynamic screens for maintaining high optical efficiency operation of solar collectors 2017 IEEE 44th Photovoltaic Specialist Conference (PVSC), p 2870-4, 2017

Mazumder, M.K., Horenstein, M.N.; Sayyah, A.; et al, Mitigation of dust impacts on solar collectors by water-free cleaning with transparent electrodynamic films: Progress and challenges 2017 IEEE 44th Photovoltaic Specialist Conference (PVSC), p 6 pp., 2017

Sayyah, A., Crowell, D.R.; Raychowdhury, A., Horenstein, M.N. ; Mazumder, M.K. , "An experimental study on the characterization of electric charge in electrostatic dust removal", Journal of Electrostatics, June 2017, pgs. 173-9

Sayyah A, Horenstein MN, Mazumder MK, Ahmadi G, "Electrostatic Force Distribution on an Electrodynamic Screen," *Journal of Electrostatics* 81:24-36 Jun 2016

Sayyah A, Horenstein MN, Mazumder MK, "A Comprehensive Analysis of the Electric Field Distribution in an Electrodynamic Screen, *Journal of Electrostatics* 76:115-126 Aug 2015

Mazumder MK, Stark JW, Heiling C, Liu M, Bernard A, Horenstein MN, Garner S, Lin HY, "Development of Transparent Electrodynamic Screens on Ultrathin Flexible Glass Film Substrates for Retrofitting Solar Panels and Mirrors for Self-Cleaning Function, *MRS Advances* 1(15):1003-1012 2016

Dai S, Knepper RW, Horenstein MN, " 300-V LDMOS Analog-Multiplexed Driver for MEMS Devices, " *IEEE Transactions On Circuits And Systems I-Regular Papers* 62(12):2806-2816 Dec 2015
A. Sayyah, M.N. Horenstein, M.K. Mazumder, "Energy yield loss caused by dust deposition on photovoltaic panels", *Solar Energy*, v 107, p 576-604, Sept. 2014.

M. N. Horenstein, M. K. Mazumder, R. C. Sumner, J.W. Stark, T. Abuhamed, R. Boxman, "Modeling of trajectories in an electrodynamic screen for obtaining maximum particle removal efficiency", *IEEE Transactions on Industry Applications*, v 49, n 2, p 707-13, March-April 2013.

Klausner, A., Trachtenberg, A.; Starobinski, D.; Horenstein, M., "An Overview of the Capabilities and Limitations of Smartphone Sensors", *Int.. Jour of Handheld Computing Research*, v 4, n 2, p 69-80, April-June 2013

Mazumder, M. Horenstein, M.N.; Stark, J.W.; Girouard, P.; Sumner, R.; Henderson, B.; Sadder, O.; Hidetaka, I.; Biris, A.S.; Sharma, R., "Characterization of Electrodynamic

Screen Performance for Dust Removal from Solar Panels and Solar Hydrogen Generators", *IEEE Transactions on Industry Applications,* v 49, n 4, p 1793-800, July-Aug. 2013

Horenstein, M.N., Mazumder, M.; Sumner, R.C., Jr., "Predicting particle trajectories on an electrodynamic screen - theory and experiment" *J. of Electrostatics*, v 71, n 3, p 185-8, June 2013

Mazumder, M.; Horenstein, M.N.; Stark, J.W.; Girouard, P.; Sumner, R.; Henderson, B.; Sadder, O.; Hidetaka, I.; Biris, A.S.; Sharma, R. "Characterization of Electrodynamic Screen Performance for Dust Removal from Solar Panels and Solar Hydrogen Generators" *IEEE Transactions on Ind. Applications,* Volume: 49, Issue: 4, 2013

Horenstein, M.N.; Sumner, R.; Miller, P.; Bifano, T.; Stewart, J.; Cornelissen, S., "Ultralow-power multiplexed electronic driver for high resolution deformable mirror systems", *Proceedings of the SPIE* v 7930, p 79300M, 2011.

Horenstein, M.N., A Simulation Model for Understanding Propagating Brush Discharges: Comparison of Theory and Experiments, *IEEE Trans. on Ind. Applications*, 47(1), 2011, 344 - 349.

Mazumder, M.K., Srirama, P.K., Sharma, R; Biris, A.S., Hidetaka, I, Trigwell, S, Horenstein, M.N, Lunar and Martian Dust Dynamics, *IEEE Industry Applications Magazine*, 16 (4), 2010, 14-21.

M. Horenstein, Electrostatics of Nanoparticles: What's the Same, What's different*?* *Journal of Electrostatics*, 67 (2-3), May 2009, pp 384-393

M. Horenstein and M. Datta, "The Electrostatics of Charged Insulating Sheets Peeled From Grounded Conductors", J. of Physics: Conference Series 142 (2008) 012076 (refereed publication)

T. Sugimoto, K. Nonaka, and M. Horenstein, "Bidirectional electrostatic actuator operated with charge control" *Journal of Microelectromechanical Systems*, v 14, n 4, Aug. 2005, p 718-24.

J. C. Crager and M.N. Horenstein, "Distributed Parameter Model for Computing Energy Dissipation in Brush-Type Electrostatic Discharges," *Journal of Electrostatics*, 63 (2005), 239-247.

J.C. Crager and M.N. Horenstein, "Measurement of Optical Intensity and Fluence Generated by Spark Discharges", *Electrostatics 2003: Institute of Physics (UK) Conf. Series*, (178)149-154 2004

Patents:

P. Horn, M. Horenstein, and D. Parent. "Air Distributing and Ionizing Systems." (US Patent 5,491,602)

M. Horenstein, "Method and Apparatus for Detecting Leaks in Electrically-Insulative Protective Articles such as Condoms, Surgical Gloves, and the Like Using Gaseous Electrostatic Ions." (US Patent 5,455,507)

Jackson and M. Horenstein, "Nasopharyngealometric Apparatus and Method" (US Patent 5,316,002*)*

T. Bifano and M. Horenstein, "MEMS-based spatial-light modulator with integrated electronics"(US Patent 6,529,311)

Method for Linearizing Deflection of a MEMS Device Using Binary Electrodes and Voltage Modulation (US Patent 7385268)

Appendix B

IRis

Digital Scholarship, Publishing, and Preservation at Northeastern University

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Presented by: Hillary Corbett, Scholarly Communication Librarian
h.corbett@neu.edu | 617.373.2352

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- Showcases your scholarship to other researchers, **funding sources**, potential collaborators, and others

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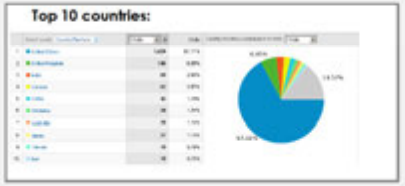
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Appendix C

FIGARO

PRODUCT INFORMATION

TGS 816 - for the detection of Combustible Gases

Features:

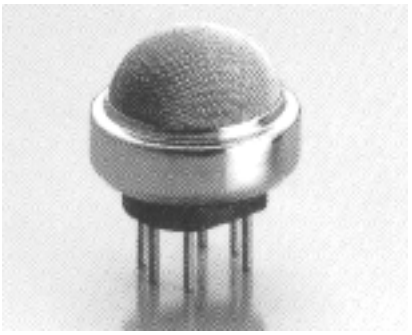
* General purpose sensor with sensitivity to a wide range of combustible gases
* High sensitivity to methane, propane, and butane
* Long life and low cost
* Ceramic base resistant to severe environment

Applications:

* Domestic gas leak detectors and alarms
* Portable gas detectors

The sensing element of Figaro gas sensors is a tin dioxide (SnO_2) semiconductor which has low conductivity in clean air. In the presence of a detectable gas, the sensor's conductivity increases depending on the gas concentration in the air. A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to the gas concentration.

The **TGS 816** is not only sensitive to a wide range of gases, it also has a ceramic base which can withstand severe environments up to 200°C. It has high sensitivity to methane, propane, and butane, making it ideal for natural gas and LPG monitoring. The sensor can detect a wide range of gases, making it an excellent, low cost sensor for a variety of applications.



The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations

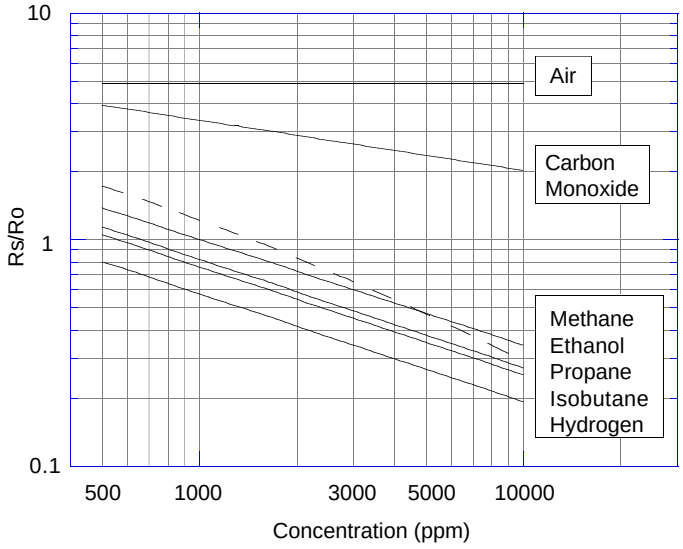
Ro = Sensor resistance in 1000ppm methane

The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio, defined as follows:

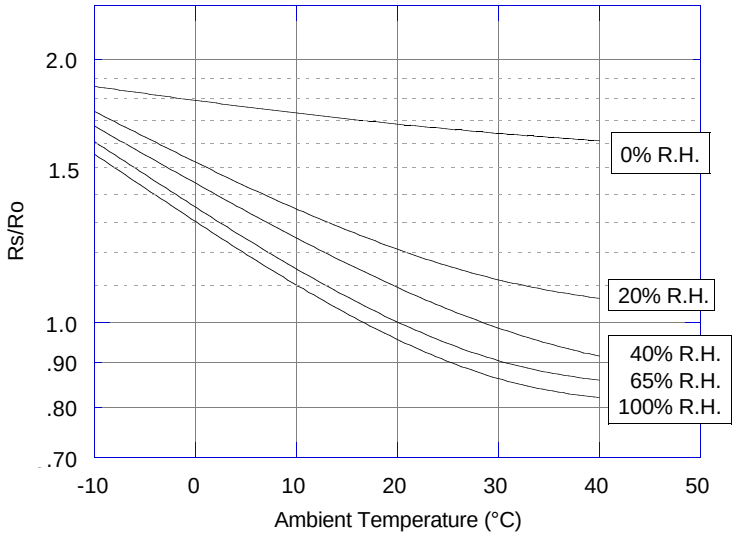
Rs = Sensor resistance at 1000ppm of methane at various temperatures/humidities

Ro = Sensor resistance at 1000ppm of methane at 20°C and 65% R.H.

Sensitivity Characteristics:

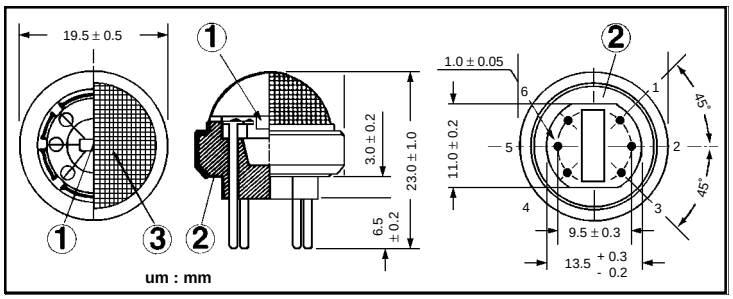


Temperature/Humidity Dependency:



IMPORTANT NOTE: **OPERATING CONDITIONS IN WHICH FIGARO SENSORS ARE USED WILL VARY WITH EACH CUSTOMER'S SPECIFIC APPLICATIONS. FIGARO STRONGLY RECOMMENDS CONSULTING OUR TECHNICAL STAFF BEFORE DEPLOYING FIGARO SENSORS IN YOUR APPLICATION AND, IN PARTICULAR, WHEN CUSTOMER'S TARGET GASES ARE NOT LISTED HEREIN. FIGARO CANNOT ASSUME ANY RESPONSIBILITY FOR ANY USE OF ITS SENSORS IN A PRODUCT OR APPLICATION FOR WHICH SENSOR HAS NOT BEEN SPECIFICALLY TESTED BY FIGARO.**

Structure and Dimensions:



(1) Sensing Element:
SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.

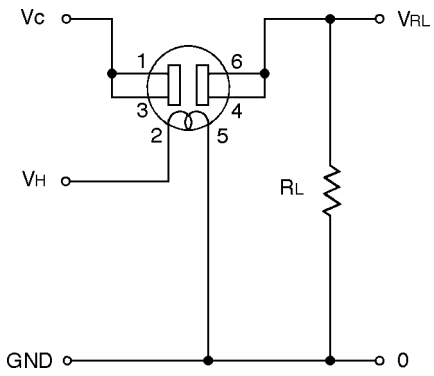
(2) Sensor Base:
Alumina ceramic

(3) Flame Arrestor:
100 mesh SUS 316 double gauze

Pin Connection and Basic Measuring Circuit:

The numbers shown around the sensor symbol in the circuit diagram at the right correspond with the pin numbers shown in the sensor's structure drawing (above). When the sensor is connected as shown in the basic circuit, output across the Load Resistor (V_{RL}) increases as the sensor's resistance (Rs) decreases, depending on gas concentration.

Basic Measuring Circuit:



Standard Circuit Conditions:

Item	Symbol	Rated Values	Remarks
Heater Voltage	V_H	5.0±0.2V	AC or DC
Circuit Voltage	V_C	Max. 24V	AC or DC *PS 15mW
Load Resistance	R_L	Variable	*PS 15mW

Electrical Characteristics:

Item	Symbol	Condition	Specification
Sensor Resistance	Rs	Methane at 1000ppm/Air	5k ~ 15k
Change Ratio of Sensor Resistance	Rs/Ro	$\frac{\text{Rs (Methane at 3000ppm/Air)}}{\text{Rs (Methane at 1000ppm/Air)}}$	0.60 ± 0.05
Heater Resistance	R_H	Room temperature	30.0 ± 3.0
Heater Power Consumption	P_H	VH=5.0V	835 ± 90mW

Standard Test Conditions:

TGS 816 complies with the above electrical characteristics when the sensor is tested in standard conditions as specified below:

Test Gas Conditions: 20°±2°C, 65±5%R.H.
Circuit Conditions: V_C = 10.0±0.1V (AC or DC),
V_H = 5.0±0.05V (AC or DC),
R_L = 4.0kΩ±1%
Preheating period before testing: More than 7 days

FIGARO USA, INC.
3703 West Lake Ave. Suite 203
Glenview, Illinois 60025
Phone: (847)-832-1701
Fax: (847)-832-1705
email: figarousa@figarosensor.com

Sensor Resistance (Rs) is calculated by the following formula:

$$Rs = \left(\frac{V_C}{V_{RL}} - 1\right) \times R_L$$

Power dissipation across sensor electrodes (Ps) is calculated by the following formula:

$$Ps = \frac{V_C^2 \times Rs}{(Rs + R_L)^2}$$

For information on warranty, please refer to Standard Terms and Conditions of Sale of Figaro USA Inc.

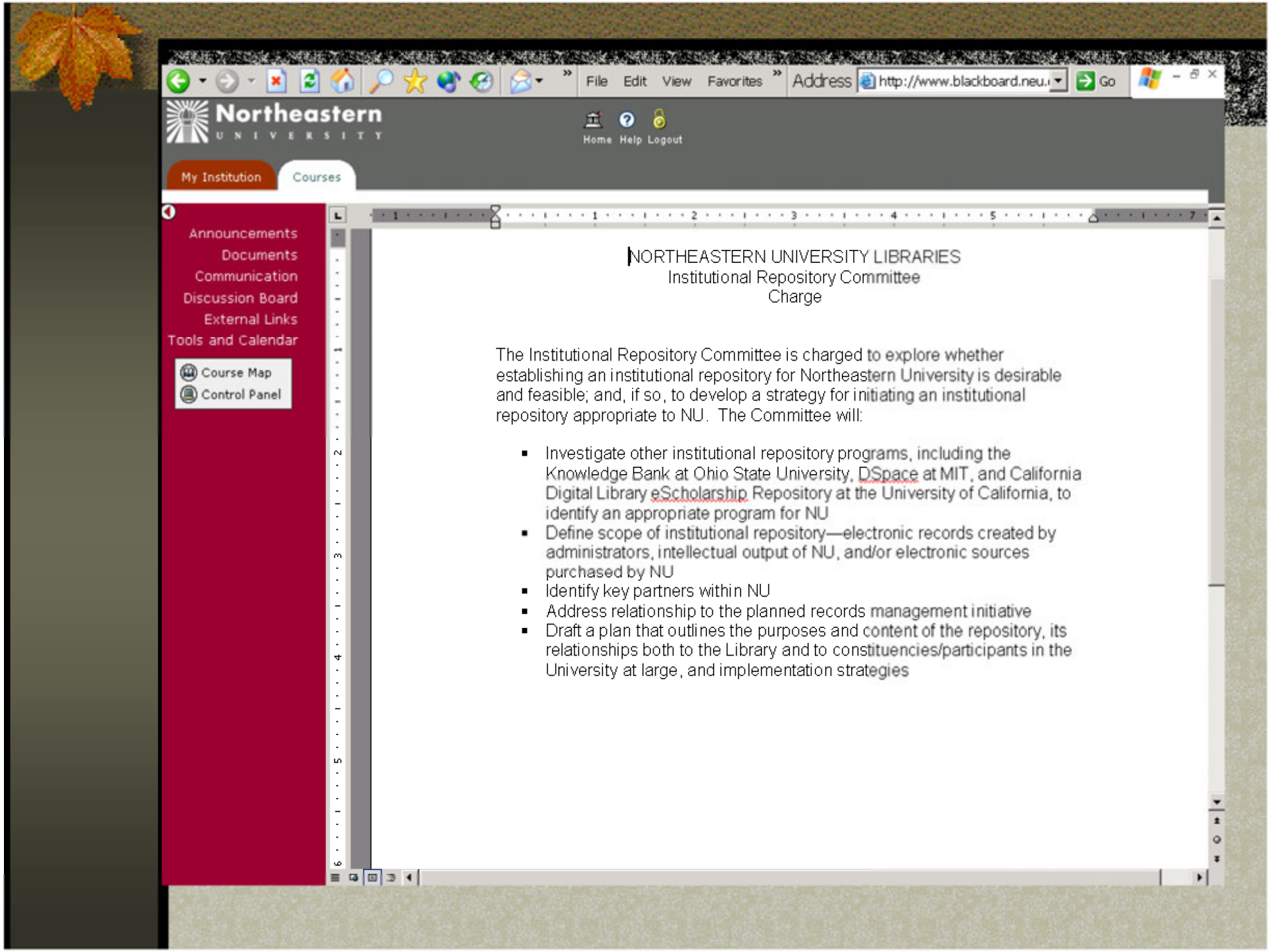
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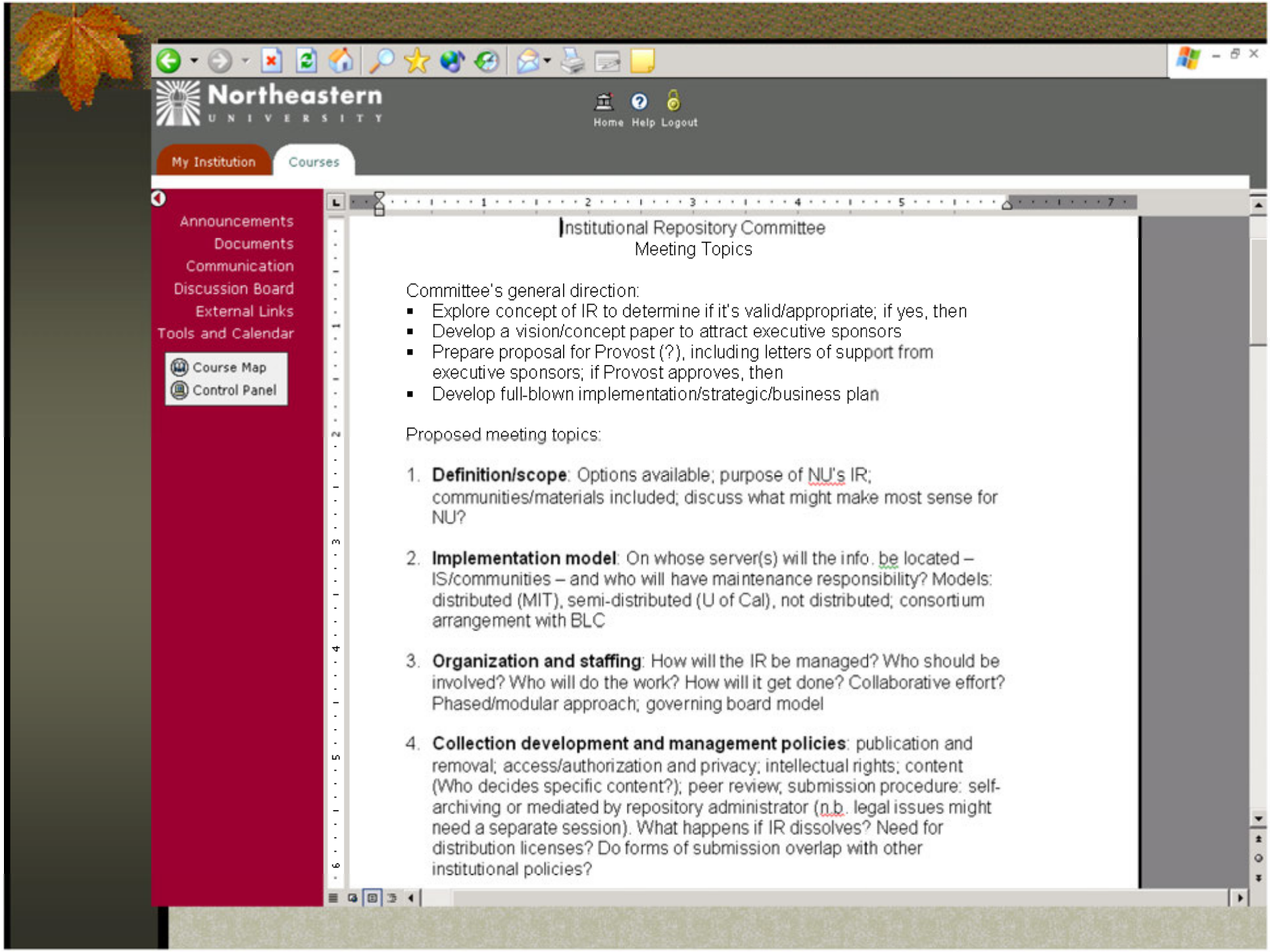
Appendix D

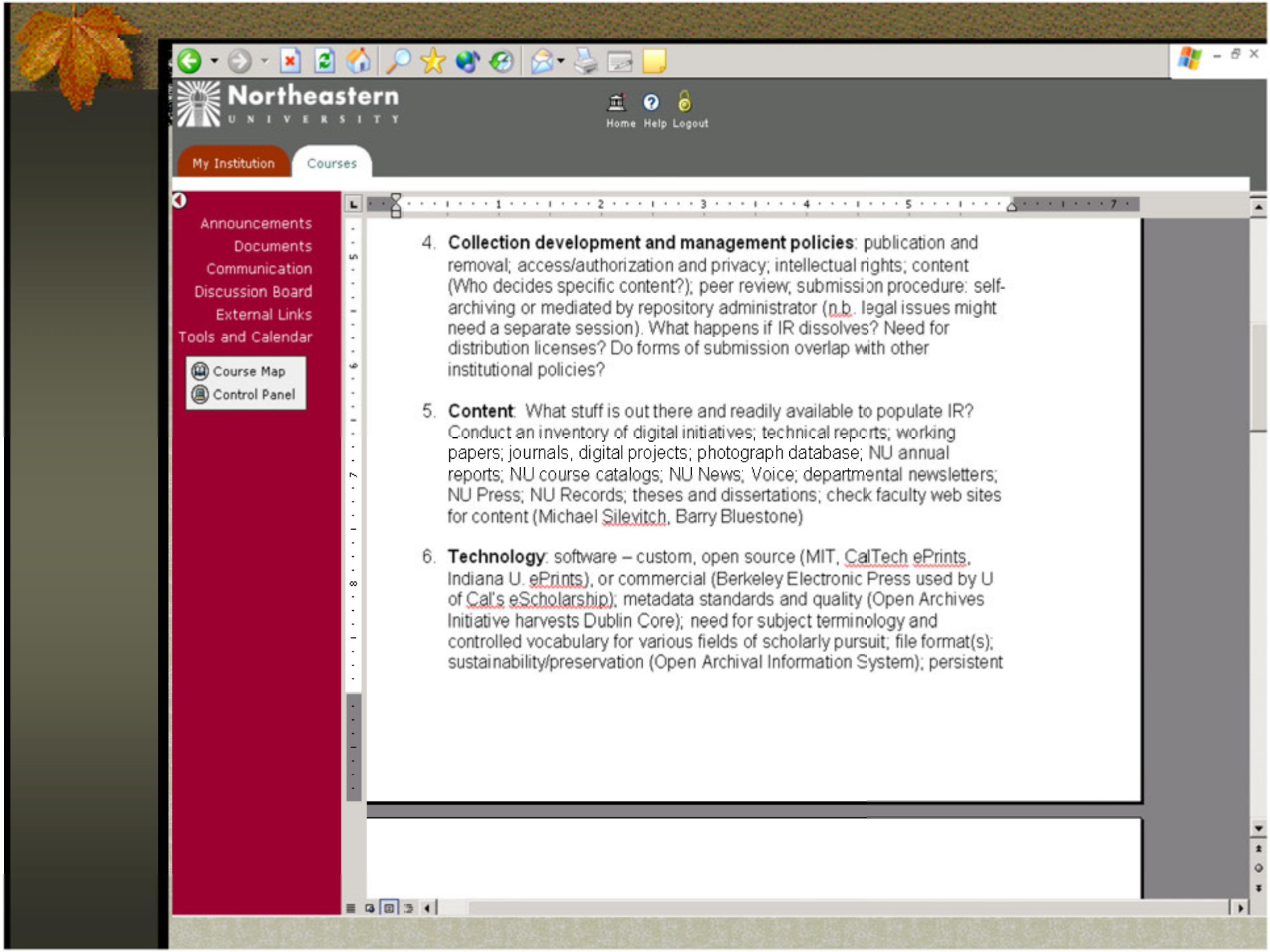
IRis at Northeastern University: Why, What, How

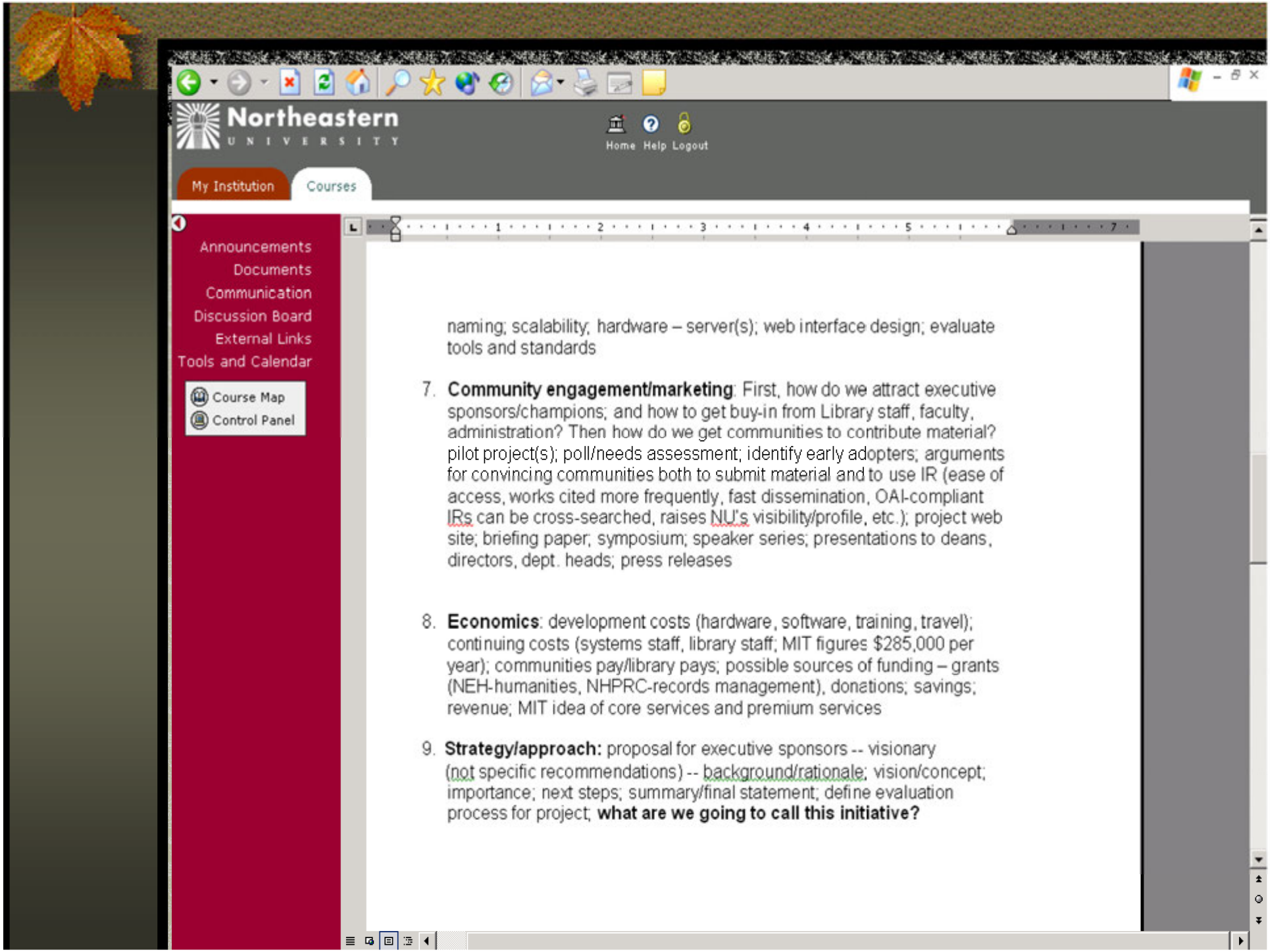
Ed Warro, Northeastern University
Sandy Hurd, Innovative Interfaces
Martin Mehrling, Northeastern University

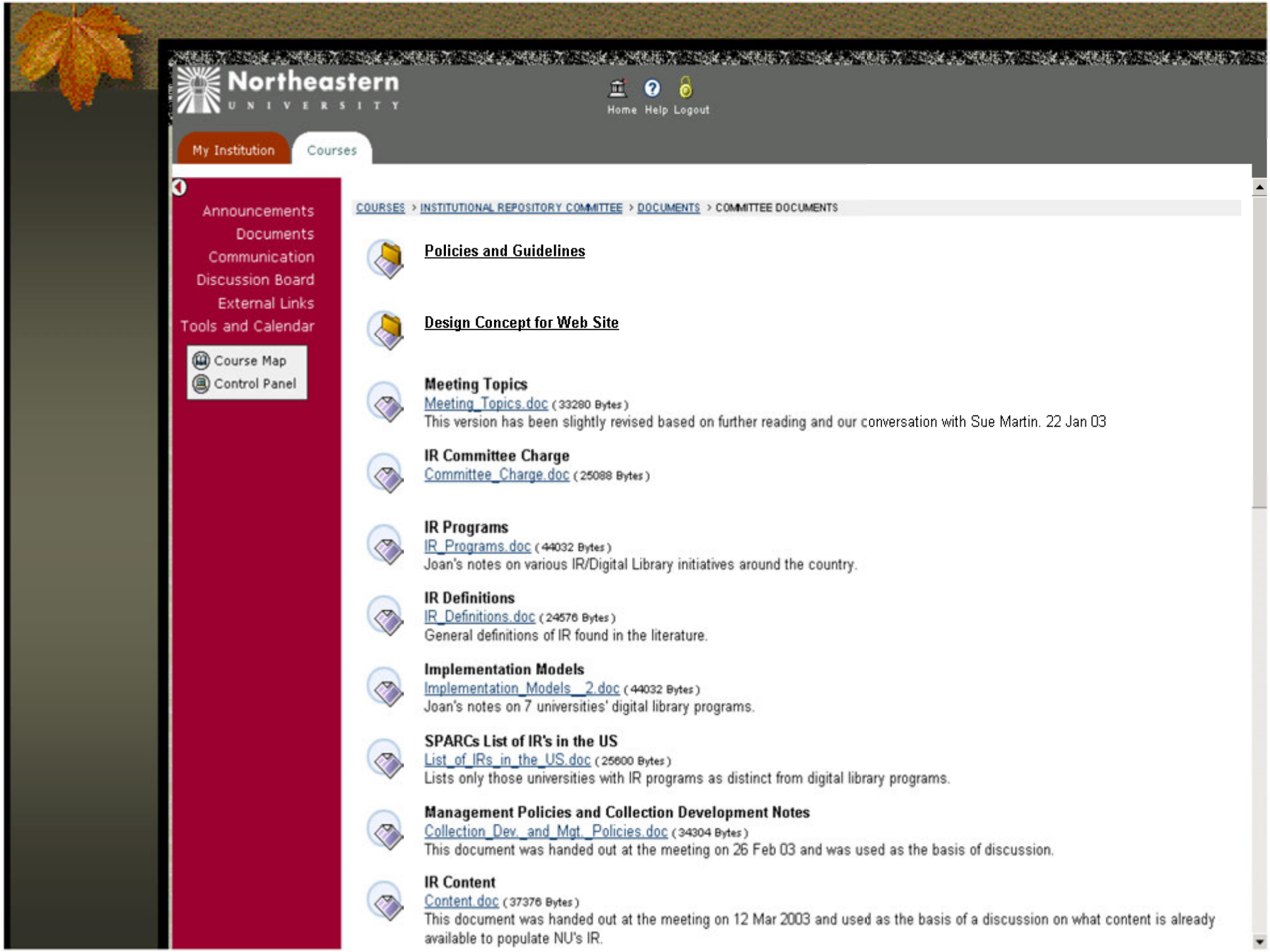
November 18, 2005

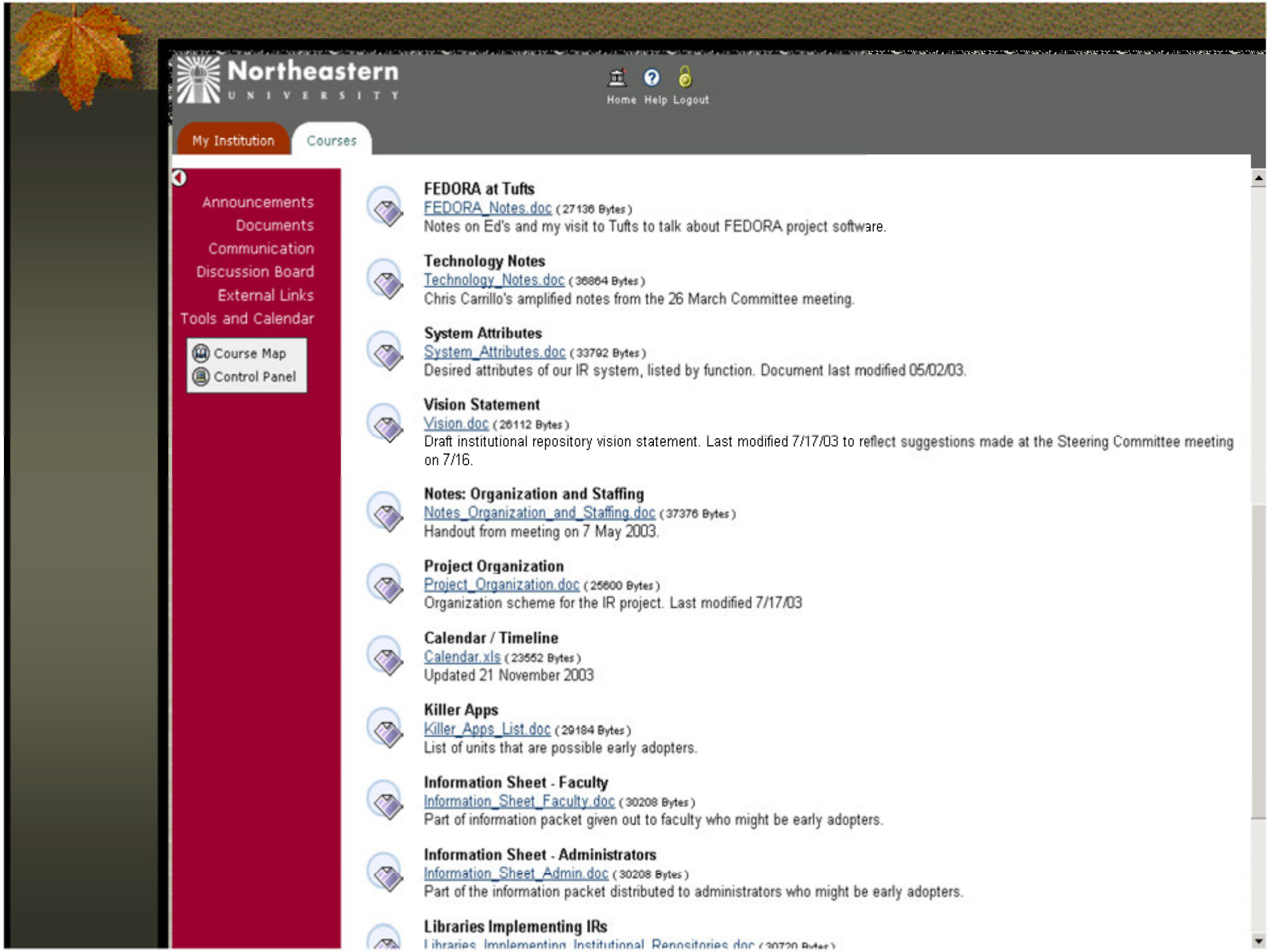

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NORTHEASTERN UNIVERSITY LIBRARIES
Institutional Repository Committee
Charge
The Institutional Repository Committee is charged to explore whether establishing an institutional repository for Northeastern University is desirable and feasible; and, if so, to develop a strategy for initiating an institutional repository appropriate to NU. The Committee will:
Investigate other institutional repository programs, including the Knowledge Bank at Ohio State University, DSpace at MIT, and California Digital Library eScholarship Repository at the University of California, to identify an appropriate program for NU
Define scope of institutional repository—electronic records created by administrators, intellectual output of NU, and/or electronic sources purchased by NU
Identify key partners within NU
Address relationship to the planned records management initiative
Draft a plan that outlines the purposes and content of the repository, its relationships both to the Library and to constituencies/participants in the University at large, and implementation strategies

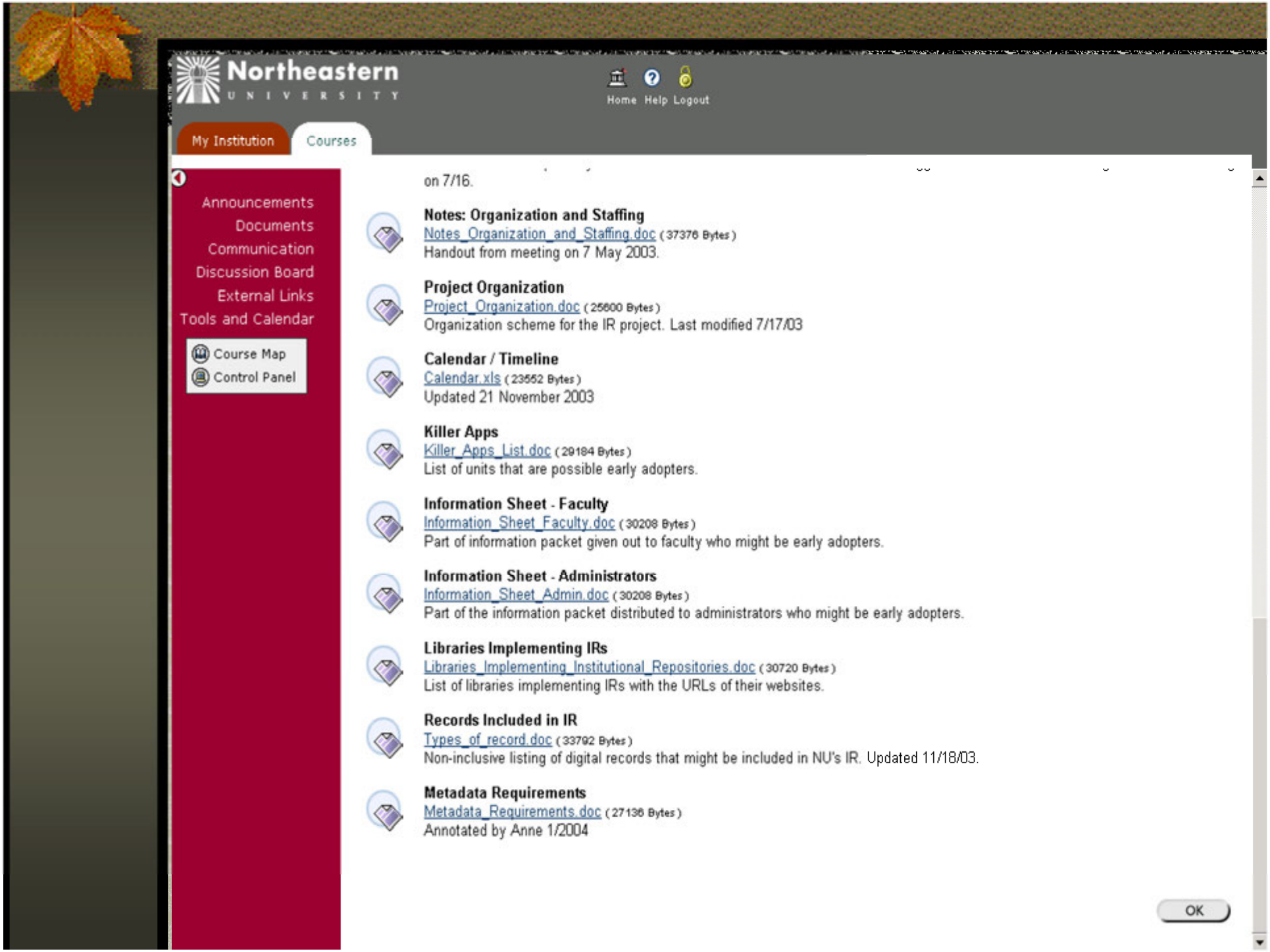

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Institutional Repository Committee
Meeting Topics
Committee's general direction:
Explore concept of IR to determine if it's valid/appropriate; if yes, then
Develop a vision/concept paper to attract executive sponsors
Prepare proposal for Provost (?), including letters of support from executive sponsors; if Provost approves, then
Develop full-blown implementation/strategic/business plan
Proposed meeting topics:
1. Definition/scope: Options available; purpose of NU's IR; communities/materials included; discuss what might make most sense for NU?
2. Implementation model: On whose server(s) will the info. be located – IS/communities – and who will have maintenance responsibility? Models: distributed (MIT), semi-distributed (U of Cal), not distributed; consortium arrangement with BLC
3. Organization and staffing: How will the IR be managed? Who should be involved? Who will do the work? How will it get done? Collaborative effort? Phased/modular approach; governing board model
4. Collection development and management policies: publication and removal; access/authorization and privacy; intellectual rights; content (Who decides specific content?); peer review; submission procedure: self-archiving or mediated by repository administrator (n.b. legal issues might need a separate session). What happens if IR dissolves? Need for distribution licenses? Do forms of submission overlap with other institutional policies?

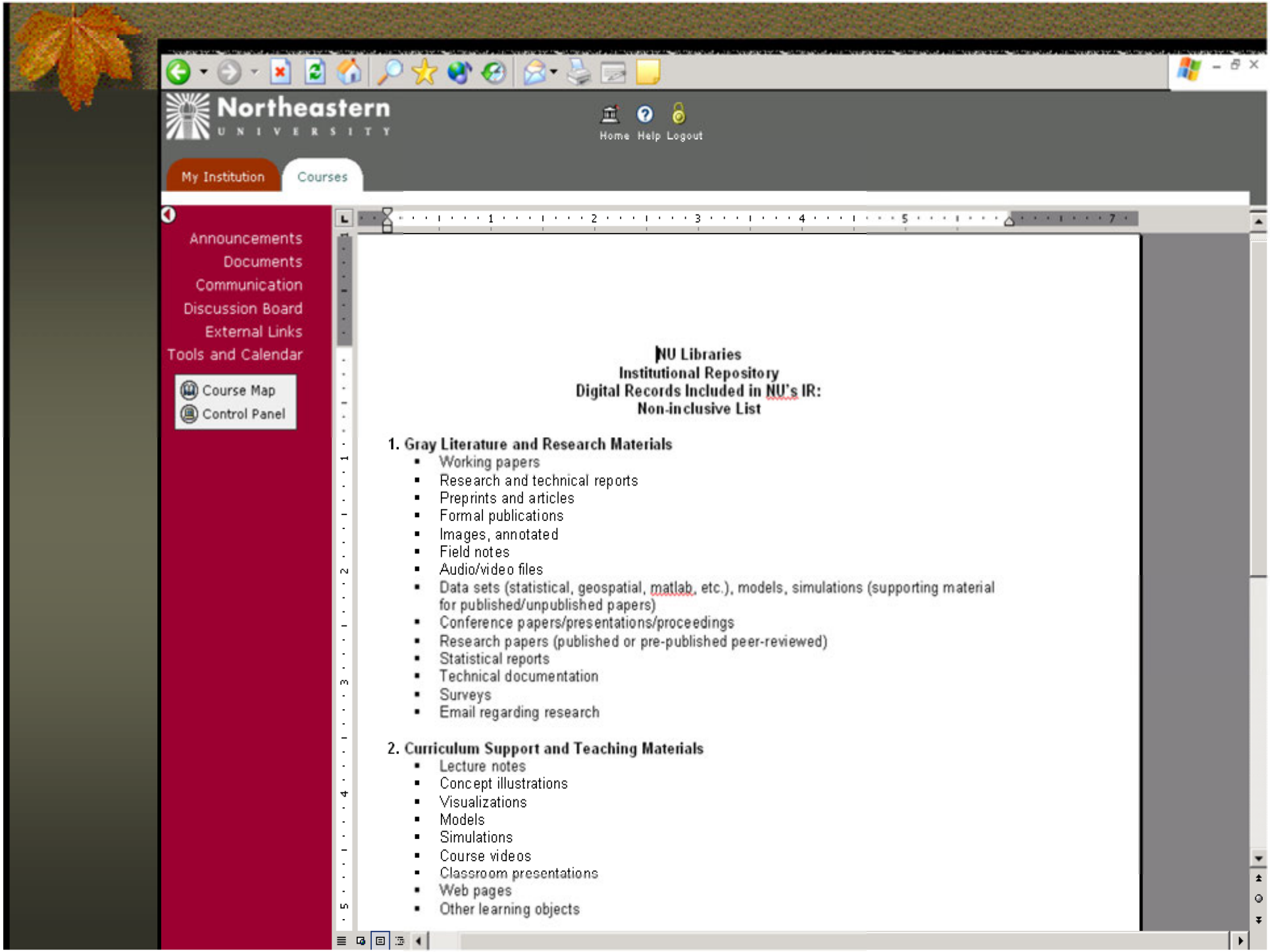

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4. **Collection development and management policies**: publication and removal; access/authorization and privacy; intellectual rights; content (Who decides specific content?); peer review; submission procedure: self-archiving or mediated by repository administrator (n.b. legal issues might need a separate session). What happens if IR dissolves? Need for distribution licenses? Do forms of submission overlap with other institutional policies?
5. **Content**: What stuff is out there and readily available to populate IR? Conduct an inventory of digital initiatives; technical reports; working papers; journals, digital projects; photograph database; NU annual reports; NU course catalogs; NU News; Voice; departmental newsletters; NU Press; NU Records; theses and dissertations; check faculty web sites for content (Michael Silevitch, Barry Bluestone)
6. **Technology**: software – custom, open source (MIT, CalTech ePrints, Indiana U. ePrints), or commercial (Berkeley Electronic Press used by U of Cal's eScholarship); metadata standards and quality (Open Archives Initiative harvests Dublin Core); need for subject terminology and controlled vocabulary for various fields of scholarly pursuit; file format(s); sustainability/preservation (Open Archival Information System); persistent

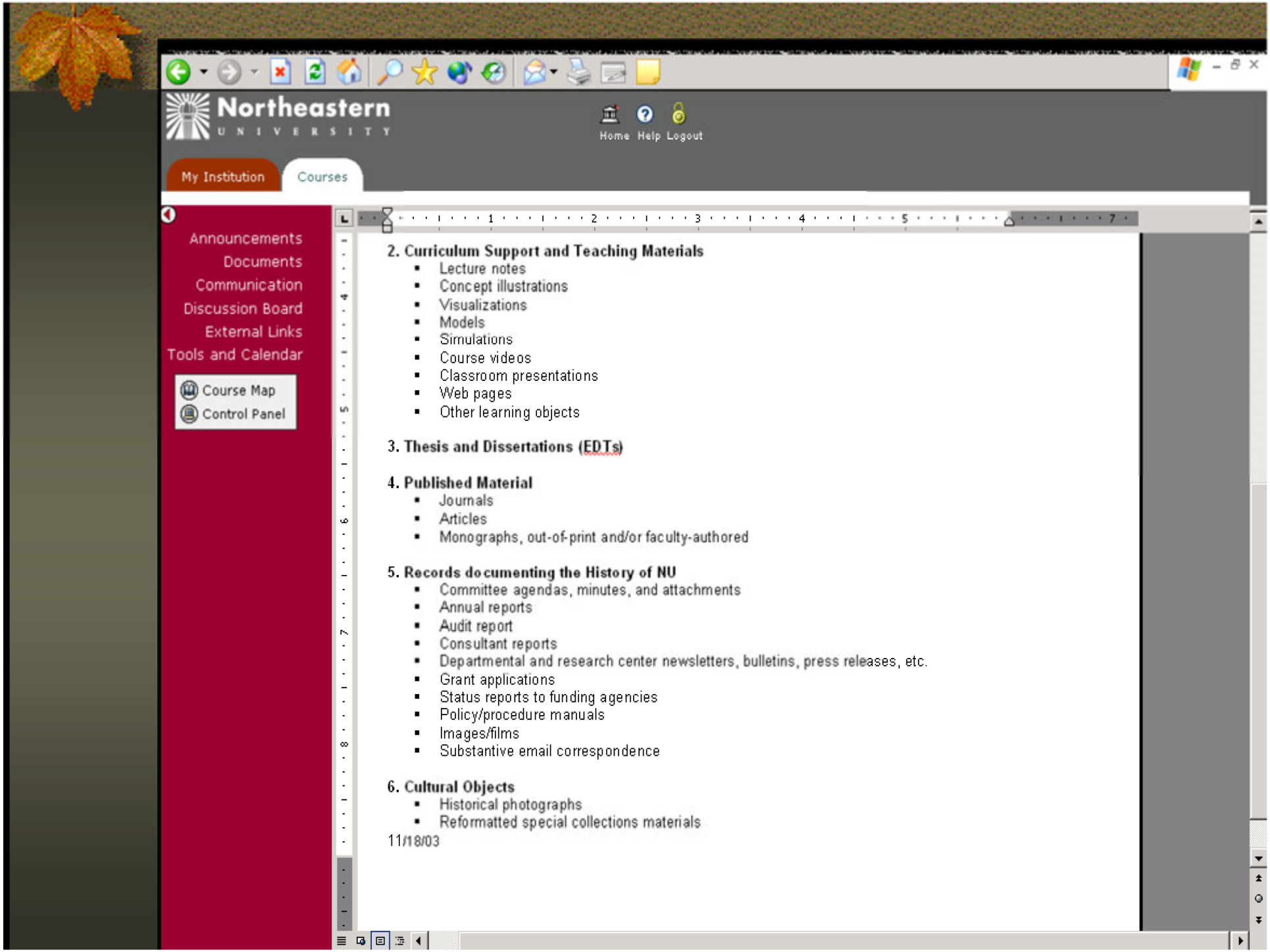

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naming; scalability; hardware – server(s); web interface design; evaluate tools and standards
7. Community engagement/marketing: First, how do we attract executive sponsors/champions; and how to get buy-in from Library staff, faculty, administration? Then how do we get communities to contribute material? pilot project(s); poll/needs assessment; identify early adopters; arguments for convincing communities both to submit material and to use IR (ease of access, works cited more frequently, fast dissemination, OAI-compliant IRs can be cross-searched, raises NU's visibility/profile, etc.); project web site; briefing paper; symposium; speaker series; presentations to deans, directors, dept. heads; press releases
8. Economics: development costs (hardware, software, training, travel); continuing costs (systems staff, library staff; MIT figures $285,000 per year); communities pay/library pays; possible sources of funding – grants (NEH-humanities, NHPRC-records management), donations; savings; revenue; MIT idea of core services and premium services
9. Strategy/approach: proposal for executive sponsors -- visionary (not specific recommendations) -- background/rationale; vision/concept; importance; next steps; summary/final statement; define evaluation process for project; what are we going to call this initiative?

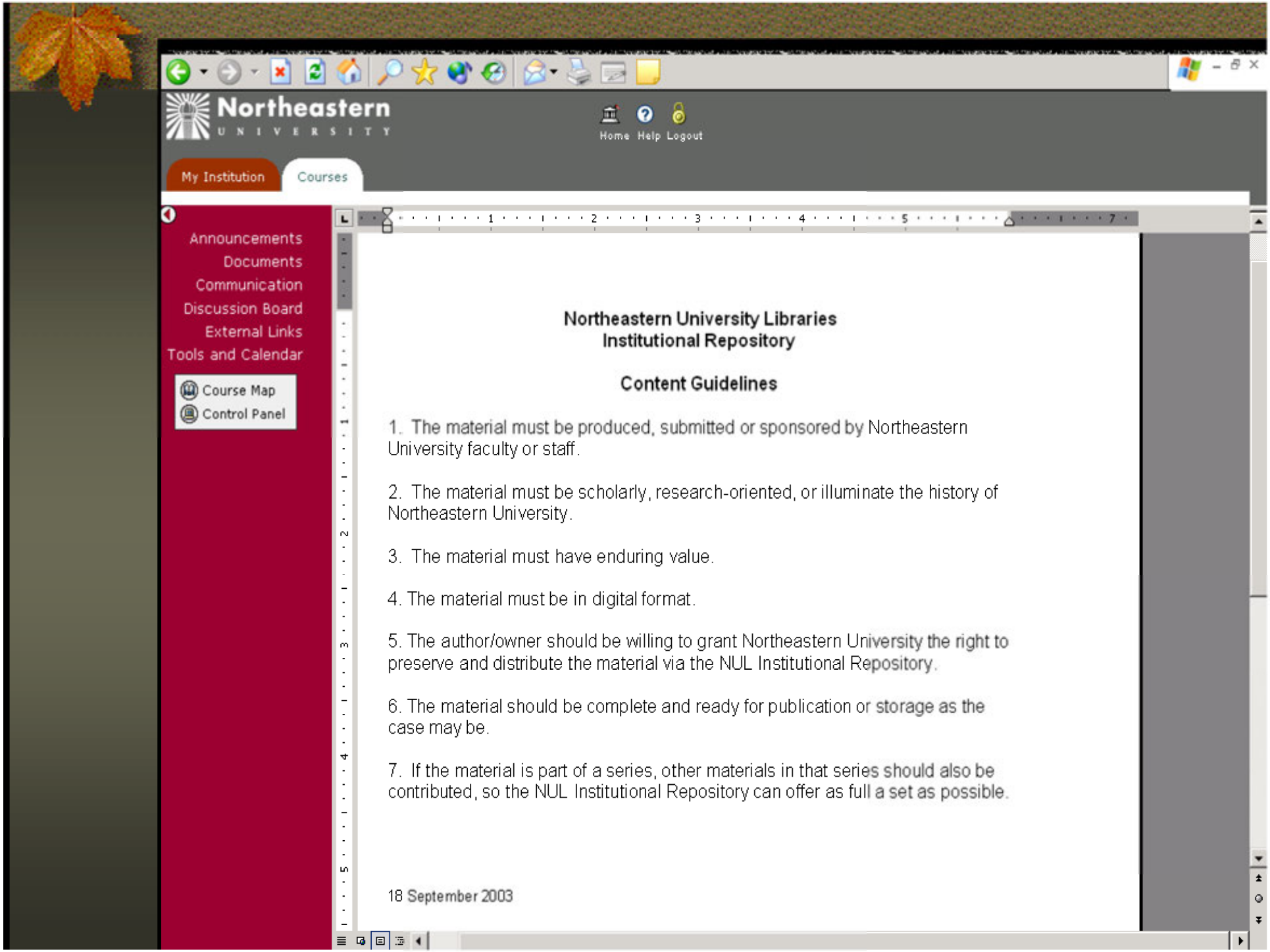

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COURSES > INSTITUTIONAL REPOSITORY COMMITTEE > DOCUMENTS > COMMITTEE DOCUMENTS
Policies and Guidelines
Design Concept for Web Site
Meeting Topics
Meeting_Topics.doc (33280 Bytes)
This version has been slightly revised based on further reading and our conversation with Sue Martin. 22 Jan 03
IR Committee Charge
Committee_Charge.doc (25088 Bytes)
IR Programs
IR_Programs.doc (44032 Bytes)
Joan's notes on various IR/Digital Library initiatives around the country.
IR Definitions
IR_Definitions.doc (24576 Bytes)
General definitions of IR found in the literature.
Implementation Models
Implementation_Models__2.doc (44032 Bytes)
Joan's notes on 7 universities' digital library programs.
SPARCs List of IR's in the US
List_of_IRs_in_the_US.doc (25600 Bytes)
Lists only those universities with IR programs as distinct from digital library programs.
Management Policies and Collection Development Notes
Collection_Dev._and_Mgt._Policies.doc (34304 Bytes)
This document was handed out at the meeting on 26 Feb 03 and was used as the basis of discussion.
IR Content
Content.doc (37376 Bytes)
This document was handed out at the meeting on 12 Mar 2003 and used as the basis of a discussion on what content is already available to populate NU's IR.

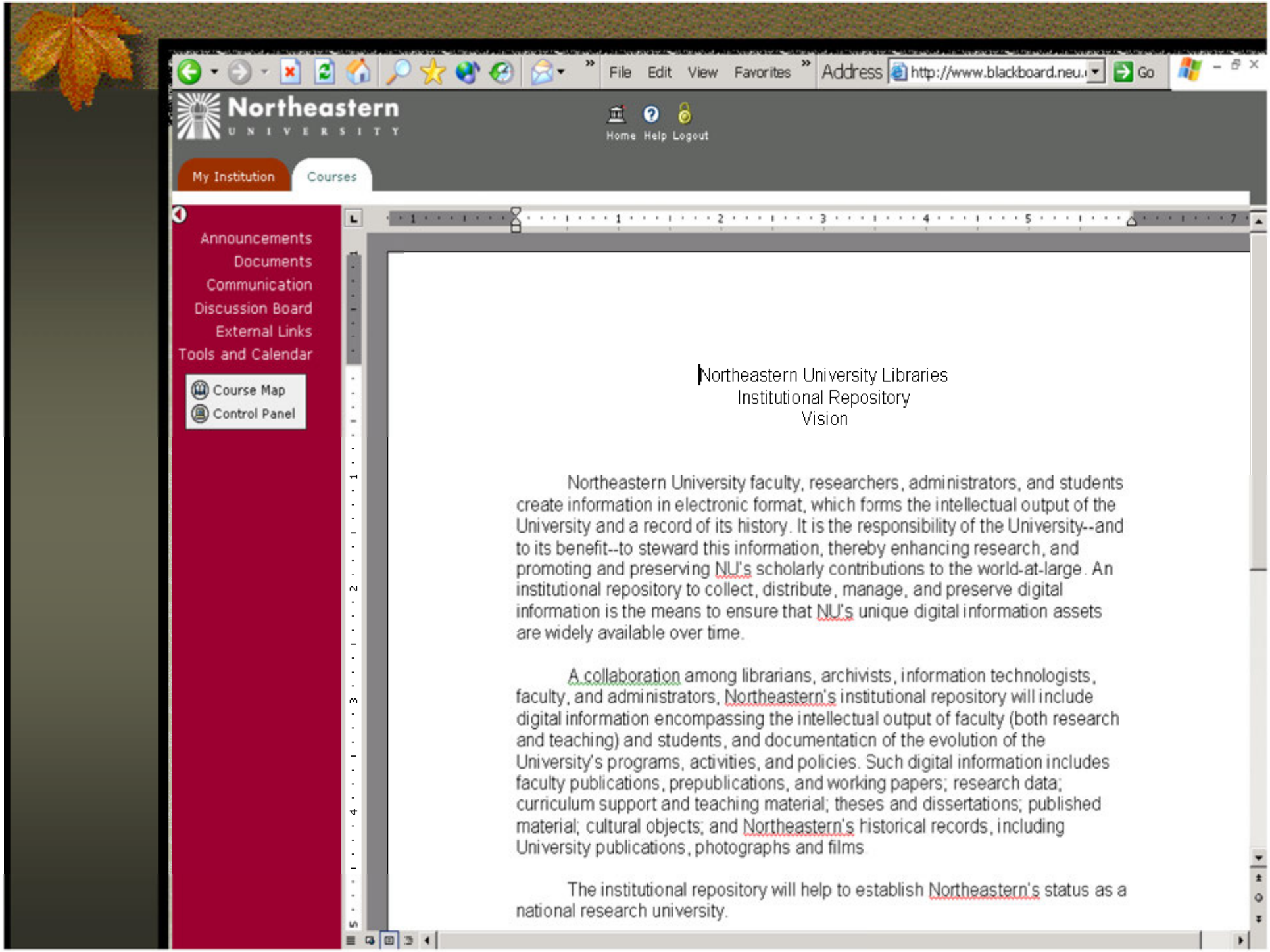

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Course Map
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FEDORA at Tufts
FEDORA_Notes.doc (27136 Bytes)
Notes on Ed's and my visit to Tufts to talk about FEDORA project software.
Technology Notes
Technology_Notes.doc (36864 Bytes)
Chris Carrillo's amplified notes from the 26 March Committee meeting.
System Attributes
System_Attributes.doc (33792 Bytes)
Desired attributes of our IR system, listed by function. Document last modified 05/02/03.
Vision Statement
Vision.doc (26112 Bytes)
Draft institutional repository vision statement. Last modified 7/17/03 to reflect suggestions made at the Steering Committee meeting on 7/16.
Notes: Organization and Staffing
Notes_Organization_and_Staffing.doc (37376 Bytes)
Handout from meeting on 7 May 2003.
Project Organization
Project_Organization.doc (25600 Bytes)
Organization scheme for the IR project. Last modified 7/17/03
Calendar / Timeline
Calendar.xls (23552 Bytes)
Updated 21 November 2003
Killer Apps
Killer_Apps_List.doc (29184 Bytes)
List of units that are possible early adopters.
Information Sheet - Faculty
Information_Sheet_Faculty.doc (30208 Bytes)
Part of information packet given out to faculty who might be early adopters.
Information Sheet - Administrators
Information_Sheet_Admin.doc (30208 Bytes)
Part of the information packet distributed to administrators who might be early adopters.
Libraries Implementing IRs

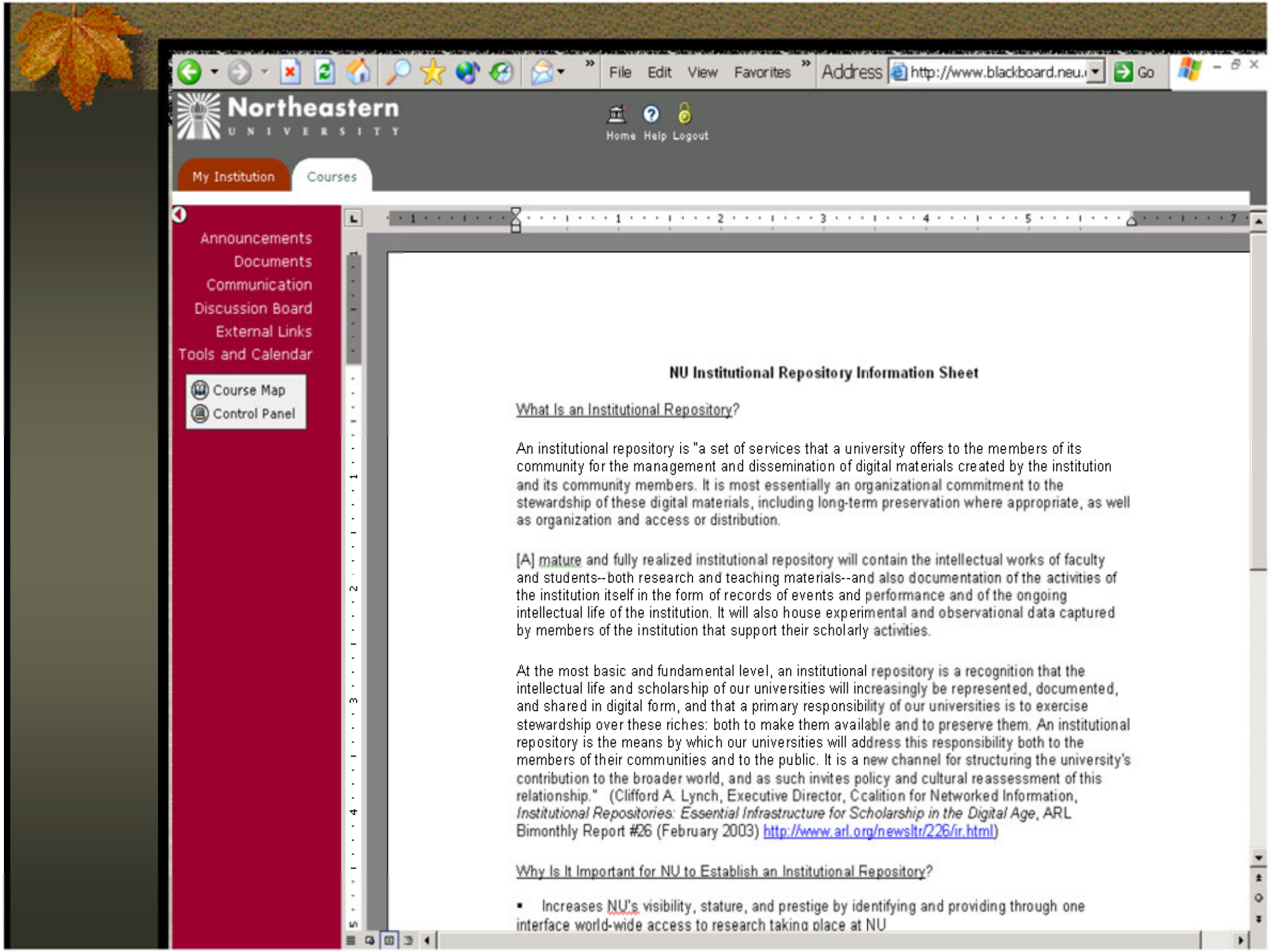

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Part of the information packet distributed to administrators who might be early adopters.
Libraries Implementing IRs
Libraries_Implementing_Institutional_Repositories.doc (30720 Bytes)
List of libraries implementing IRs with the URLs of their websites.
Records Included in IR
Types_of_record.doc (33792 Bytes)
Non-inclusive listing of digital records that might be included in NU's IR. Updated 11/18/03.
Metadata Requirements
Metadata_Requirements.doc (27136 Bytes)
Annotated by Anne 1/2004
OK

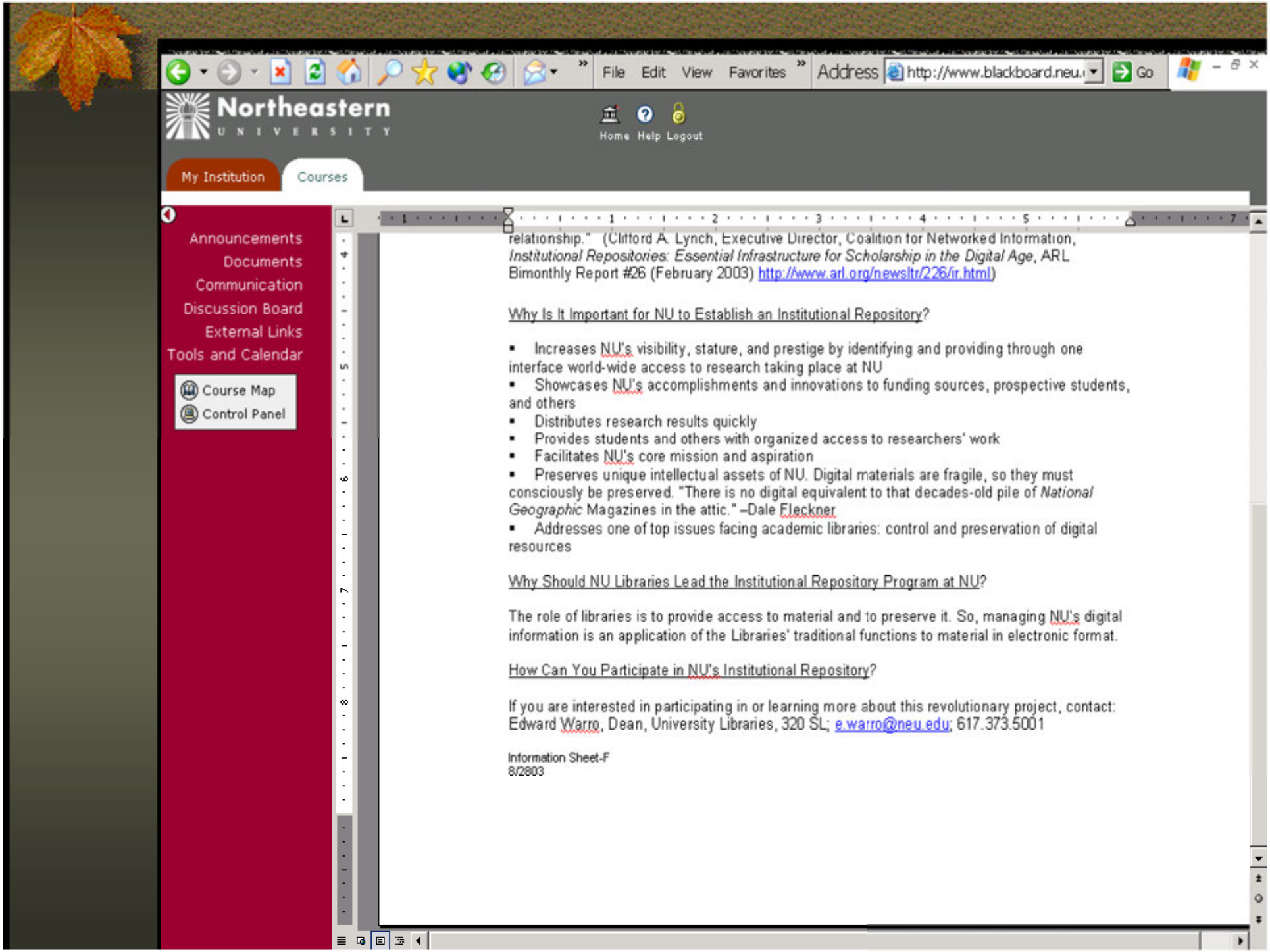

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Announcements
Documents
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NU Libraries
Institutional Repository
Digital Records Included in NU's IR:
Non-inclusive List
1. Gray Literature and Research Materials
Working papers
Research and technical reports
Preprints and articles
Formal publications
Images, annotated
Field notes
Audio/video files
Data sets (statistical, geospatial, matlab, etc.), models, simulations (supporting material for published/unpublished papers)
Conference papers/presentations/proceedings
Research papers (published or pre-published peer-reviewed)
Statistical reports
Technical documentation
Surveys
Email regarding research
2. Curriculum Support and Teaching Materials
Lecture notes
Concept illustrations
Visualizations
Models
Simulations
Course videos
Classroom presentations
Web pages
Other learning objects

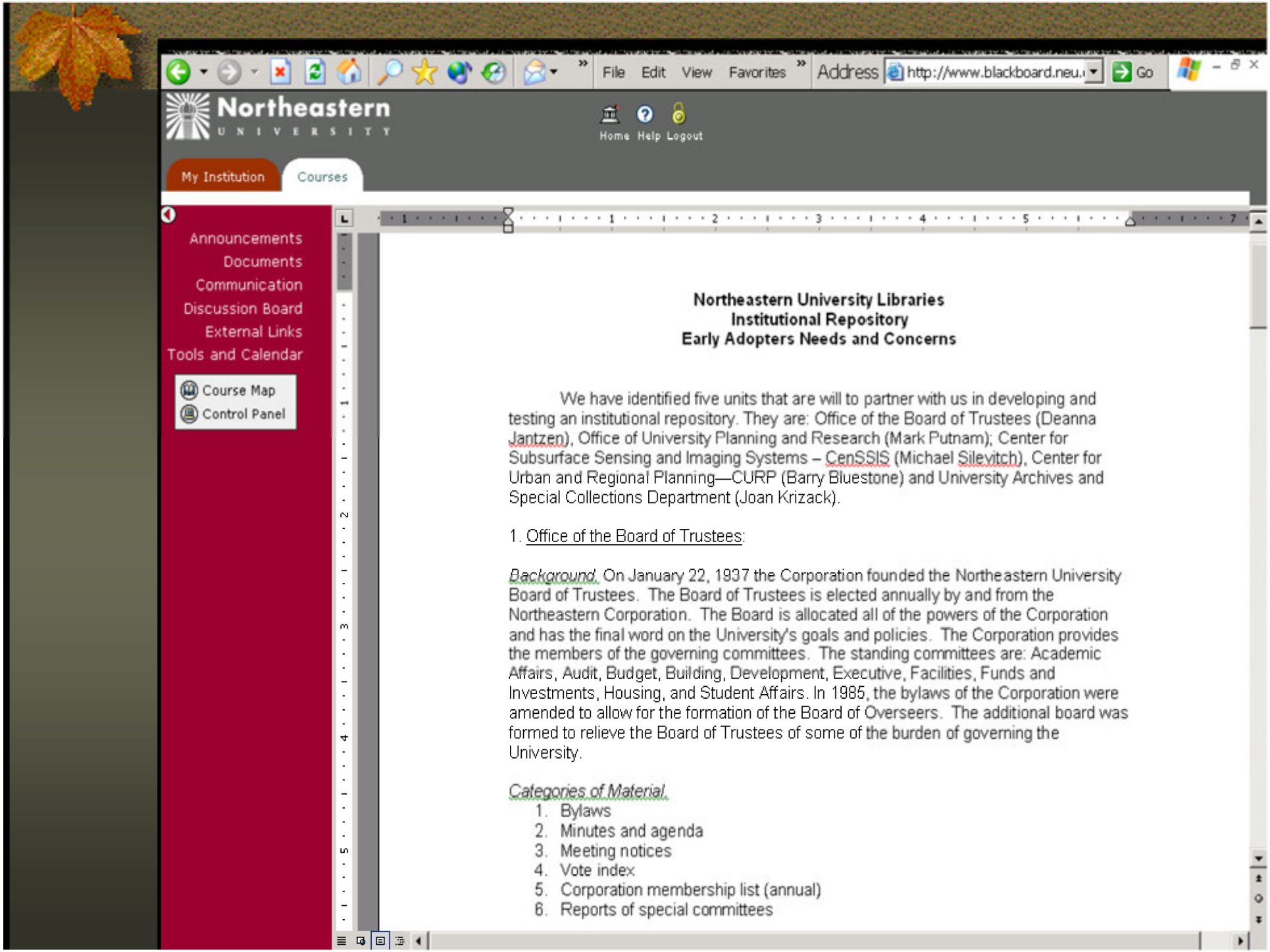

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Courses
Announcements
Documents
Communication
Discussion Board
External Links
Tools and Calendar
Course Map
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2. Curriculum Support and Teaching Materials
Lecture notes
Concept illustrations
Visualizations
Models
Simulations
Course videos
Classroom presentations
Web pages
Other learning objects
3. Thesis and Dissertations (EDTs)
4. Published Material
Journals
Articles
Monographs, out-of-print and/or faculty-authored
5. Records documenting the History of NU
Committee agendas, minutes, and attachments
Annual reports
Audit report
Consultant reports
Departmental and research center newsletters, bulletins, press releases, etc.
Grant applications
Status reports to funding agencies
Policy/procedure manuals
Images/films
Substantive email correspondence
6. Cultural Objects
Historical photographs
Reformatted special collections materials
11/18/03

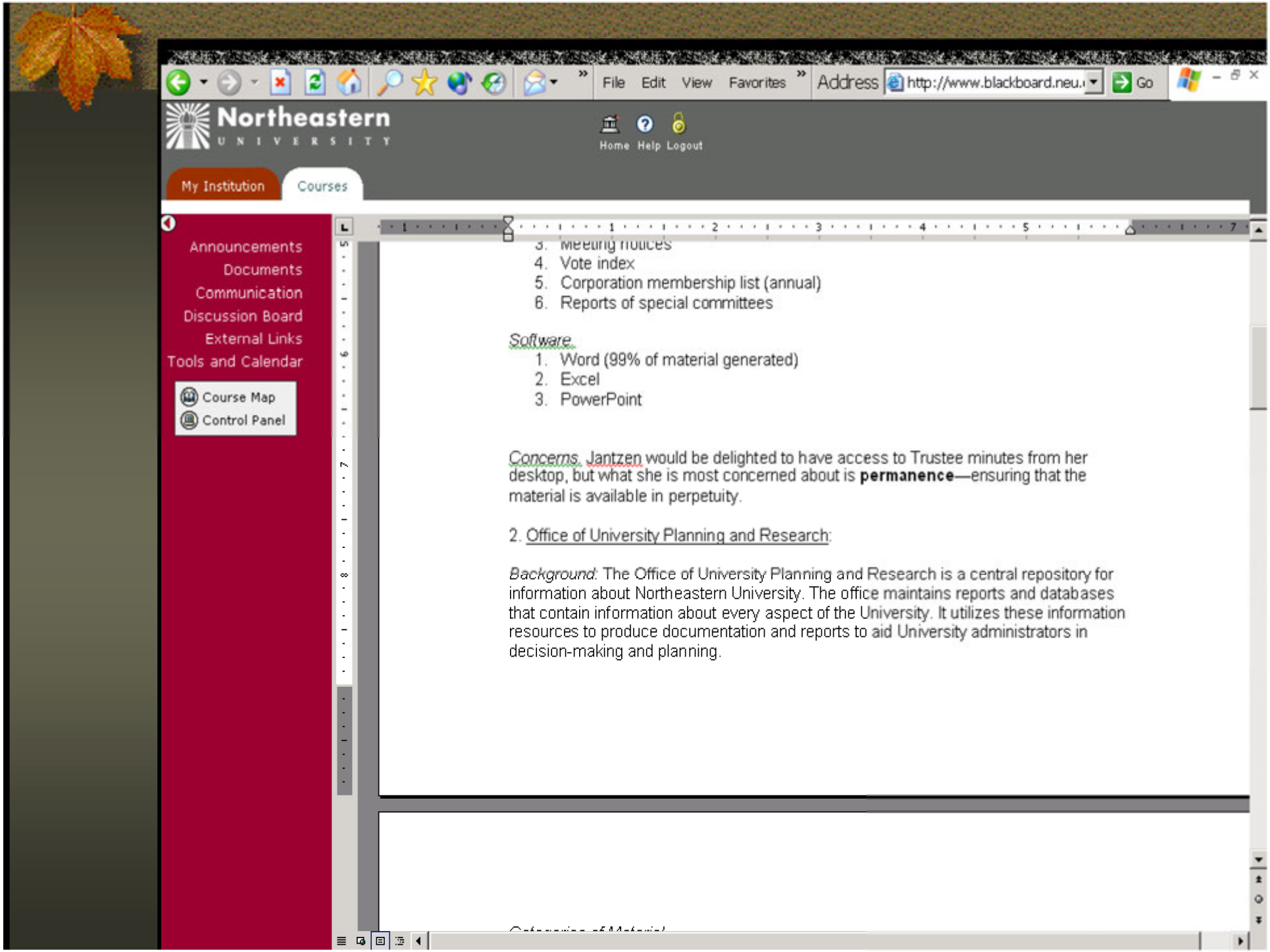

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Northeastern University Libraries
Institutional Repository
Content Guidelines
1. The material must be produced, submitted or sponsored by Northeastern University faculty or staff.
2. The material must be scholarly, research-oriented, or illuminate the history of Northeastern University.
3. The material must have enduring value.
4. The material must be in digital format.
5. The author/owner should be willing to grant Northeastern University the right to preserve and distribute the material via the NUL Institutional Repository.
6. The material should be complete and ready for publication or storage as the case may be.
7. If the material is part of a series, other materials in that series should also be contributed, so the NUL Institutional Repository can offer as full a set as possible.
18 September 2003

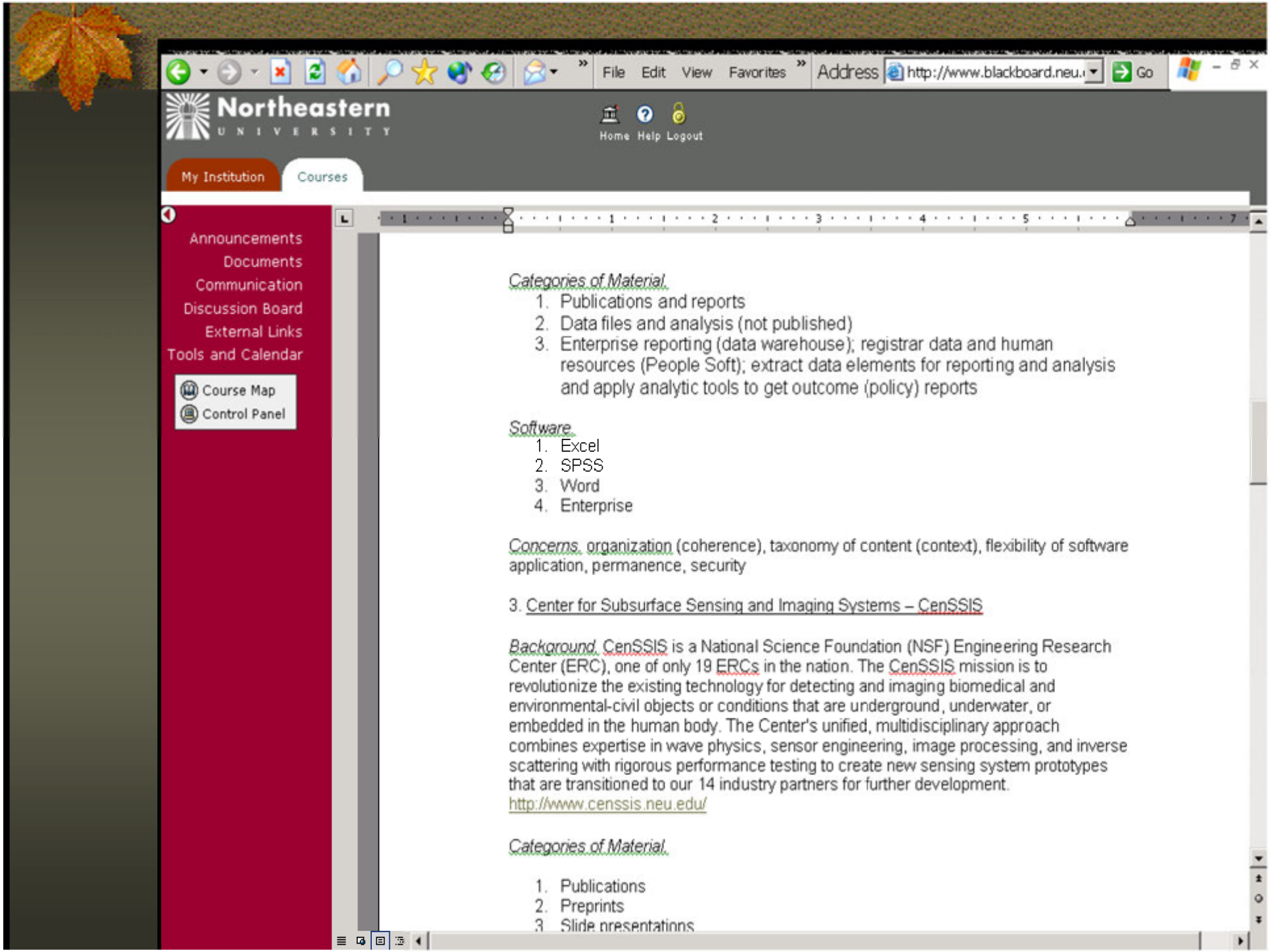

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Northeastern University Libraries
Institutional Repository
Vision
Northeastern University faculty, researchers, administrators, and students create information in electronic format, which forms the intellectual output of the University and a record of its history. It is the responsibility of the University--and to its benefit--to steward this information, thereby enhancing research, and promoting and preserving NU's scholarly contributions to the world-at-large. An institutional repository to collect, distribute, manage, and preserve digital information is the means to ensure that NU's unique digital information assets are widely available over time.
A collaboration among librarians, archivists, information technologists, faculty, and administrators, Northeastern's institutional repository will include digital information encompassing the intellectual output of faculty (both research and teaching) and students, and documentaticn of the evolution of the University's programs, activities, and policies. Such digital information includes faculty publications, prepublications, and working papers; research data; curriculum support and teaching material; theses and dissertations; published material; cultural objects; and Northeastern's historical records, including University publications, photographs and films
The institutional repository will help to establish Northeastern's status as a national research university.

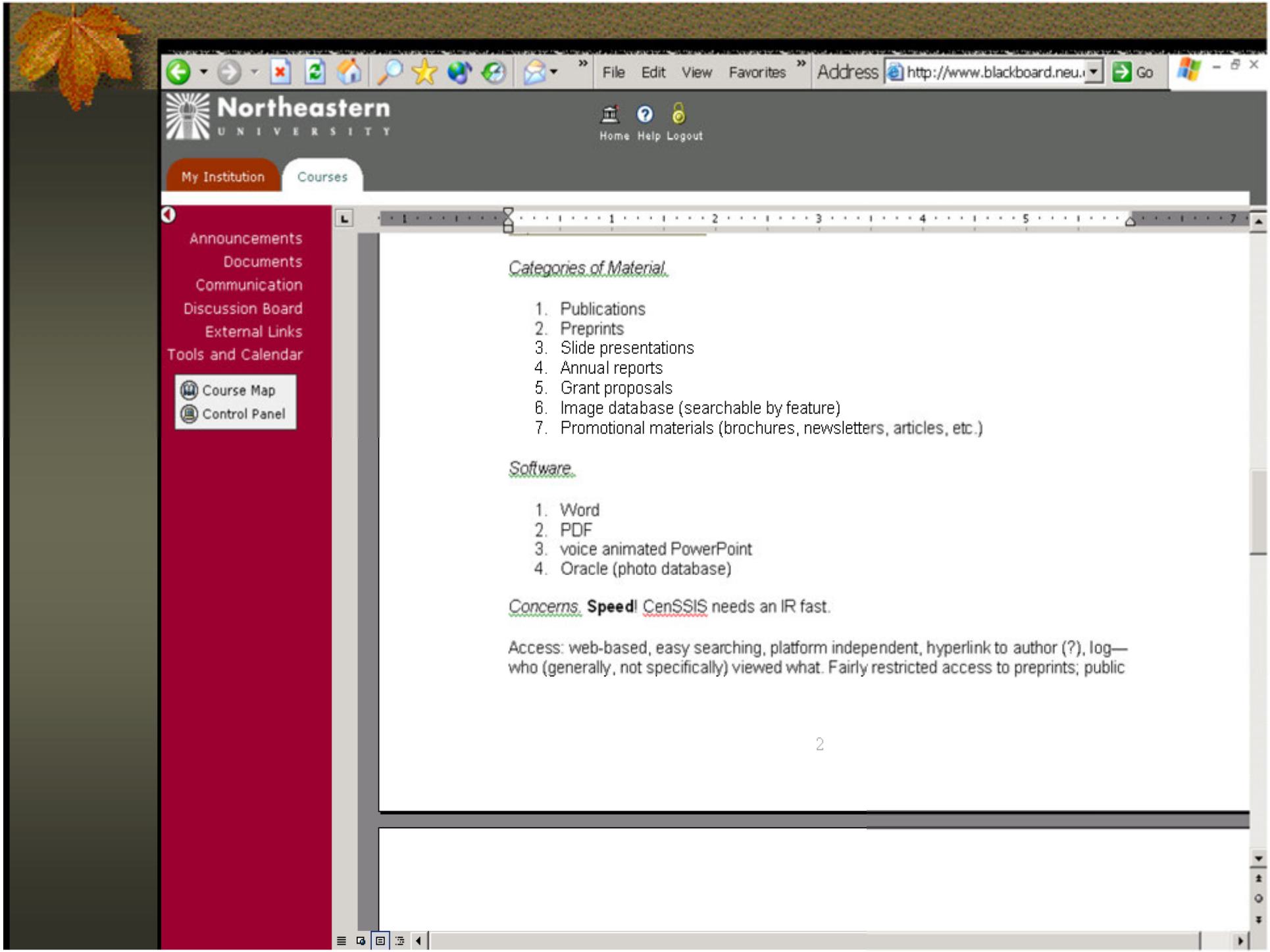

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NU Institutional Repository Information Sheet
What Is an Institutional Repository?
An institutional repository is "a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution.
[A] mature and fully realized institutional repository will contain the intellectual works of faculty and students--both research and teaching materials--and also documentation of the activities of the institution itself in the form of records of events and performance and of the ongoing intellectual life of the institution. It will also house experimental and observational data captured by members of the institution that support their scholarly activities.
At the most basic and fundamental level, an institutional repository is a recognition that the intellectual life and scholarship of our universities will increasingly be represented, documented, and shared in digital form, and that a primary responsibility of our universities is to exercise stewardship over these riches: both to make them available and to preserve them. An institutional repository is the means by which our universities will address this responsibility both to the members of their communities and to the public. It is a new channel for structuring the university's contribution to the broader world, and as such invites policy and cultural reassessment of this relationship." (Clifford A. Lynch, Executive Director, Coalition for Networked Information, Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age, ARL Bimonthly Report #26 (February 2003) http://www.arl.org/newsltr/226/ir.html)
Why Is It Important for NU to Establish an Institutional Repository?
Increases NU's visibility, stature, and prestige by identifying and providing through one interface world-wide access to research taking place at NU

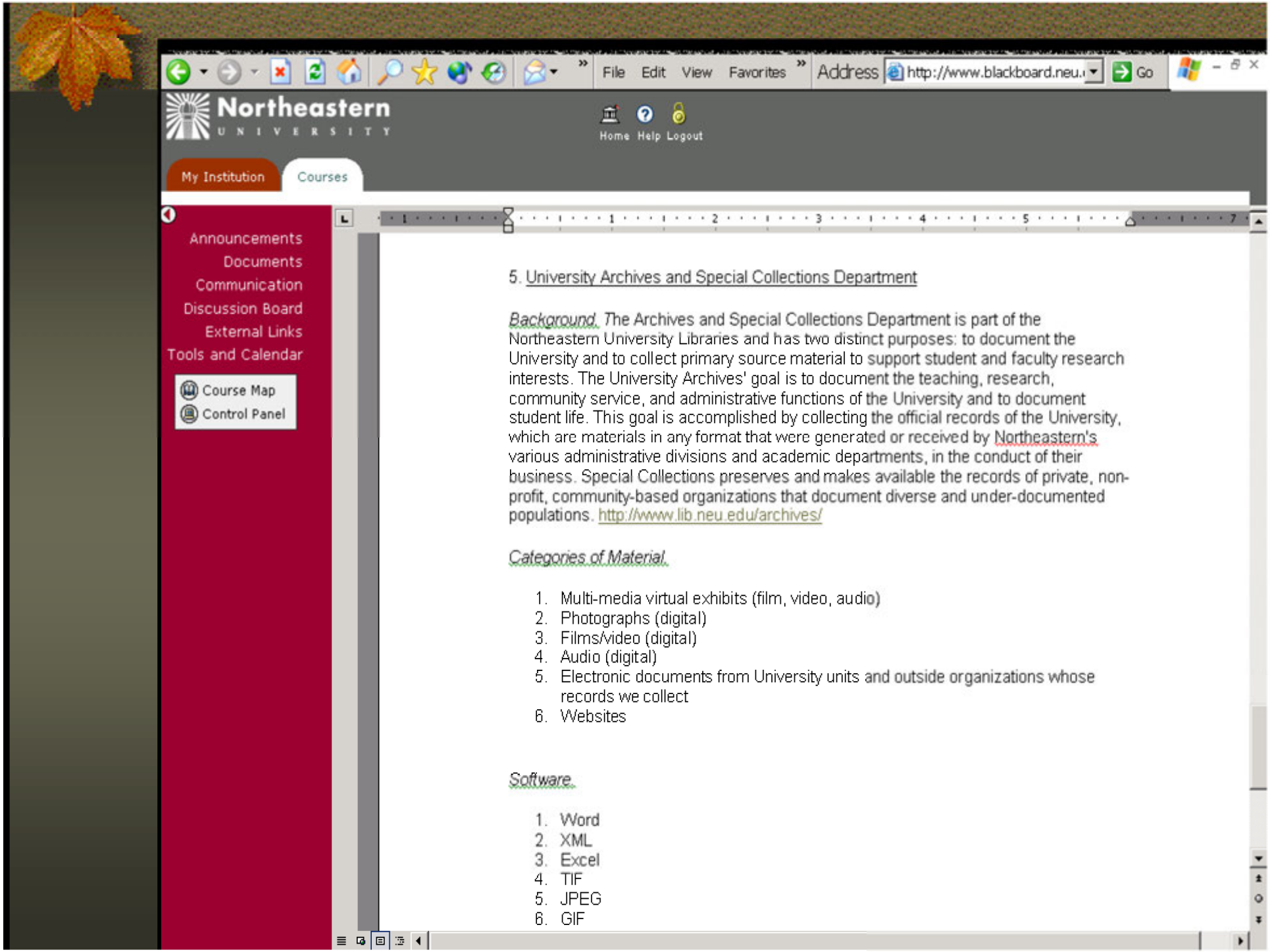

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Why Is It Important for NU to Establish an Institutional Repository?
• Increases NU's visibility, stature, and prestige by identifying and providing through one interface world-wide access to research taking place at NU
• Showcases NU's accomplishments and innovations to funding sources, prospective students, and others
• Distributes research results quickly
• Provides students and others with organized access to researchers' work
• Facilitates NU's core mission and aspiration
• Preserves unique intellectual assets of NU. Digital materials are fragile, so they must consciously be preserved. "There is no digital equivalent to that decades-old pile of *National Geographic* Magazines in the attic." –Dale Fleckner
• Addresses one of top issues facing academic libraries: control and preservation of digital resources
Why Should NU Libraries Lead the Institutional Repository Program at NU?
The role of libraries is to provide access to material and to preserve it. So, managing NU's digital information is an application of the Libraries' traditional functions to material in electronic format.
How Can You Participate in NU's Institutional Repository?
If you are interested in participating in or learning more about this revolutionary project, contact: Edward Warro, Dean, University Libraries, 320 SL; e.warro@neu.edu; 617.373.5001
Information Sheet-F
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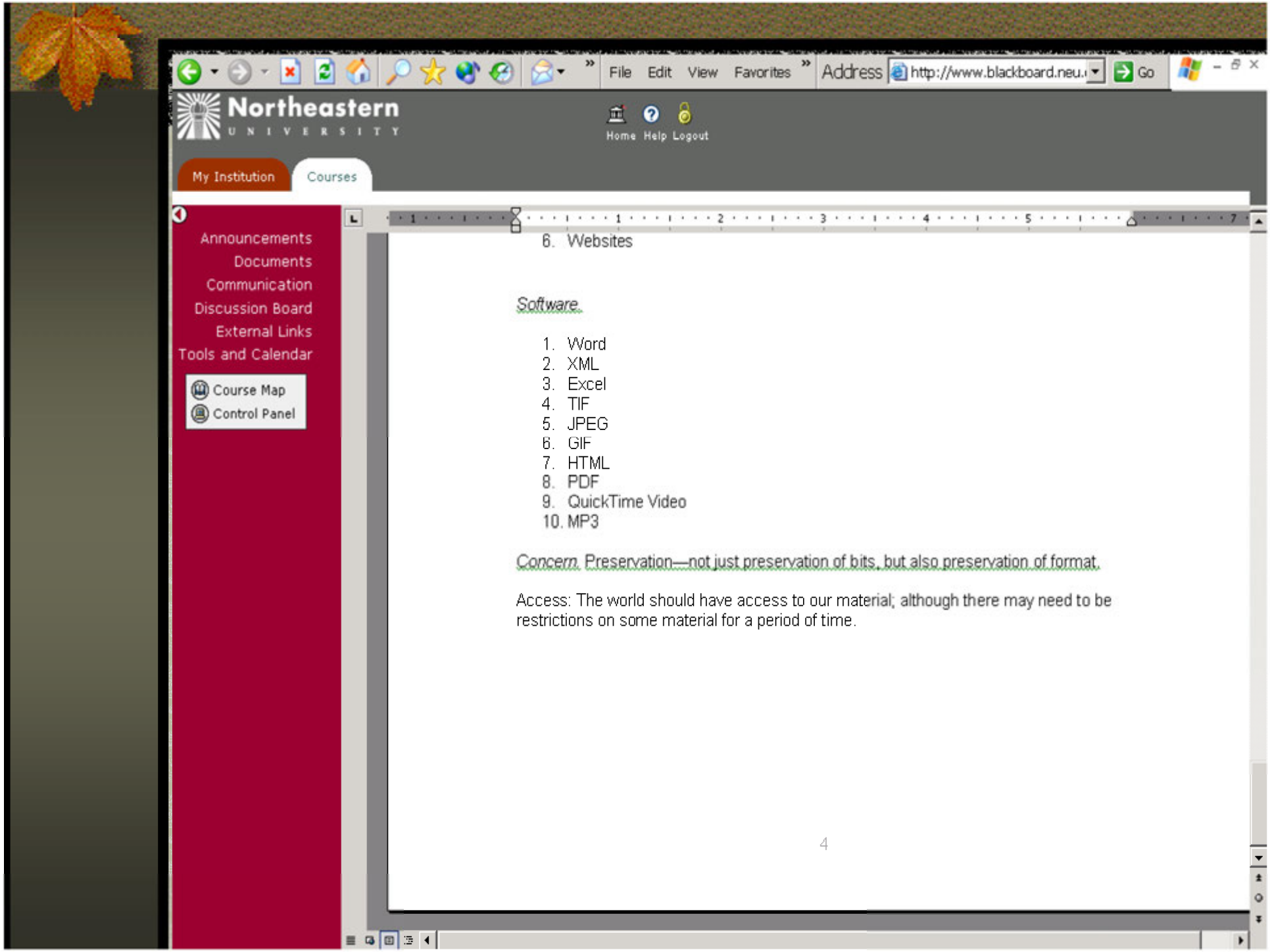

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Northeastern University Libraries
Institutional Repository
Early Adopters Needs and Concerns
We have identified five units that are will to partner with us in developing and testing an institutional repository. They are: Office of the Board of Trustees (Deanna Jantzen), Office of University Planning and Research (Mark Putnam); Center for Subsurface Sensing and Imaging Systems – CenSSIS (Michael Silevitch), Center for Urban and Regional Planning—CURP (Barry Bluestone) and University Archives and Special Collections Department (Joan Krizack).
1. Office of the Board of Trustees:
Background. On January 22, 1937 the Corporation founded the Northeastern University Board of Trustees. The Board of Trustees is elected annually by and from the Northeastern Corporation. The Board is allocated all of the powers of the Corporation and has the final word on the University's goals and policies. The Corporation provides the members of the governing committees. The standing committees are: Academic Affairs, Audit, Budget, Building, Development, Executive, Facilities, Funds and Investments, Housing, and Student Affairs. In 1985, the bylaws of the Corporation were amended to allow for the formation of the Board of Overseers. The additional board was formed to relieve the Board of Trustees of some of the burden of governing the University.
Categories of Material
1. Bylaws
2. Minutes and agenda
3. Meeting notices
4. Vote index
5. Corporation membership list (annual)
6. Reports of special committees

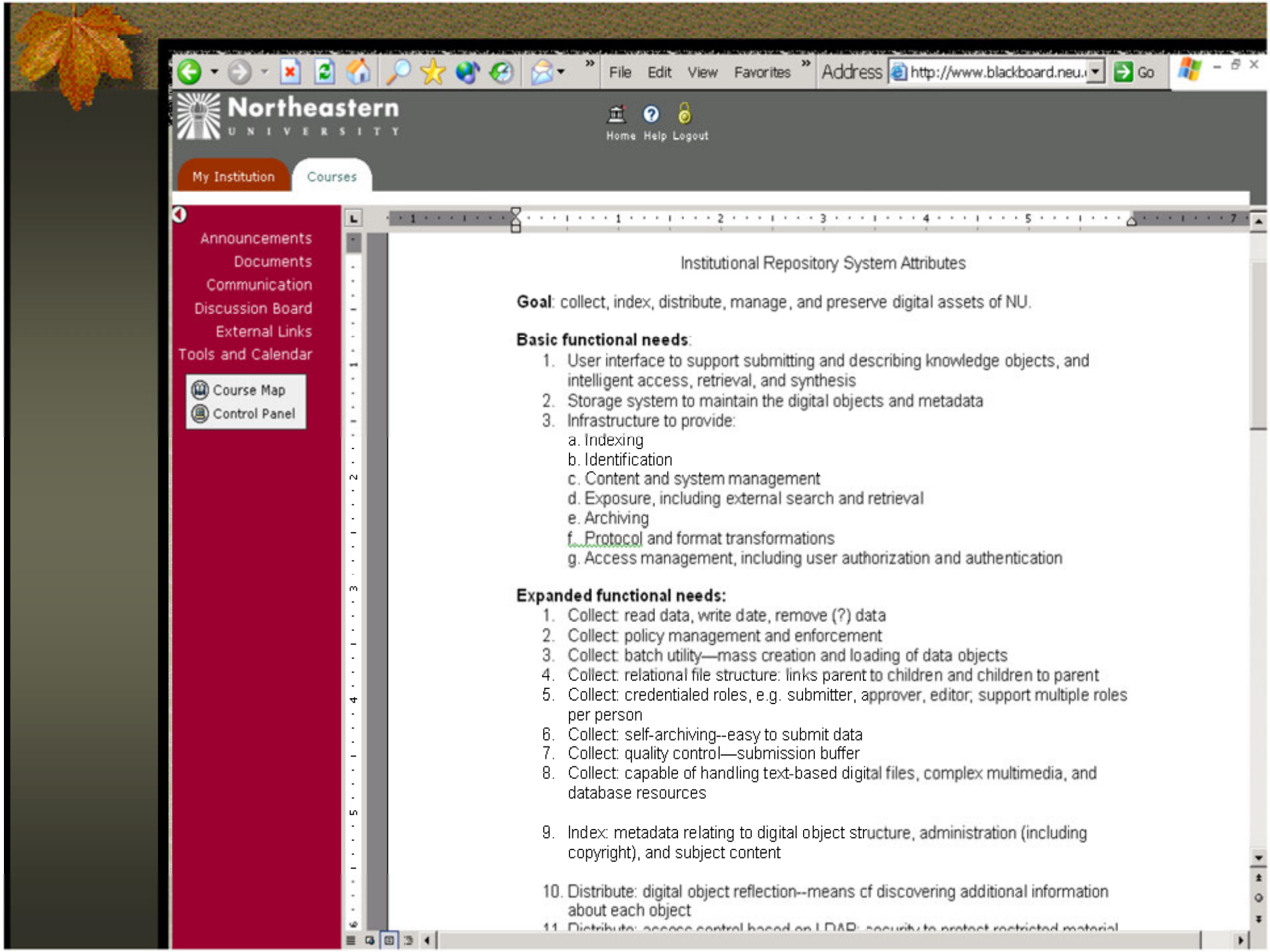

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My Institution
Courses
Announcements
Documents
Communication
Discussion Board
External Links
Tools and Calendar
Course Map
Control Panel
4. Vote index
5. Corporation membership list (annual)
6. Reports of special committees
Software.
1. Word (99% of material generated)
2. Excel
3. PowerPoint
Concerns. Jantzen would be delighted to have access to Trustee minutes from her desktop, but what she is most concerned about is permanence—ensuring that the material is available in perpetuity.
2. Office of University Planning and Research:
Background: The Office of University Planning and Research is a central repository for information about Northeastern University. The office maintains reports and databases that contain information about every aspect of the University. It utilizes these information resources to produce documentation and reports to aid University administrators in decision-making and planning.

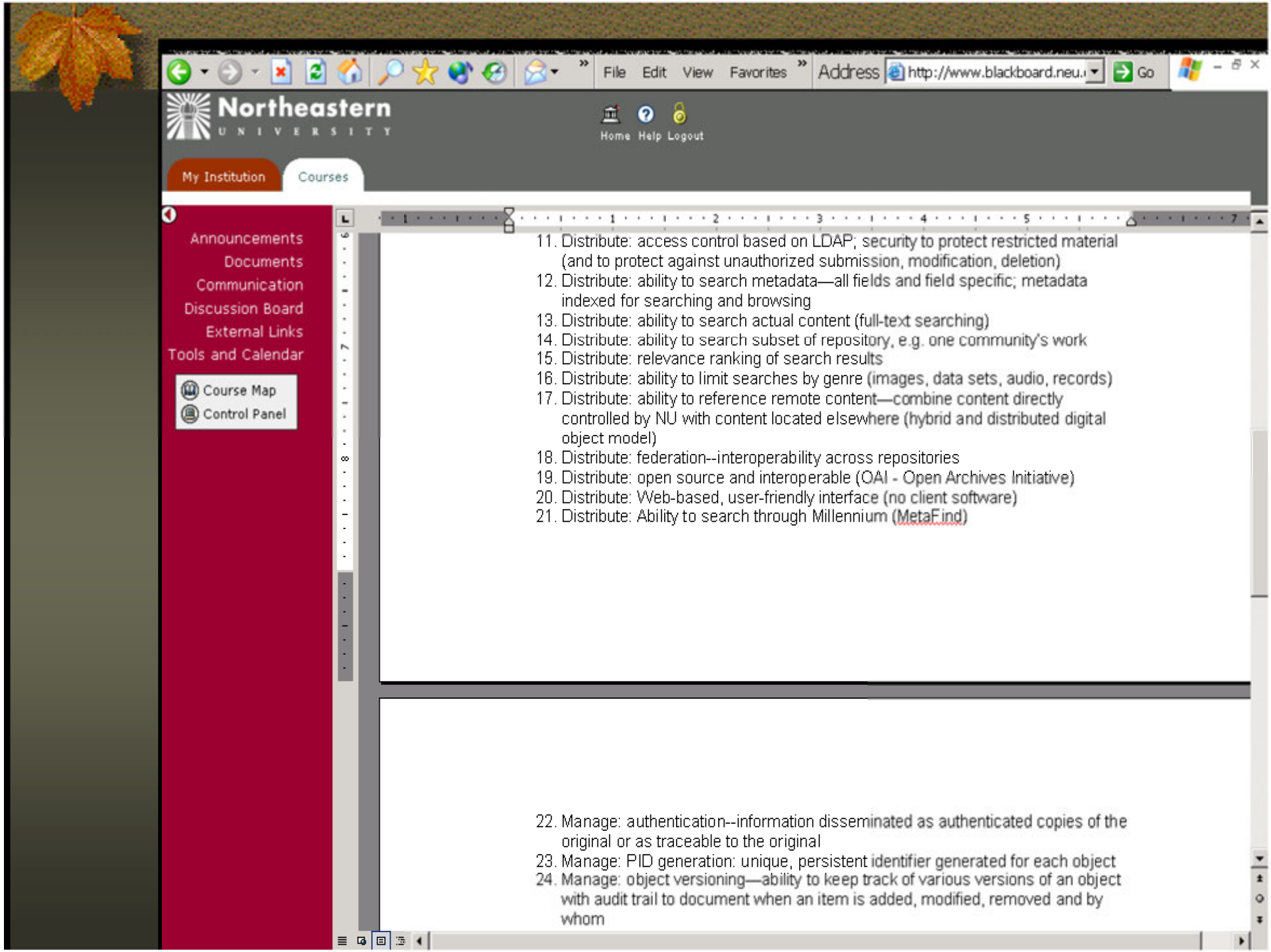

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Tools and Calendar
Course Map
Control Panel
Categories of Material
1. Publications and reports
2. Data files and analysis (not published)
3. Enterprise reporting (data warehouse); registrar data and human resources (People Soft); extract data elements for reporting and analysis and apply analytic tools to get outcome (policy) reports
Software
1. Excel
2. SPSS
3. Word
4. Enterprise
Concerns, organization (coherence), taxonomy of content (context), flexibility of software application, permanence, security
3. Center for Subsurface Sensing and Imaging Systems – CenSSIS
Background CenSSIS is a National Science Foundation (NSF) Engineering Research Center (ERC), one of only 19 ERCs in the nation. The CenSSIS mission is to revolutionize the existing technology for detecting and imaging biomedical and environmental-civil objects or conditions that are underground, underwater, or embedded in the human body. The Center's unified, multidisciplinary approach combines expertise in wave physics, sensor engineering, image processing, and inverse scattering with rigorous performance testing to create new sensing system prototypes that are transitioned to our 14 industry partners for further development.
http://www.censsis.neu.edu/
Categories of Material
1. Publications
2. Preprints
3. Slide presentations

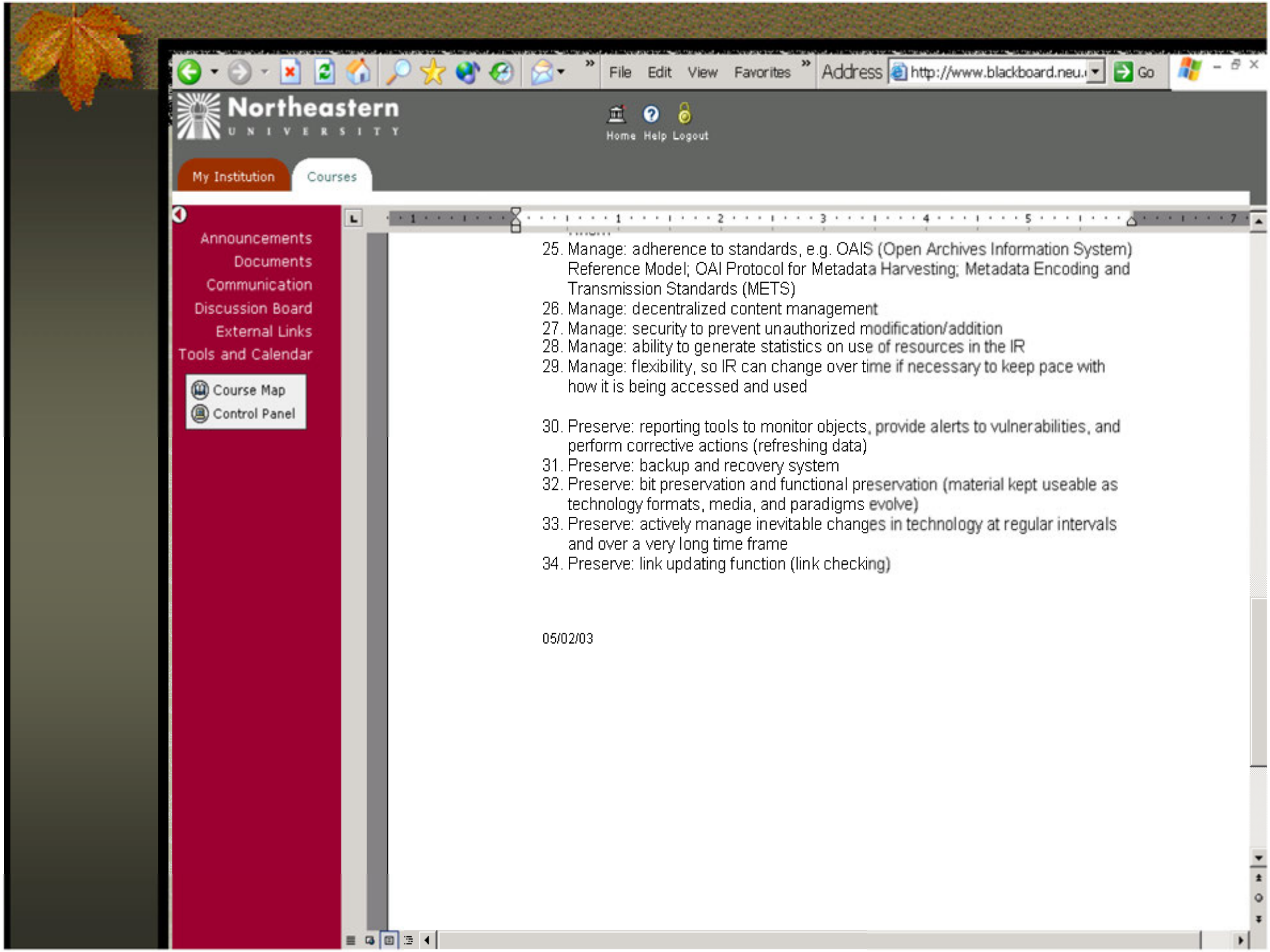

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Announcements
Documents
Communication
Discussion Board
External Links
Tools and Calendar
Course Map
Control Panel
Categories of Material
1. Publications
2. Preprints
3. Slide presentations
4. Annual reports
5. Grant proposals
6. Image database (searchable by feature)
7. Promotional materials (brochures, newsletters, articles, etc.)
Software
1. Word
2. PDF
3. voice animated PowerPoint
4. Oracle (photo database)
Concerns. Speed! CenSSIS needs an IR fast.
Access: web-based, easy searching, platform independent, hyperlink to author (?), log—who (generally, not specifically) viewed what. Fairly restricted access to preprints; public
2


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Course Map
Control Panel
5. University Archives and Special Collections Department
Background. The Archives and Special Collections Department is part of the Northeastern University Libraries and has two distinct purposes: to document the University and to collect primary source material to support student and faculty research interests. The University Archives' goal is to document the teaching, research, community service, and administrative functions of the University and to document student life. This goal is accomplished by collecting the official records of the University, which are materials in any format that were generated or received by Northeastern's various administrative divisions and academic departments, in the conduct of their business. Special Collections preserves and makes available the records of private, non-profit, community-based organizations that document diverse and under-documented populations. http://www.lib.neu.edu/archives/
Categories of Material.
1. Multi-media virtual exhibits (film, video, audio)
2. Photographs (digital)
3. Films/video (digital)
4. Audio (digital)
5. Electronic documents from University units and outside organizations whose records we collect
6. Websites
Software.
1. Word
2. XML
3. Excel
4. TIF
5. JPEG
6. GIF


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Courses
Announcements
Documents
Communication
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External Links
Tools and Calendar
Course Map
Control Panel
6. Websites
Software
1. Word
2. XML
3. Excel
4. TIF
5. JPEG
6. GIF
7. HTML
8. PDF
9. QuickTime Video
10. MP3
Concern. Preservation—not just preservation of bits, but also preservation of format.
Access: The world should have access to our material; although there may need to be restrictions on some material for a period of time.
4


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Course Map
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Institutional Repository System Attributes
Goal: collect, index, distribute, manage, and preserve digital assets of NU.
Basic functional needs:
1. User interface to support submitting and describing knowledge objects, and intelligent access, retrieval, and synthesis
2. Storage system to maintain the digital objects and metadata
3. Infrastructure to provide:
a. Indexing
b. Identification
c. Content and system management
d. Exposure, including external search and retrieval
e. Archiving
f. Protocol and format transformations
g. Access management, including user authorization and authentication
Expanded functional needs:
1. Collect: read data, write date, remove (?) data
2. Collect: policy management and enforcement
3. Collect: batch utility—mass creation and loading of data objects
4. Collect: relational file structure: links parent to children and children to parent
5. Collect: credentialed roles, e.g. submitter, approver, editor; support multiple roles per person
6. Collect: self-archiving--easy to submit data
7. Collect: quality control—submission buffer
8. Collect: capable of handling text-based digital files, complex multimedia, and database resources
9. Index: metadata relating to digital object structure, administration (including copyright), and subject content
10. Distribute: digital object reflection--means cf discovering additional information about each object


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11. Distribute: access control based on LDAP; security to protect restricted material (and to protect against unauthorized submission, modification, deletion)
12. Distribute: ability to search metadata—all fields and field specific; metadata indexed for searching and browsing
13. Distribute: ability to search actual content (full-text searching)
14. Distribute: ability to search subset of repository, e.g. one community's work
15. Distribute: relevance ranking of search results
16. Distribute: ability to limit searches by genre (images, data sets, audio, records)
17. Distribute: ability to reference remote content—combine content directly controlled by NU with content located elsewhere (hybrid and distributed digital object model)
18. Distribute: federation--interoperability across repositories
19. Distribute: open source and interoperable (OAI - Open Archives Initiative)
20. Distribute: Web-based, user-friendly interface (no client software)
21. Distribute: Ability to search through Millennium (MetaFind)
22. Manage: authentication--information disseminated as authenticated copies of the original or as traceable to the original
23. Manage: PID generation: unique, persistent identifier generated for each object
24. Manage: object versioning—ability to keep track of various versions of an object with audit trail to document when an item is added, modified, removed and by whom


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25. Manage: adherence to standards, e.g. OAIS (Open Archives Information System) Reference Model; OAI Protocol for Metadata Harvesting; Metadata Encoding and Transmission Standards (METS)
26. Manage: decentralized content management
27. Manage: security to prevent unauthorized modification/addition
28. Manage: ability to generate statistics on use of resources in the IR
29. Manage: flexibility, so IR can change over time if necessary to keep pace with how it is being accessed and used
30. Preserve: reporting tools to monitor objects, provide alerts to vulnerabilities, and perform corrective actions (refreshing data)
31. Preserve: backup and recovery system
32. Preserve: bit preservation and functional preservation (material kept useable as technology formats, media, and paradigms evolve)
33. Preserve: actively manage inevitable changes in technology at regular intervals and over a very long time frame
34. Preserve: link updating function (link checking)
05/02/03

- An Institutional Repository for Northeastern University



- IRis is...

  •a system for collecting, distributing, managing, and preserving digital (electronic) information created by NU faculty, students, and staff.

  •a collaboration among NU librarians, archivists, technology professionals, faculty, and administrators.
- Learn about guidelines for content and participation in IRis. See who our campus partners are. And follow our web links about institutional repositories.
- **More about IRis**
- **IRis will include the intellectual output** of NU faculty and students, encompassing both research and teaching/learning materials. It will also contain materials that document the evolution of the University's programs, activities, and policies.
- **IRis will be part of a larger system** of repositories worldwide that are searchable through a single interface, providing free access to material that was previously inaccessible or only accessible for a fee.
- **NU is a development partner with Innovative Interfaces, Inc.,** in the creation of Symposia, the software for IRis (currently in beta testing). Read more about the Innovative-NU partnership.
- **Questions?**
- If you are interested in participating in or learning more about this revolutionary project, contact:
- **Joan Krizack**
  Tel: 617-373-8318

How to access Northeastern University's Institutional Repository site on Blackboard

1. Go to http://blackboard.neu.edu
2. Click on "Course Catalog" on the left (no need to log in)
3. Click "Library" on the left
4. Click "Institutional Repository Committee"

As a guest, you will have access to the Documents and External Links sections on the left.

In order to access the other sections, you will need to log in with a username and password. Right now the other sections are unused. But in the future if access is needed, a username and password can easily be created.

The Co-Development Process

The Development Process Begins

- A spark
- Environmental factors
- An initiator or a collision
- Think about "why" you want something
- An agreement
- Goals
- The "killer app"
- Will anyone want this?

Work

- E-mail
- Conference calls
- Meetings
- Specifications
- Architecture
- Interior and exterior [is what we're building going to work in other places]

Trying It On For Size

- Iterations
- Use it
- Feedback
- Use it in a larger group
- Feedback
- Use it….

Success Factors

- Multiple sites
- Active creative and problem solving process
- The value of peers
- The value of sales
- Greater development and enhancement focus

Launch Inside and Out

- Planning
- Training
- Publicity
- Reinforcement

What's Next?

- Batch loads of records
- More user empowerment
  - Automate more processes
  - Web services
  - Move some items away from the administrator – communities & collections
- More flexible metadata formats
- More e-mail notification
- Collaborative work space???

Marketing an Institutional Repository

What will an IR do?

- Collect, save, disseminate, and preserve:
  - Papers
  - Thesis
  - Honors projects
  - Simulations
  - Learning objects
  - Digitized collections
  - Institutional Records (Records Management)
  - AND MORE

What doesn't work?

- The following terms:
  - Institutional Repository
  - Metadata
  - Open Archives Initiative
  - Persistent Identifiers
  - Z39
  - MARC
  - Dublin Core

Knowing your audience

- What appeals to Administrators?
  - Branding the institution
  - Putting all faculty research in one place
- What appeals to Alumni and Trustees?
  - Prestige for the university

What does not appeal to most faculty?

- You can find a handful of articles about Tom Wolfe and Boris Pasternak in the same place as well as some chemistry data tables
- This will add to the prestige of our institution
- Open Access and self archiving will eventually lead to reforms in the publishing industry

Concerns of Tenure Track Faculty

- Submitting my work to an online archive will not count toward tenure
- My department wants articles submitted only to the highest prestige journals
- What is the peer review process?

Faculty Concerns

- How do other scholars refer to my articles and other information?
- Where did I put that paper? That computer file?
- What if my backup doesn't work?
- What if the OS is gone -- Word files
- What if hackers change my data -- change all my 5s to 7s
- What will happen to my research when I retire? When my grant ends? When my interests change?

What does appeal to faculty?

- This is a Library Service for faculty
- Your digital materials will be:
  - SAFE
  - MADE AVAILABLE
  - KEPT FOR A LONG TIME
- The submission process is very easy. Just a few clicks and a little info. Your secretary can do this.
- We will take responsibility for servers
- We will take responsibility for migrations
- We will guide you through copyright issues
- Your academic colleagues will have easy access to your work—
- Your work will be cited more often
- Your work will be searchable through Google
- Confidential data can be kept confidential – permission required

Copyright Issues

- Consult with campus Copyright Officer and Counsel, then…
- Provide online and paper information on copyright/intellectual property rights, e.g.
  - University of Maryland's Copyown site http://www.nethics.umd.edu/copyown/
  - The Eprint.org FAQ http://www.eprints.org/self-faq/
- Have self-archiving guidance and language incorporated into campus Intellectual Property and/or Appropriate Computer Use Guidelines
- Refer to ROMEO and SHERPA – both UK JISC (government) funded
  - ROMEO – for general discussion of global rights issues: http://www.lboro.ac.uk/departments/ls/disresearch/romeo/
  - SHERPA – for listings of publisher copyright policies, and guidance on IR licensing agreements and language: http://www.sherpa.ac.uk/romeo.php
- See suggested language and policies for IP management at Creative Commons: http://creativecommons.org

Starting Points

- A records management application
  - Records of the President's office
  - Records of the Board of Trustees
- Non-threatening useful publications
  - Senior honors projects
  - Theses and dissertations
  - Learning objects
  - Then, faculty research, articles, data sets, etc.

More sophisticated appeal

- As a profession, we need to appeal to senior researchers and faculty until we reach a tipping point
- Some faculty are champions of open access
- Have influence in their disciplines

Methods

- Faculty Newsletters
- Library Liaisons
- Seminars, breakfasts, symposia--get a faculty champion to invite them
- Research Assistants
- Slow, one by one, marketing to faculty
- Partnership on grant applications – how will you disseminate your research?
- **Need Seven (7) Impressions**

Unmet Faculty Needs

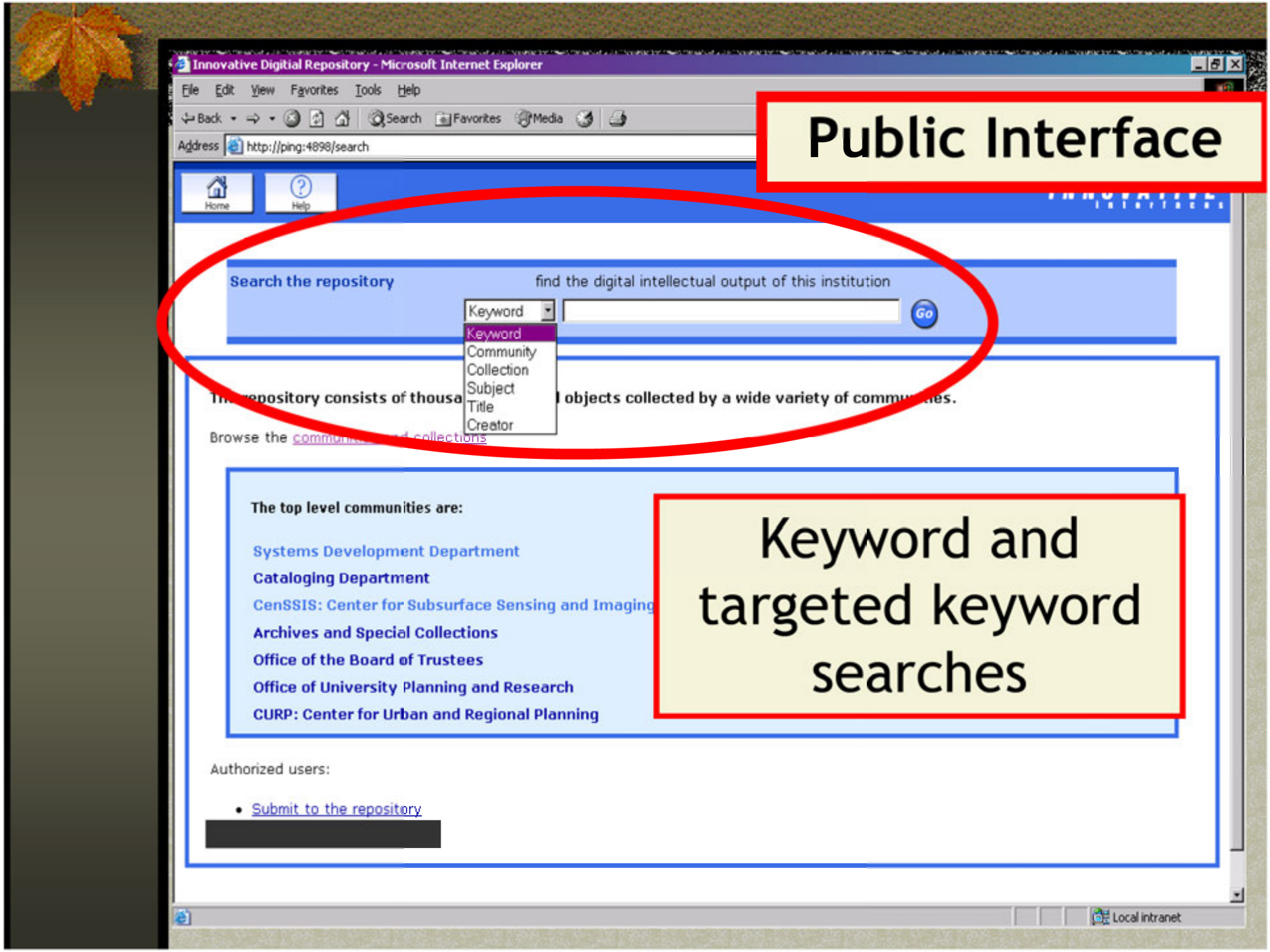
- The need for an authoring system
  - Sharing work with colleagues
  - Various drafts – time and date stamped
  - A POSSIBLE PROSPECT FOR A LATER RELEASE
    - ALLOW FACULTY TO WORK WITH VARIOUS VERSIONS KEPT IN THEIR OWN WORKING GROUP INITIALLY
    - OR

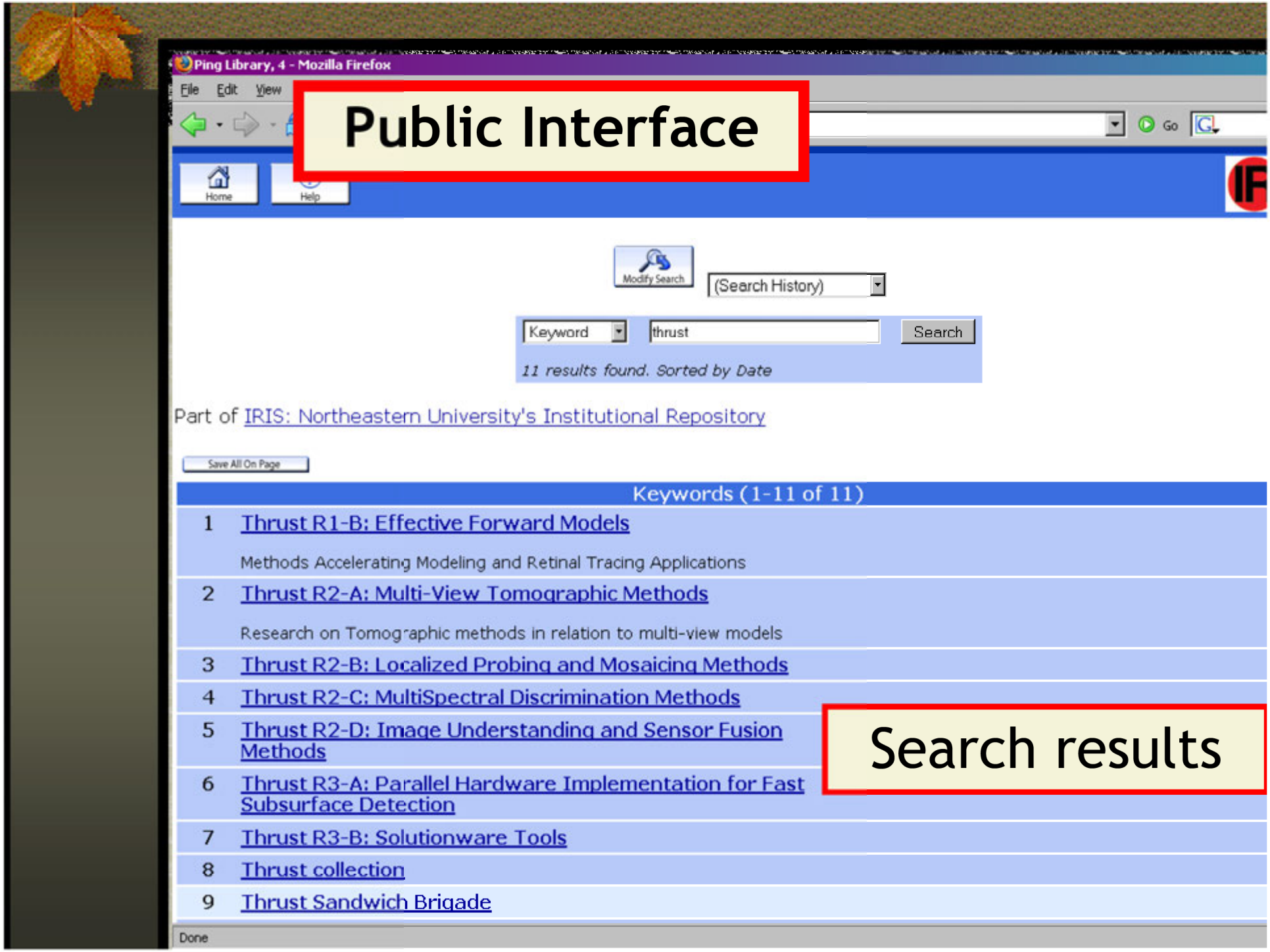
Is the IR better used to HOST ONLINE JOURNALS? Which is also wanted by faculty

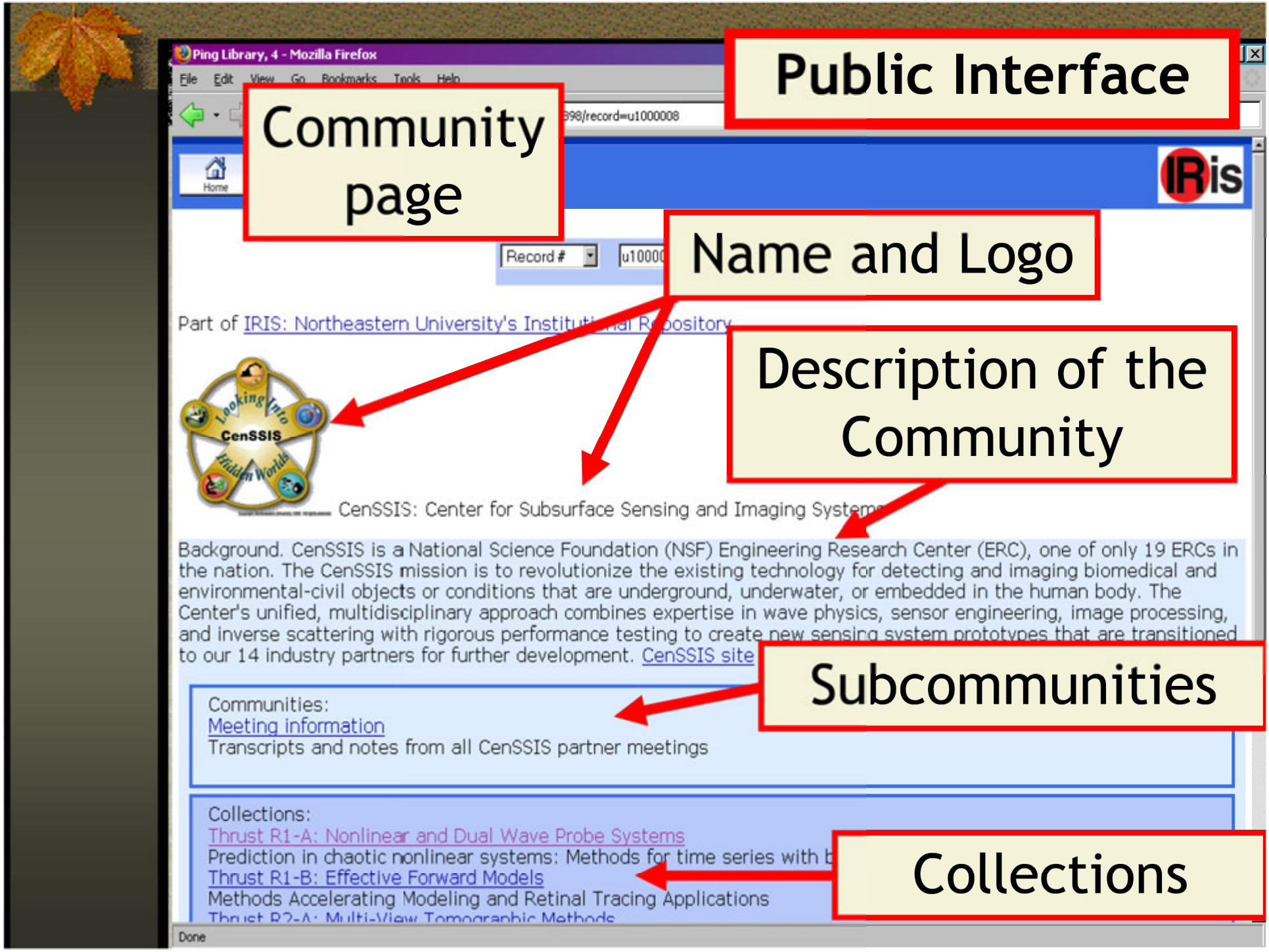
Institutional Repository Demonstration

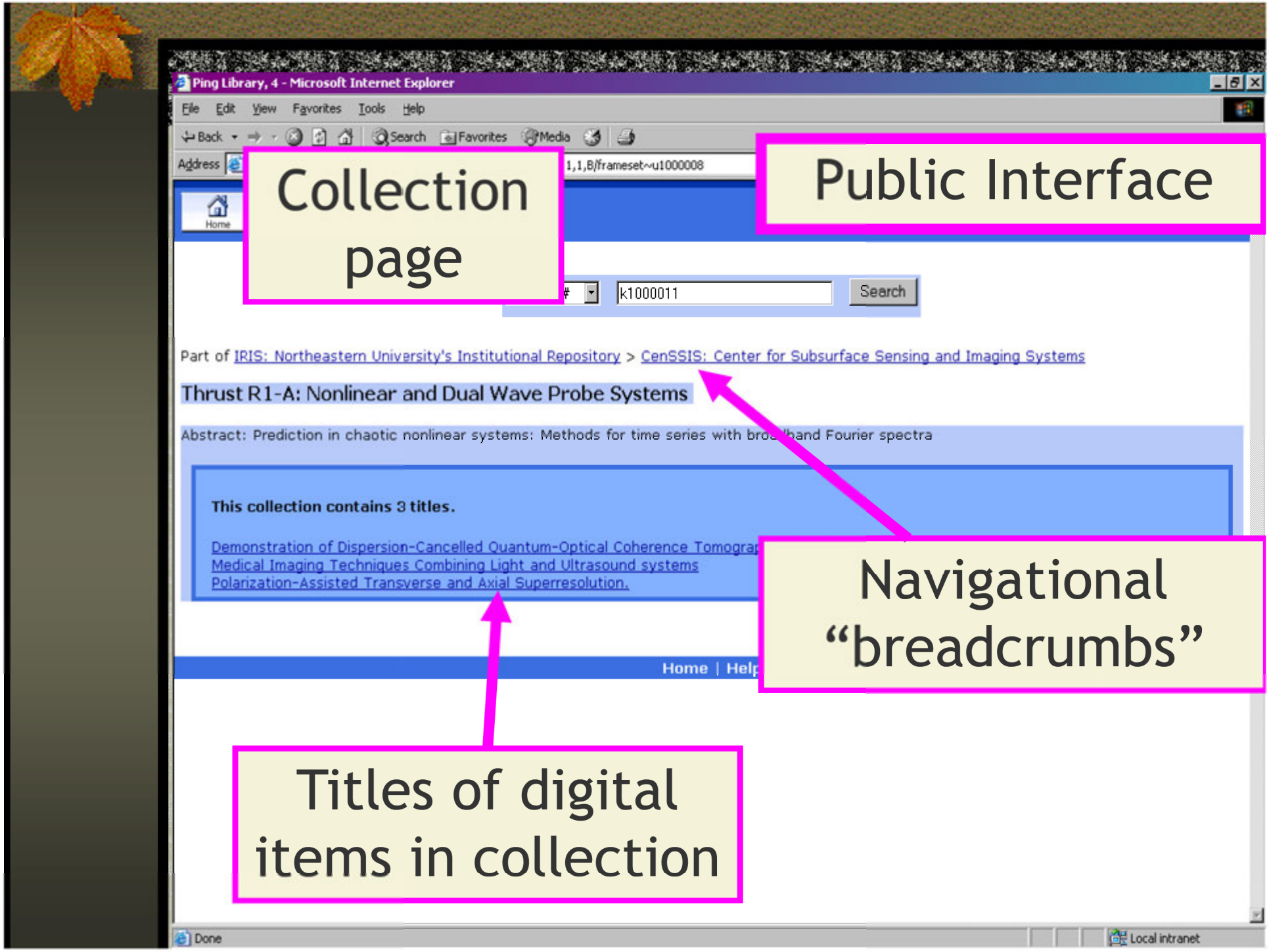
Key Components of Symposia (IRis)

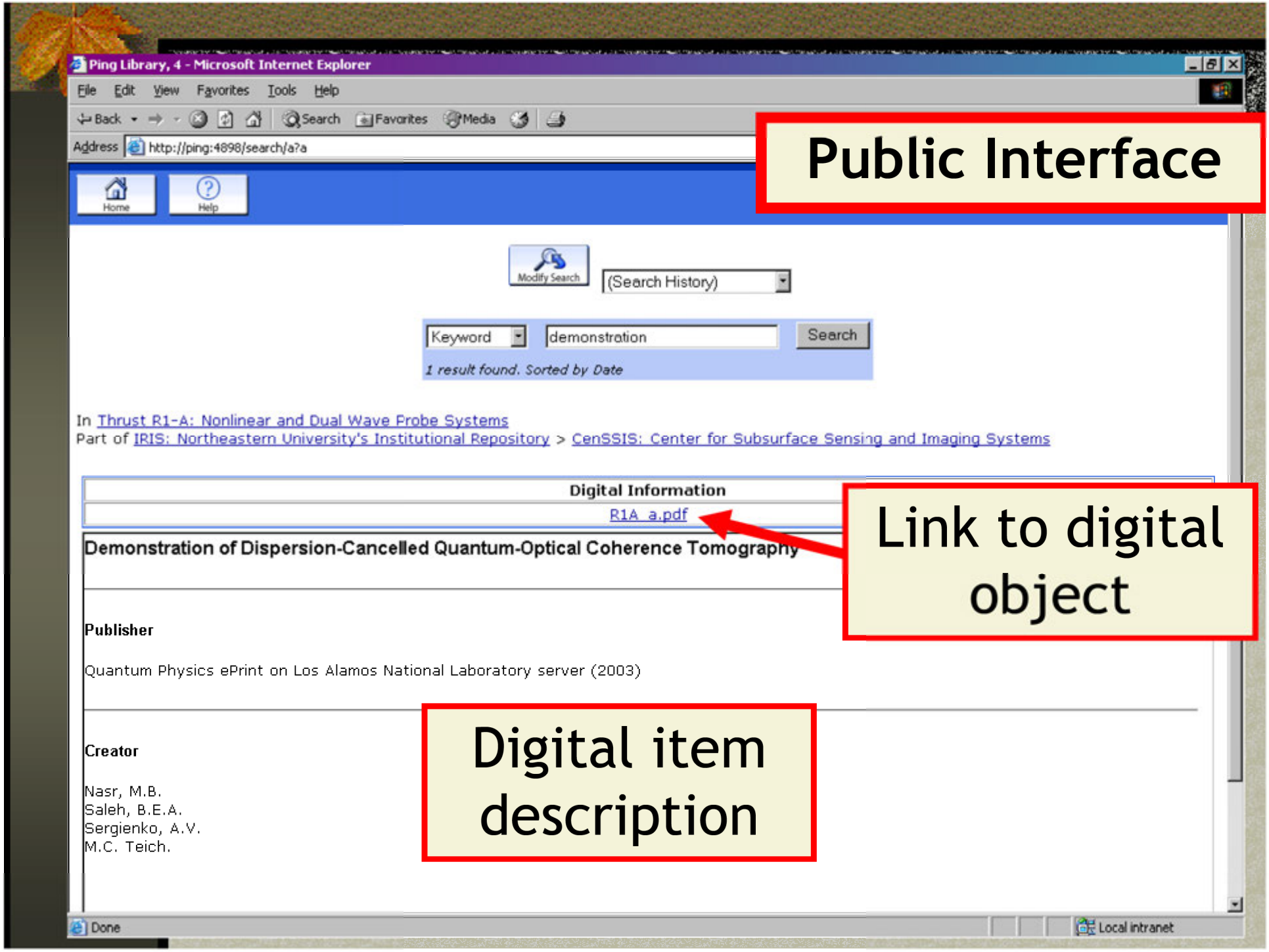
- Public search and retrieval
- Web submission interface
- Management client


Innovative Digitial Repository - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://ping:4898/search
Home
Help
Search the repository
find the digital intellectual output of this institution
Keyword
Keyword
Community
Collection
Subject
Title
Creator
Go
objects collected by a wide variety of
Browse the
The top level communities are:
Systems Development Department
Cataloging Department
CenSSIS: Center for Subsurface Sensing and Imaging
Archives and Special Collections
Office of the Board of Trustees
Office of University Planning and Research
CURP: Center for Urban and Regional Planning
Authorized users:
Submit to the repository
Local intranet
Public Interface
Keyword and targeted keyword searches

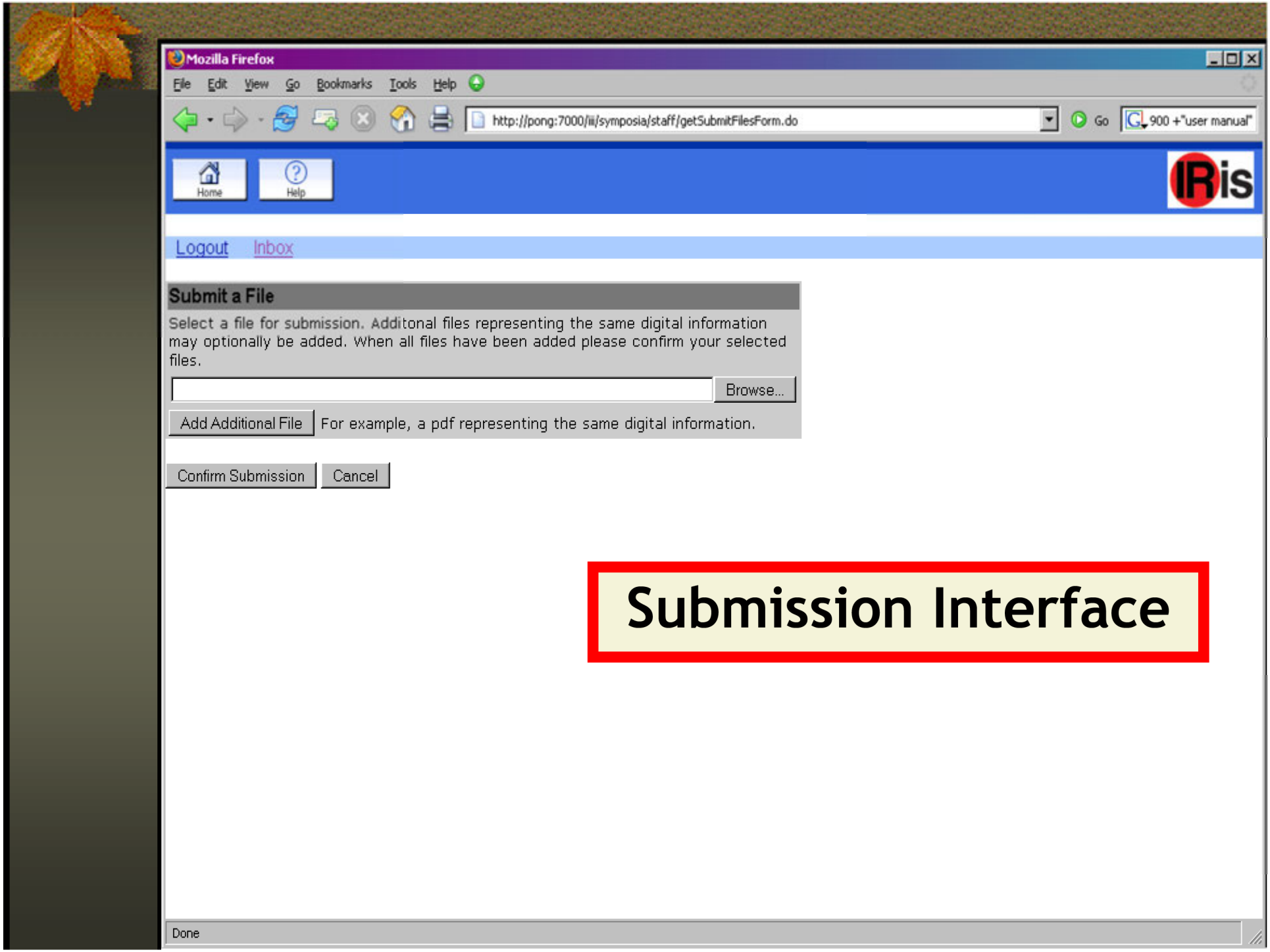

Ping Library, 4 - Mozilla Firefox
File Edit View
Go
Home
Help
Public Interface
Modify Search
(Search History)
Keyword
thrust
Search
11 results found. Sorted by Date
Part of IRIS: Northeastern University's Institutional Repository
Save All On Page
Keywords (1-11 of 11)
1 Thrust R1-B: Effective Forward Models
Methods Accelerating Modeling and Retinal Tracing Applications
2 Thrust R2-A: Multi-View Tomographic Methods
Research on Tomographic methods in relation to multi-view models
3 Thrust R2-B: Localized Probing and Mosaicing Methods
4 Thrust R2-C: MultiSpectral Discrimination Methods
5 Thrust R2-D: Image Understanding and Sensor Fusion Methods
6 Thrust R3-A: Parallel Hardware Implementation for Fast Subsurface Detection
7 Thrust R3-B: Solutionware Tools
8 Thrust collection
9 Thrust Sandwich Brigade
Search results
Done


Public Interface
Community page
Name and Logo
Description of the Community
Subcommunities
Collections
Ping Library, 4 - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
Home
IRis
Record #
Part of IRIS: Northeastern University's Institutional Repository
CenSSIS
Looking Into Hidden Worlds
CenSSIS: Center for Subsurface Sensing and Imaging Systems
Background. CenSSIS is a National Science Foundation (NSF) Engineering Research Center (ERC), one of only 19 ERCs in the nation. The CenSSIS mission is to revolutionize the existing technology for detecting and imaging biomedical and environmental-civil objects or conditions that are underground, underwater, or embedded in the human body. The Center's unified, multidisciplinary approach combines expertise in wave physics, sensor engineering, image processing, and inverse scattering with rigorous performance testing to create new sensing system prototypes that are transitioned to our 14 industry partners for further development. CenSSIS site
Communities:
Meeting information
Transcripts and notes from all CenSSIS partner meetings
Collections:
Thrust R1-A: Nonlinear and Dual Wave Probe Systems
Prediction in chaotic nonlinear systems: Methods for time series with b
Thrust R1-B: Effective Forward Models
Methods Accelerating Modeling and Retinal Tracing Applications
Done

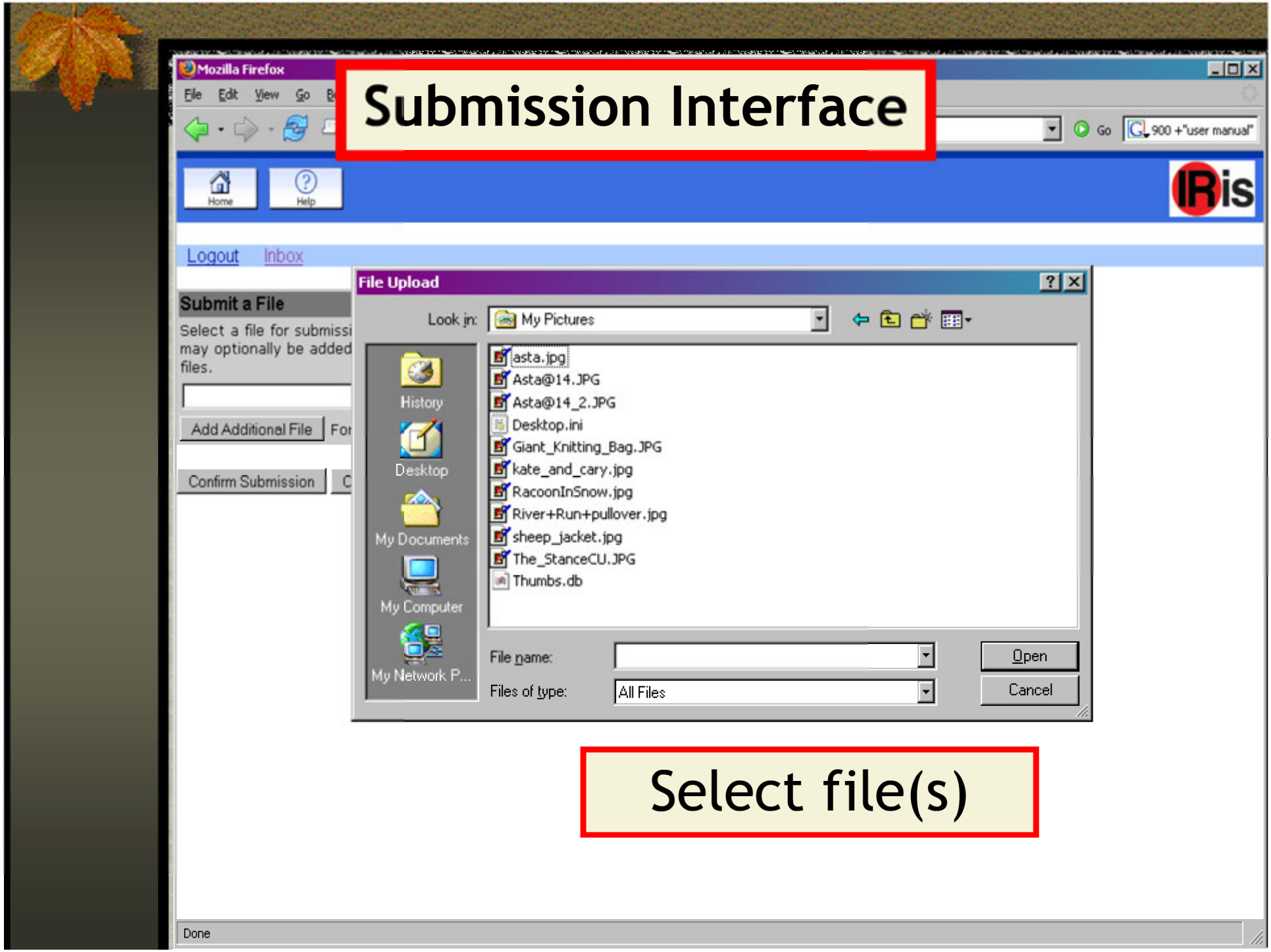

Ping Library, 4 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address
1,1,B/frameset~u1000008
Home
k1000011
Search
Part of IRIS: Northeastern University's Institutional Repository > CenSSIS: Center for Subsurface Sensing and Imaging Systems
Thrust R1-A: Nonlinear and Dual Wave Probe Systems
Abstract: Prediction in chaotic nonlinear systems: Methods for time series with bro band Fourier spectra
This collection contains 3 titles.
Demonstration of Dispersion-Cancelled Quantum-Optical Coherence Tomograp
Medical Imaging Techniques Combining Light and Ultrasound systems
Polarization-Assisted Transverse and Axial Superresolution.
Home | Help
Done
Local intranet
Collection page
Public Interface
Navigational "breadcrumbs"
Titles of digital items in collection

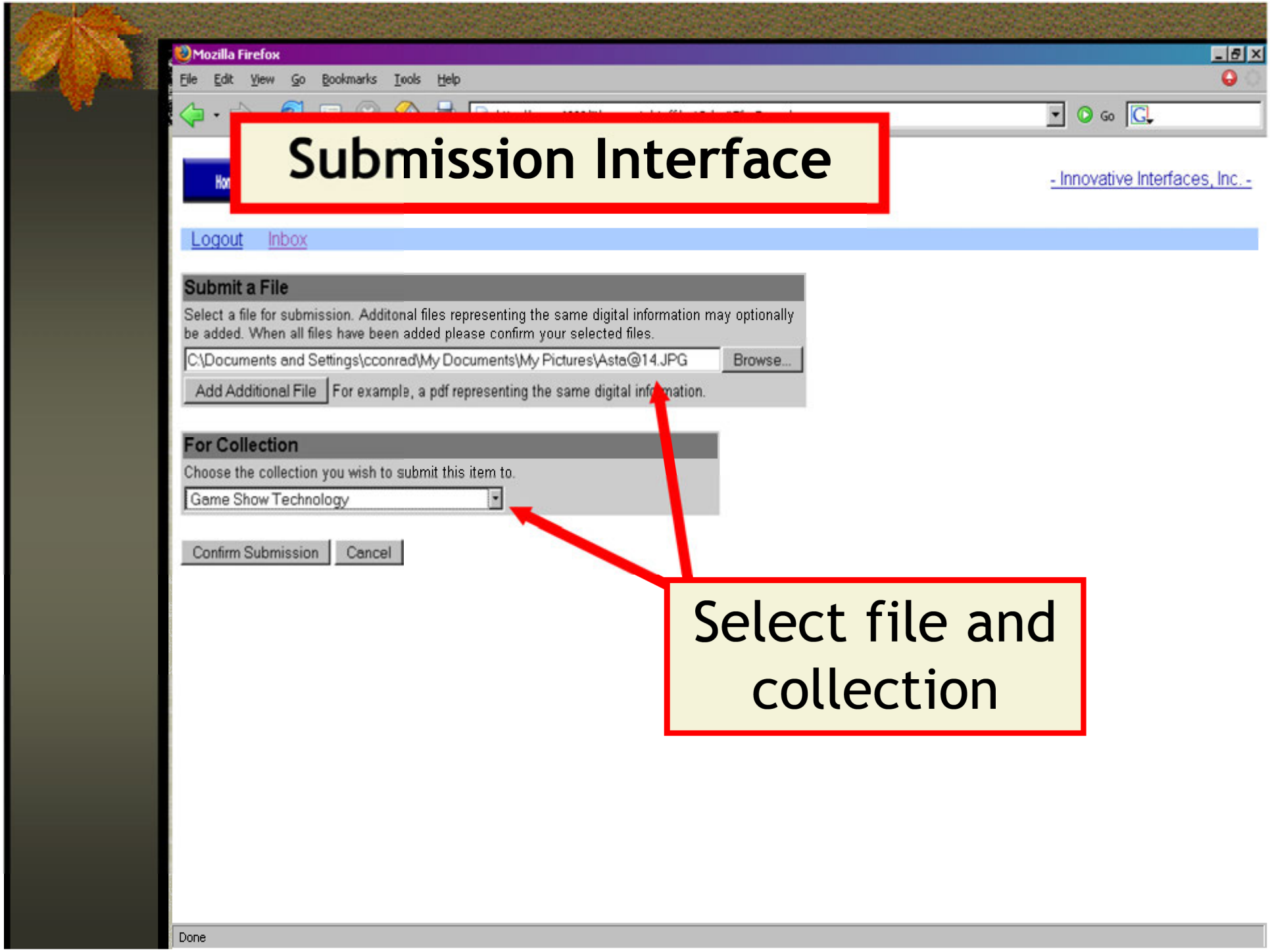

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Back Search Favorites Media
Address http://ping:4898/search/a?a
Home
Help
Public Interface
Modify Search
(Search History)
Keyword
demonstration
Search
1 result found. Sorted by Date
In Thrust R1-A: Nonlinear and Dual Wave Probe Systems
Part of IRIS: Northeastern University's Institutional Repository > CenSSIS: Center for Subsurface Sensing and Imaging Systems
Digital Information
R1A_a.pdf
Link to digital object
Demonstration of Dispersion-Cancelled Quantum-Optical Coherence Tomography
Publisher
Quantum Physics ePrint on Los Alamos National Laboratory server (2003)
Creator
Nasr, M.B.
Saleh, B.E.A.
Sergienko, A.V.
M.C. Teich.
Digital item description
Done
Local intranet

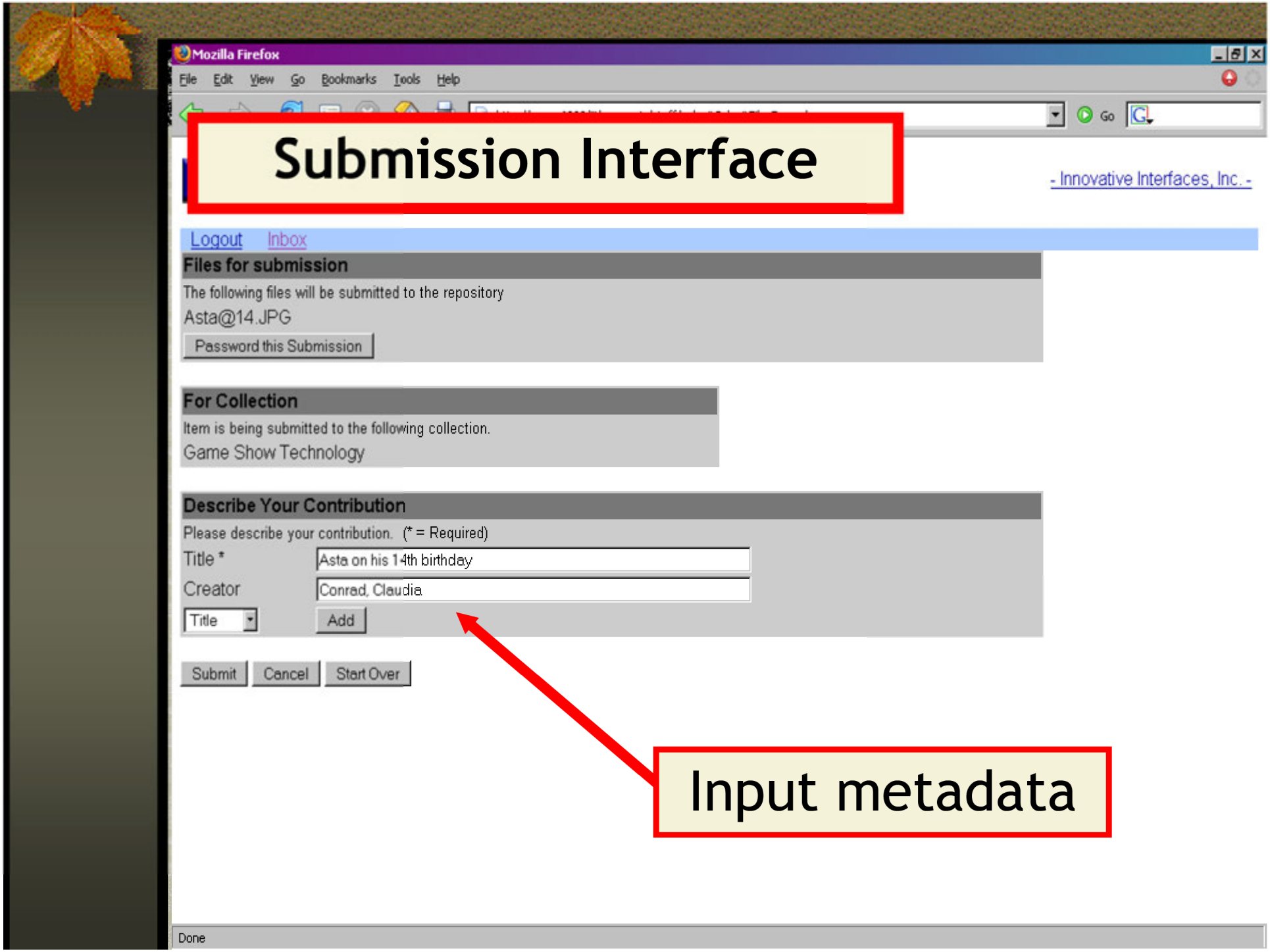
Submission Interface

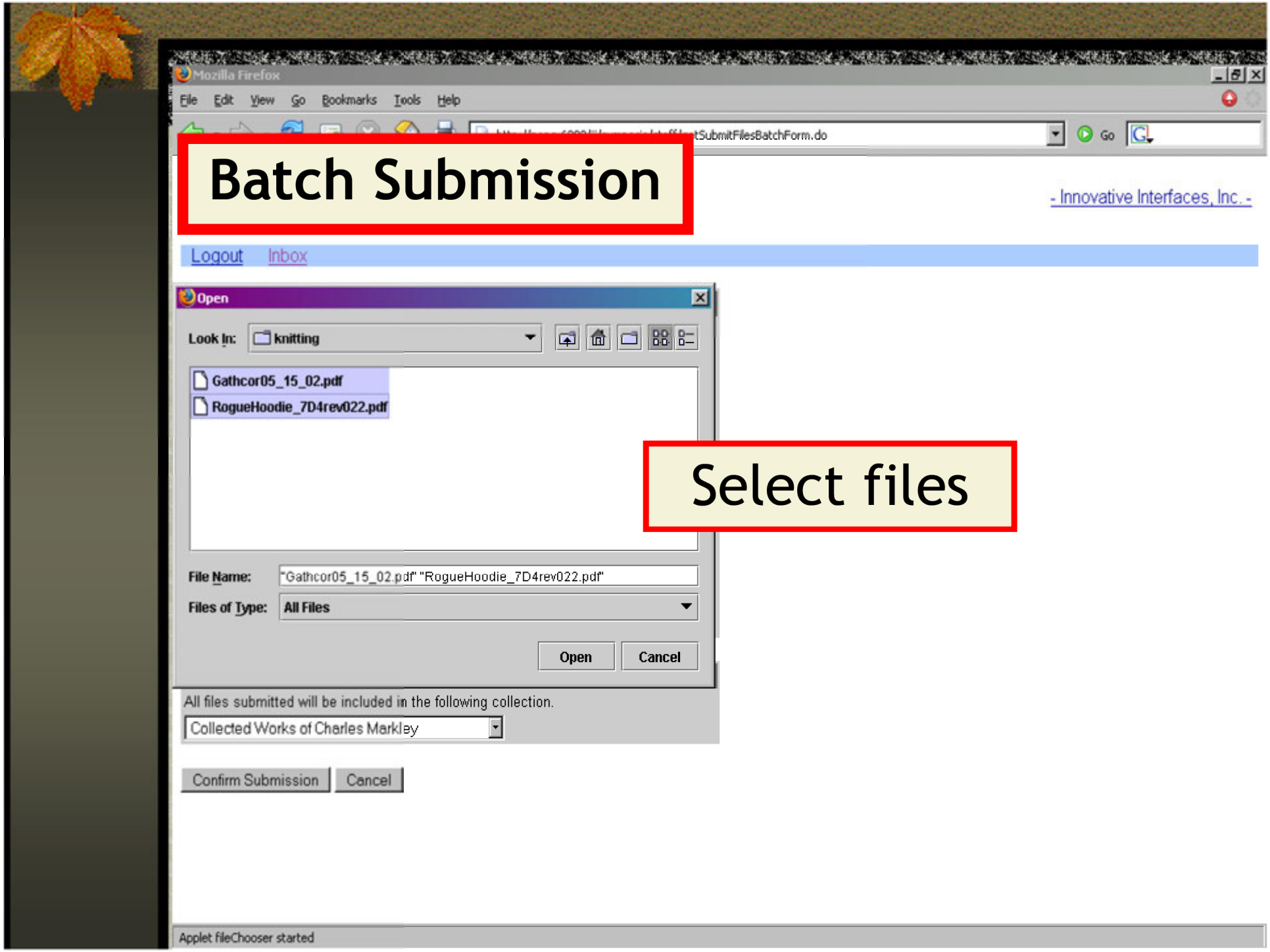


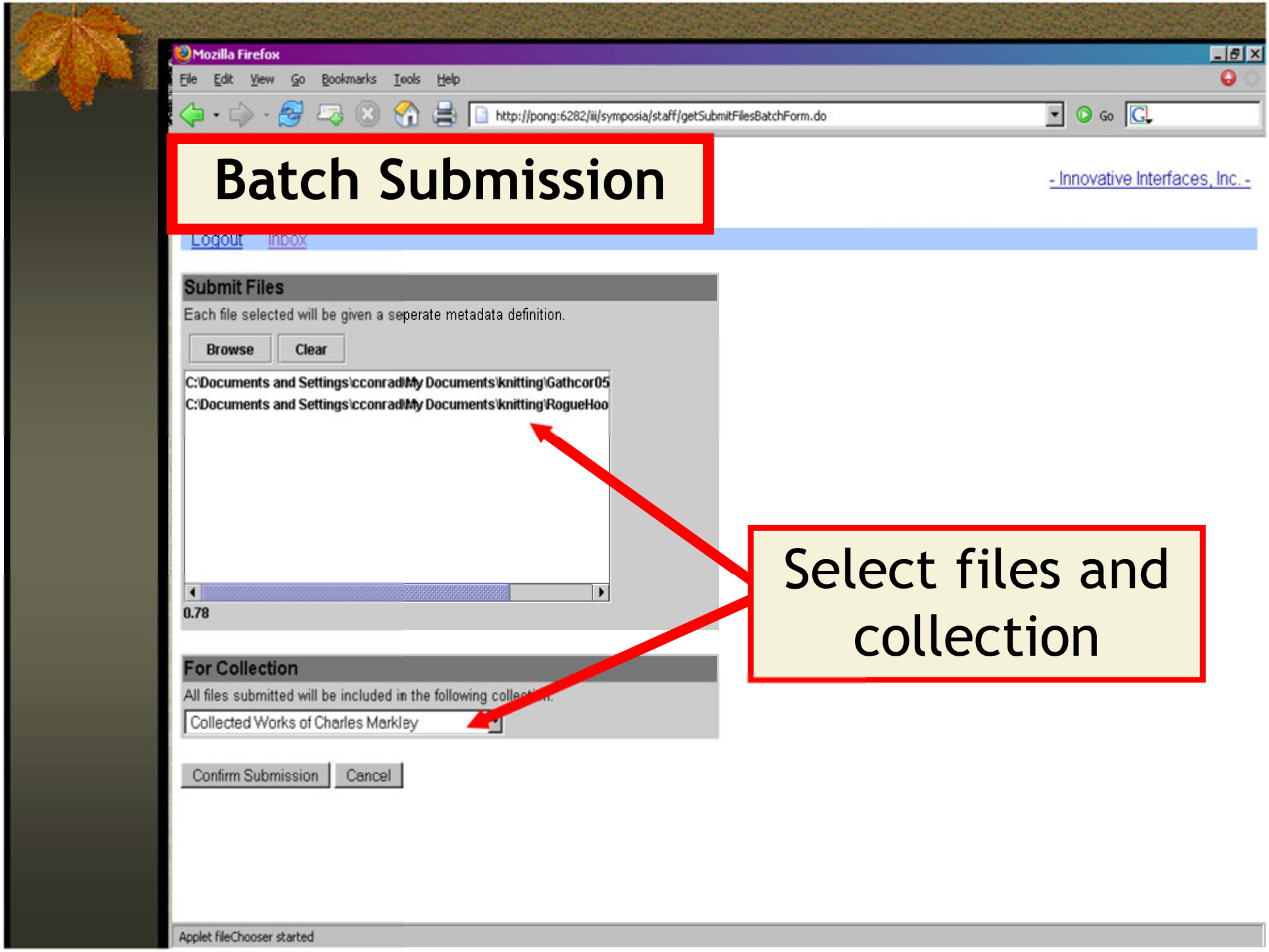
Submission Interface

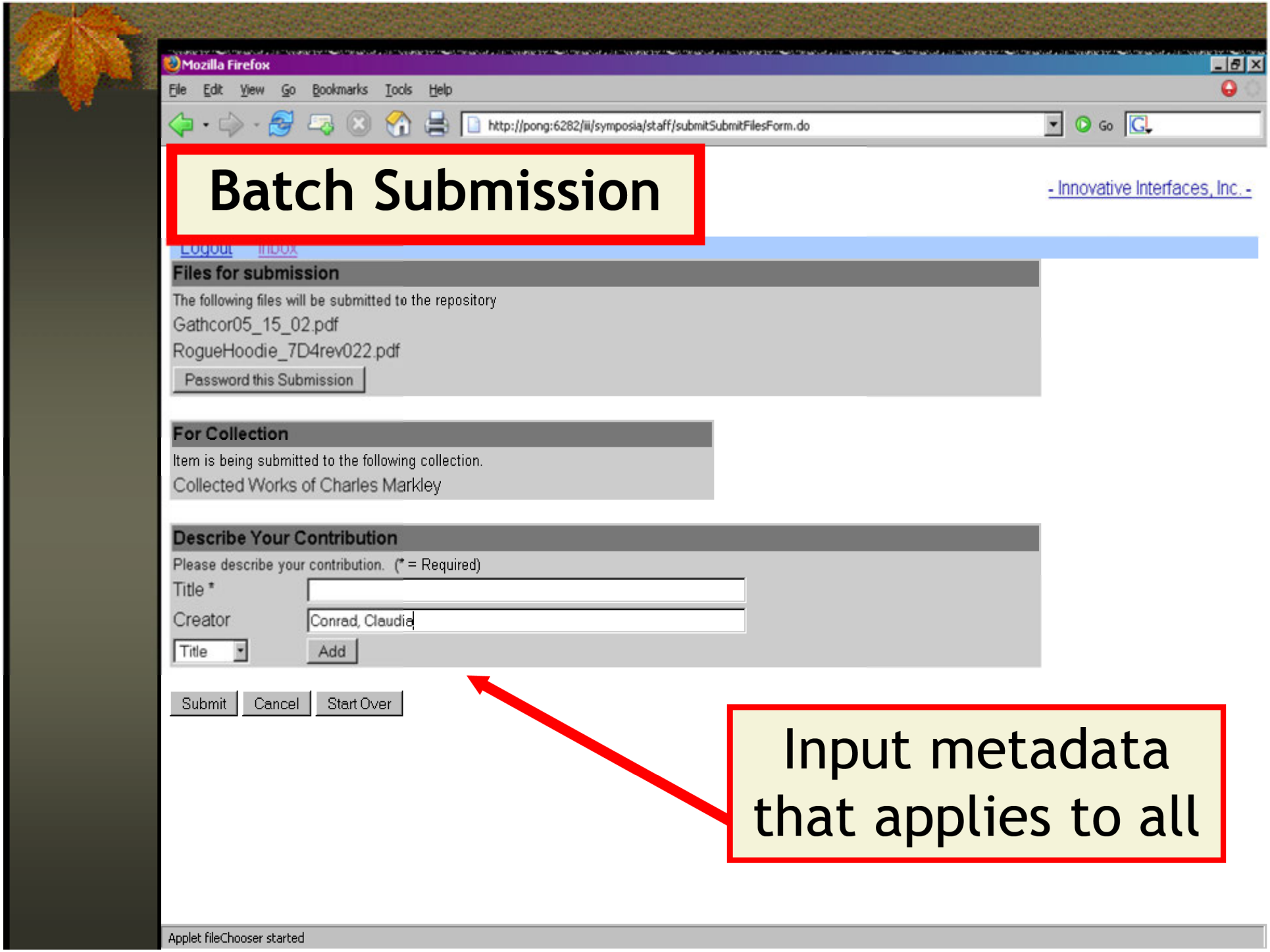

Submission Interface
Mozilla Firefox
File Edit View Go
Home
Help
Logout
Inbox
Submit a File
Select a file for submissi
may optionally be added
files.
Add Additional File
Confirm Submission
File Upload
Look in:
My Pictures
History
Desktop
My Documents
My Computer
My Network P...
asta.jpg
Asta@14.JPG
Asta@14_2.JPG
Desktop.ini
Giant_Knitting_Bag.JPG
kate_and_cary.jpg
RacoonInSnow.jpg
River+Run+pullover.jpg
sheep_jacket.jpg
The_StanceCU.JPG
Thumbs.db
File name:
Files of type:
All Files
Open
Cancel
Select file(s)
Done

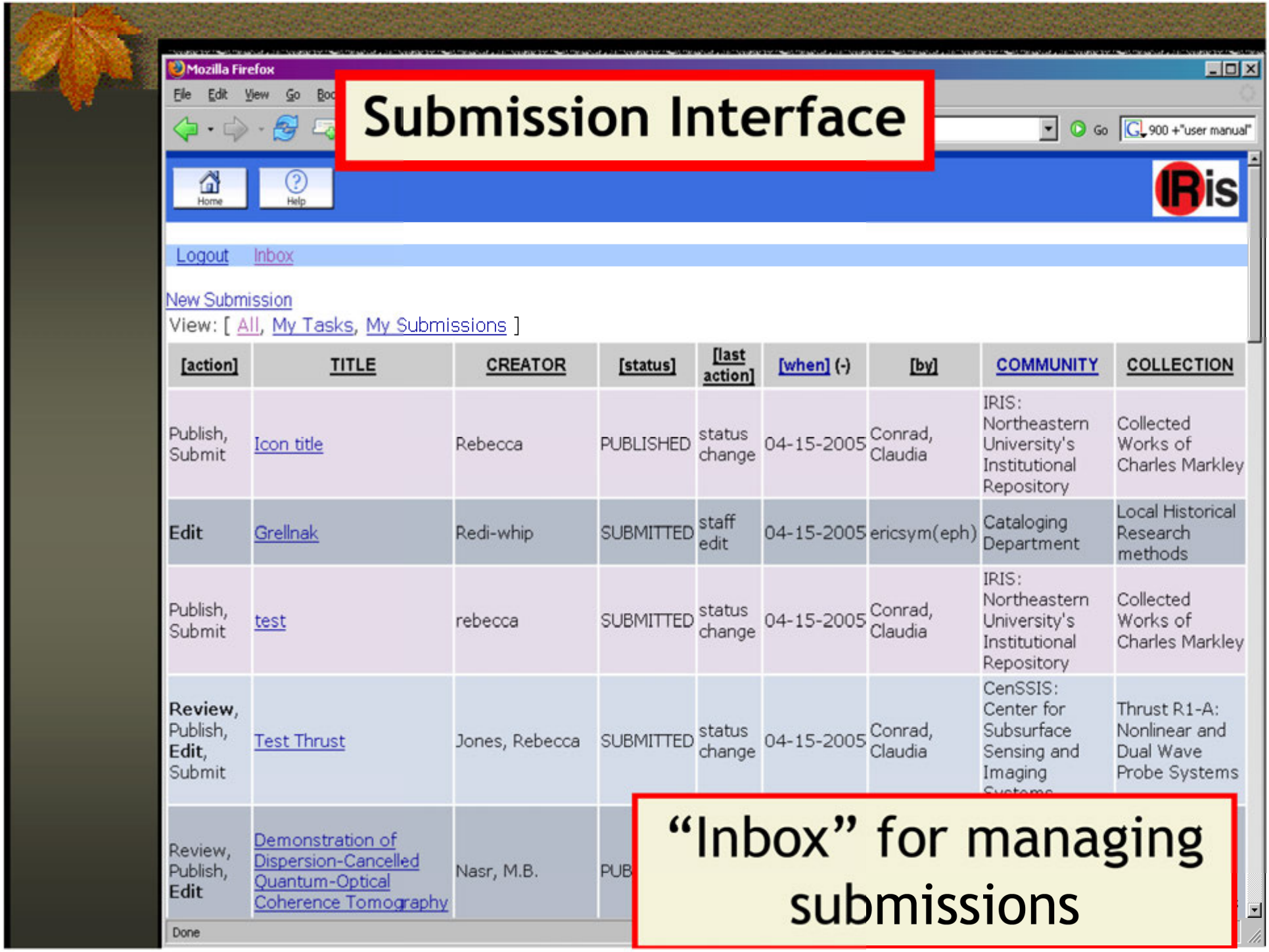

Mozilla Firefox
File Edit View Go Bookmarks Tools Help
Go
Submission Interface
- Innovative Interfaces, Inc. -
Logout Inbox
Submit a File
Select a file for submission. Additonal files representing the same digital information may optionally be added. When all files have been added please confirm your selected files.
C:\Documents and Settings\cconrad\My Documents\My Pictures\Asta@14.JPG
Browse...
Add Additional File
For example, a pdf representing the same digital information.
For Collection
Choose the collection you wish to submit this item to.
Game Show Technology
Confirm Submission
Cancel
Select file and collection
Done

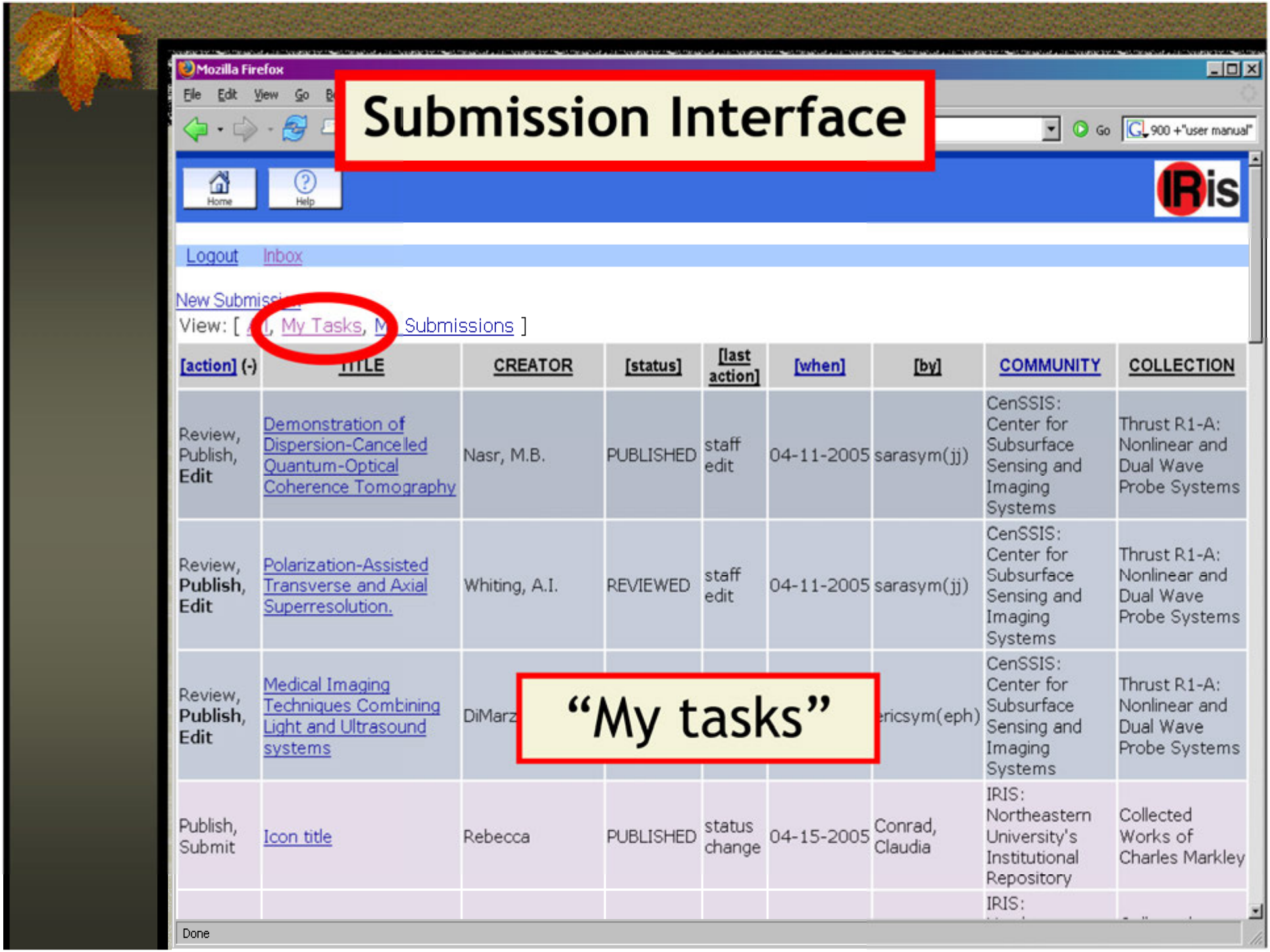

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Submission Interface
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Files for submission
The following files will be submitted to the repository
Asta@14.JPG
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Item is being submitted to the following collection.
Game Show Technology
Describe Your Contribution
Please describe your contribution. (* = Required)
Title * Asta on his 14th birthday
Creator Conrad, Claudia
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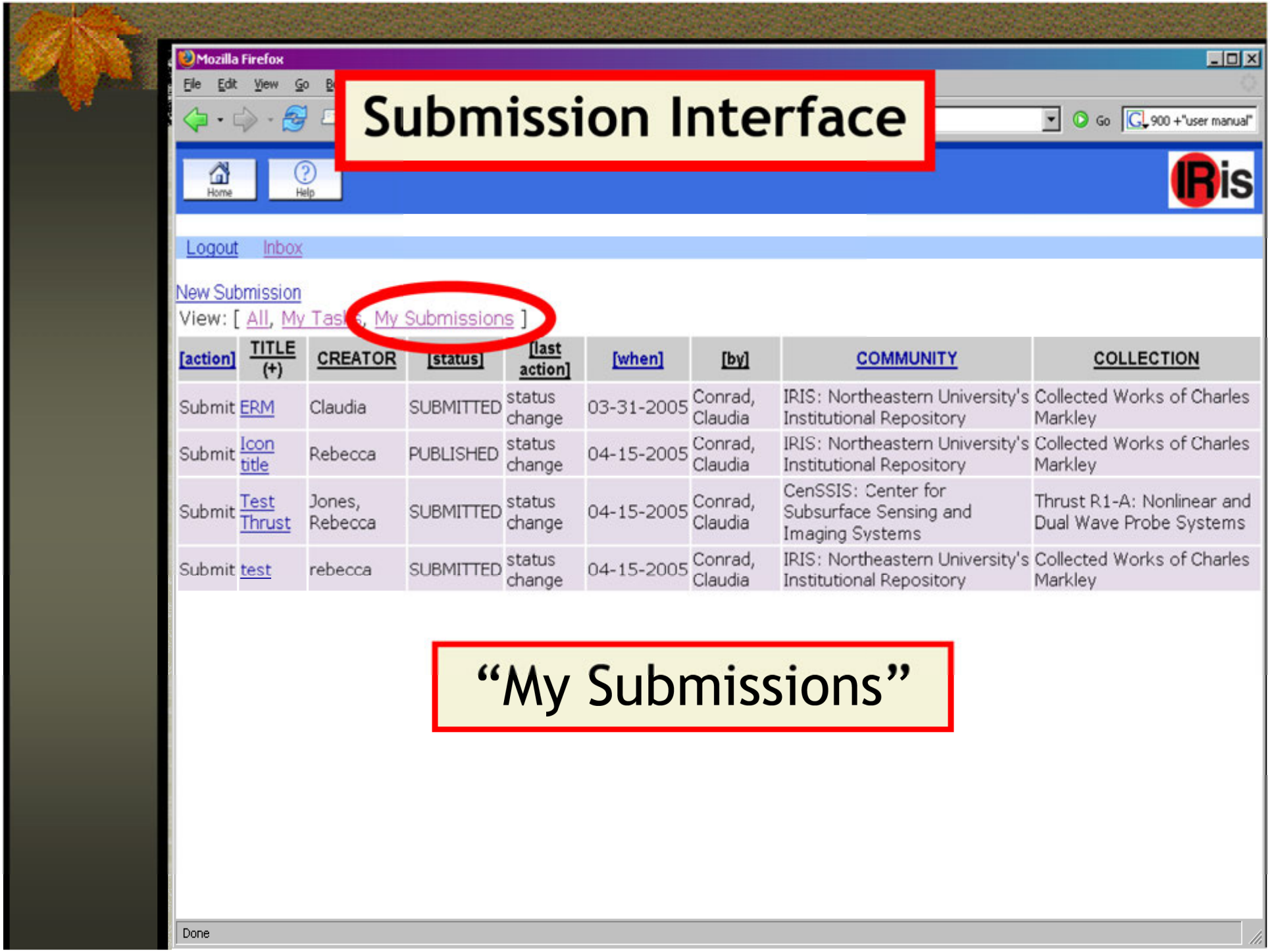

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Batch Submission
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Collected Works of Charles Markley
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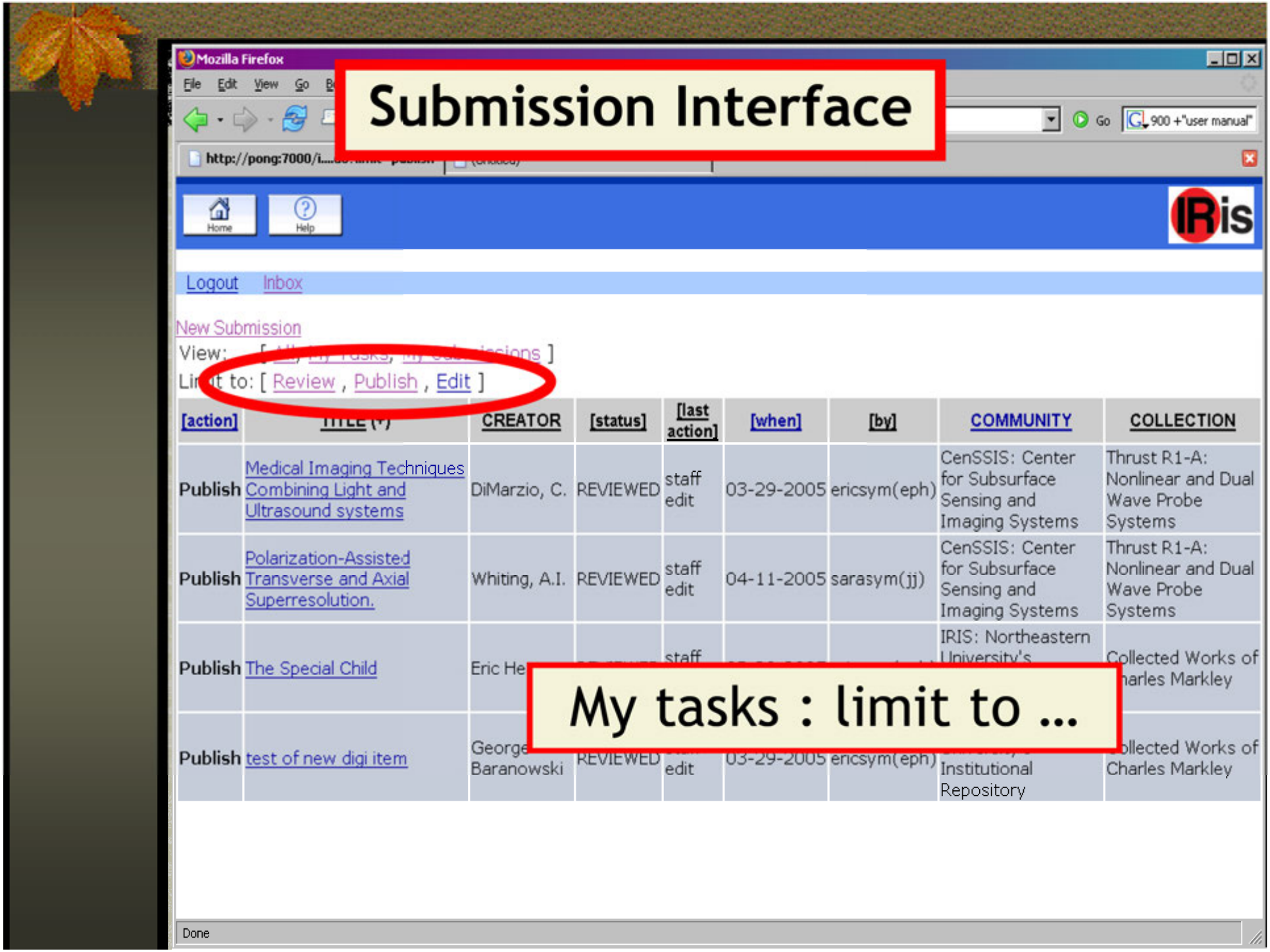

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Submit Files
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Review, Publish, Edit, Submit | Test Thrust | Jones, Rebecca | SUBMITTED | status change | 04-15-2005 | Conrad, Claudia | CenSSIS: Center for Subsurface Sensing and Imaging | Thrust R1-A: Nonlinear and Dual Wave Probe Systems
Review, Publish, Edit | Demonstration of Dispersion-Cancelled Quantum-Optical Coherence Tomography | Nasr, M.B. | PUB
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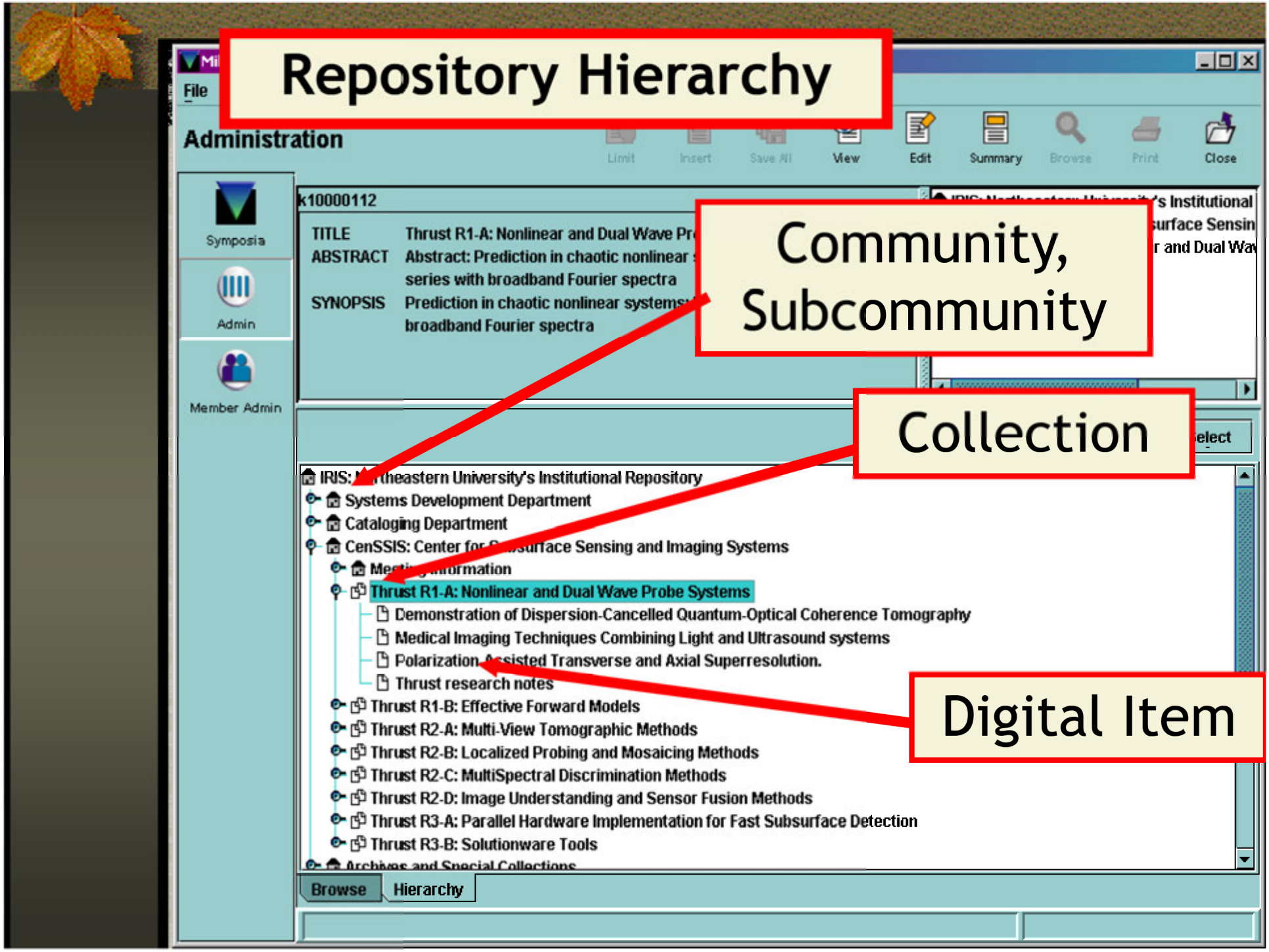

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Review, Publish, Edit | Medical Imaging Techniques Combining Light and Ultrasound systems | DiMarz | ericsym(eph) | CenSSIS: Center for Subsurface Sensing and Imaging Systems | Thrust R1-A: Nonlinear and Dual Wave Probe Systems
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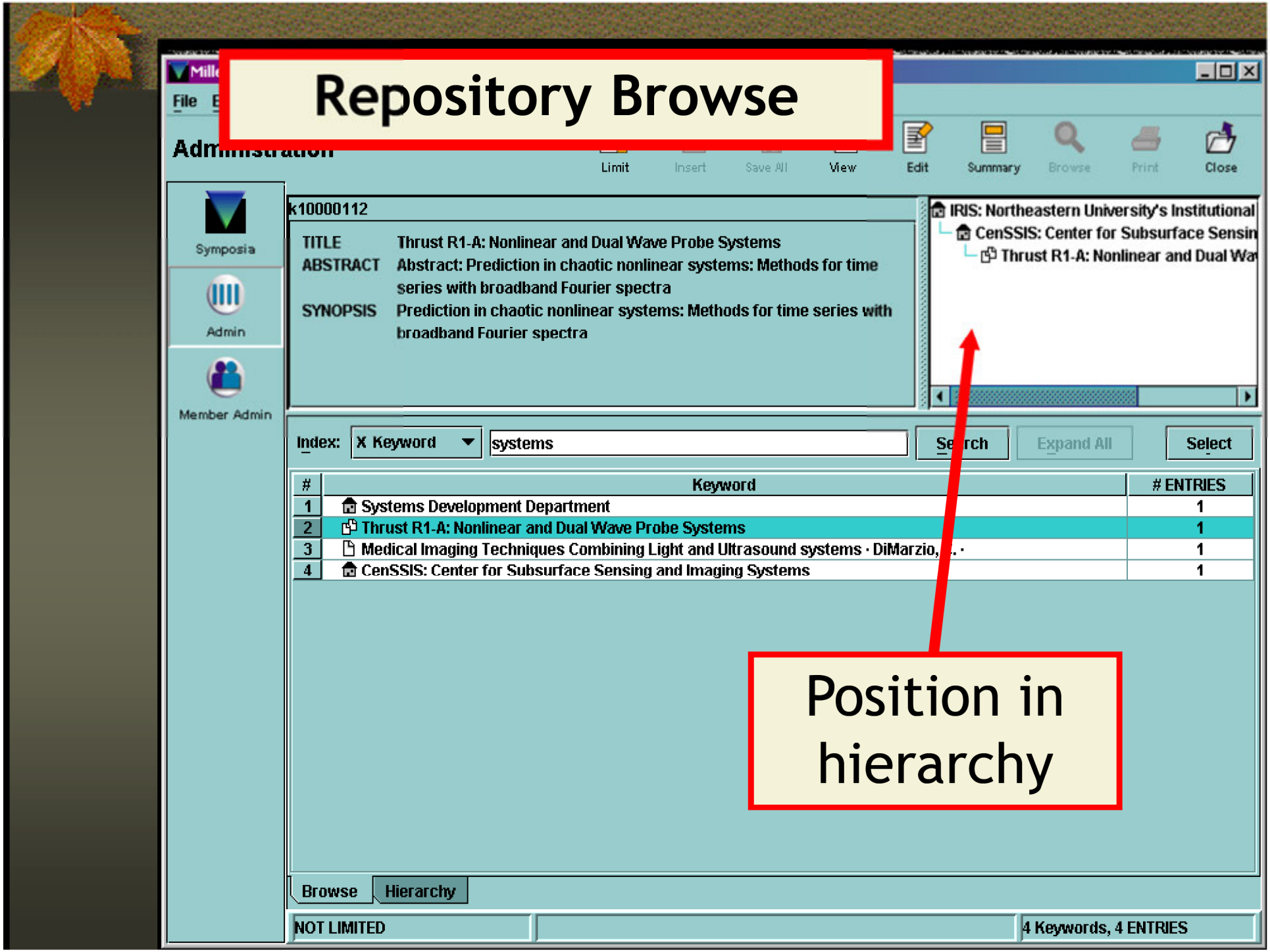

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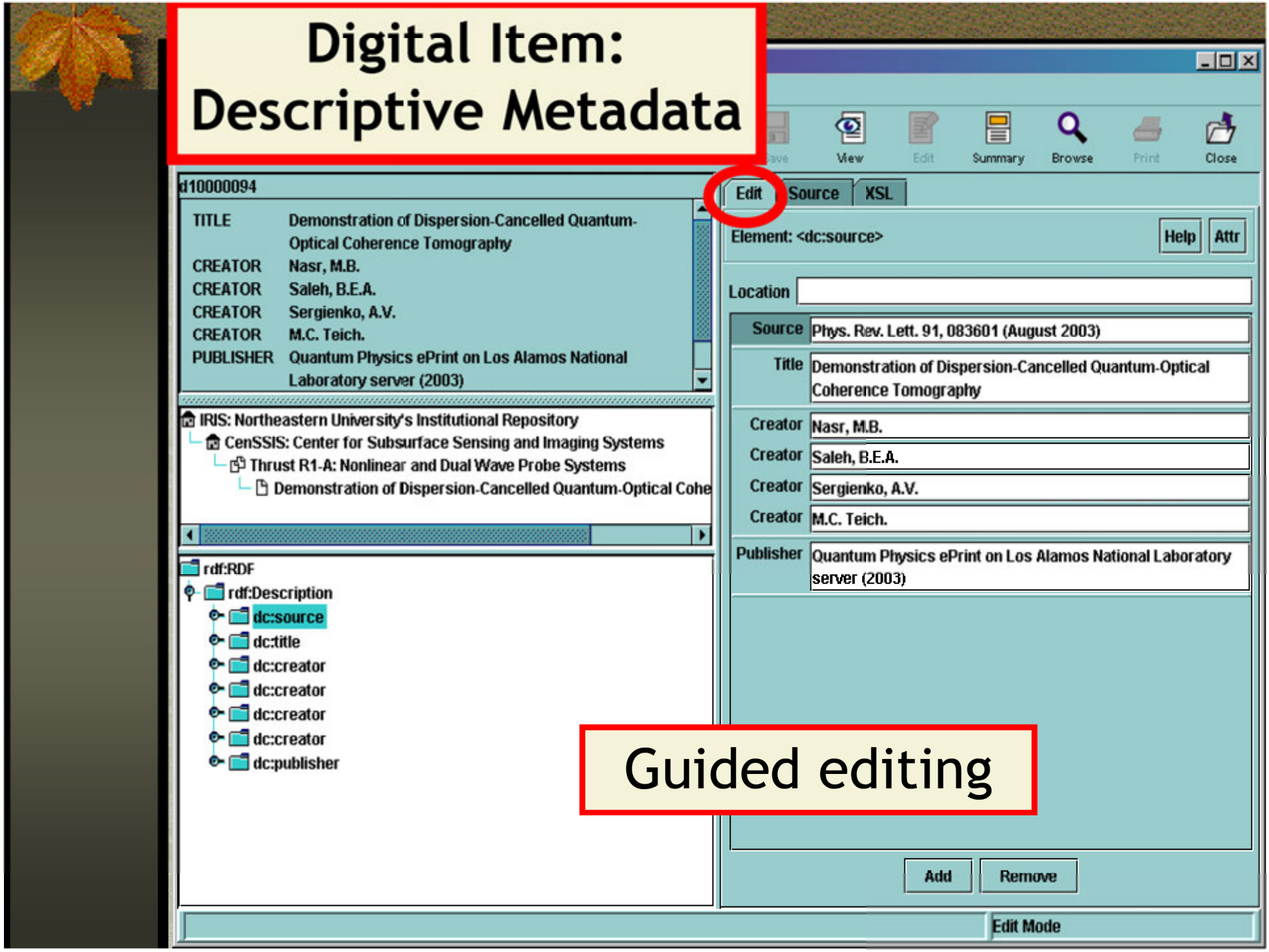

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Publish Polarization-Assisted Transverse and Axial Superresolution. Whiting, A.I. REVIEWED staff edit 04-11-2005 sarasym(jj) CenSSIS: Center for Subsurface Sensing and Imaging Systems Thrust R1-A: Nonlinear and Dual Wave Probe Systems
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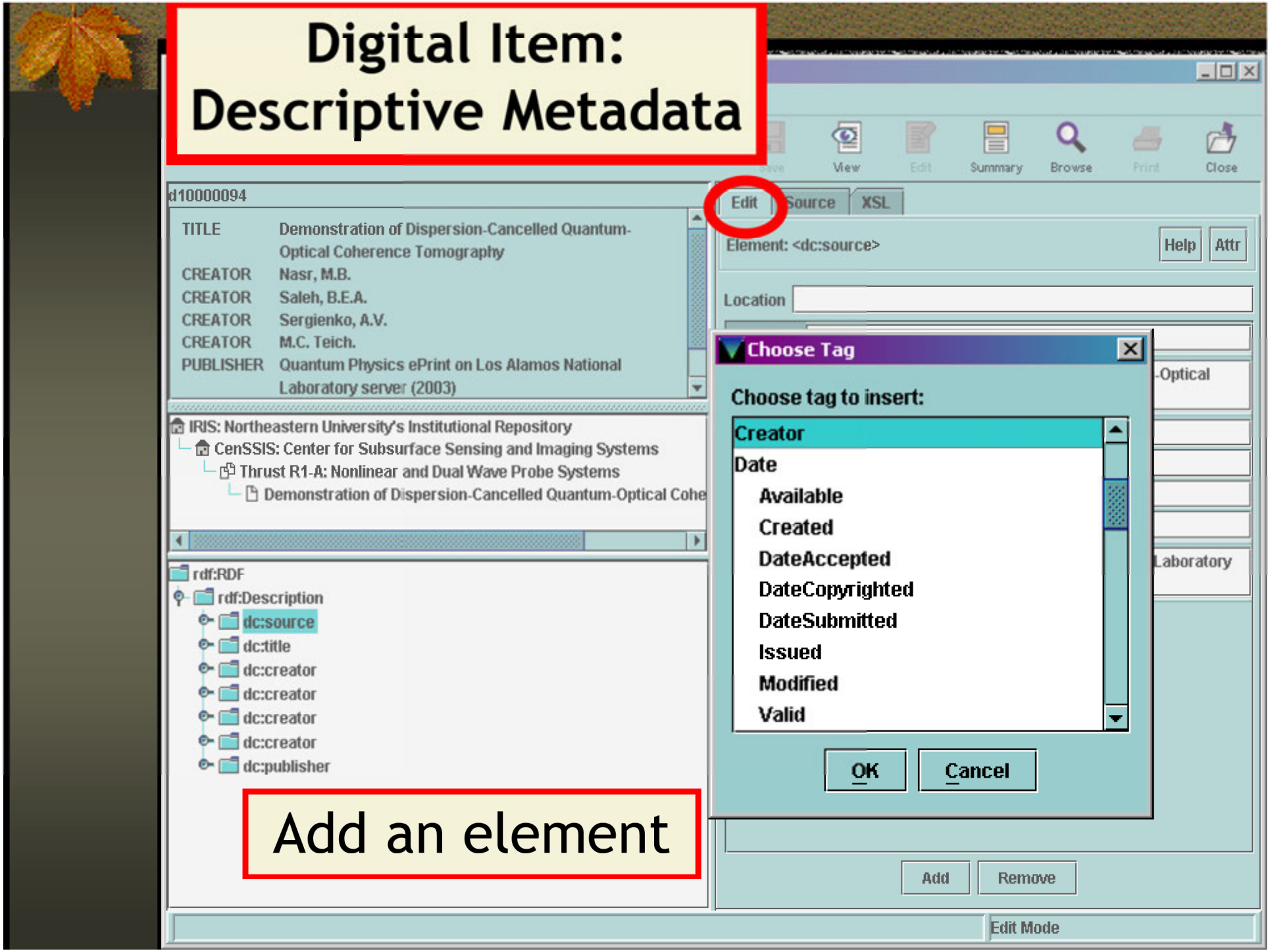
Java-based Management Interface

- For “super-users” who can manage all
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- Management of Members
- Logins and authorizations

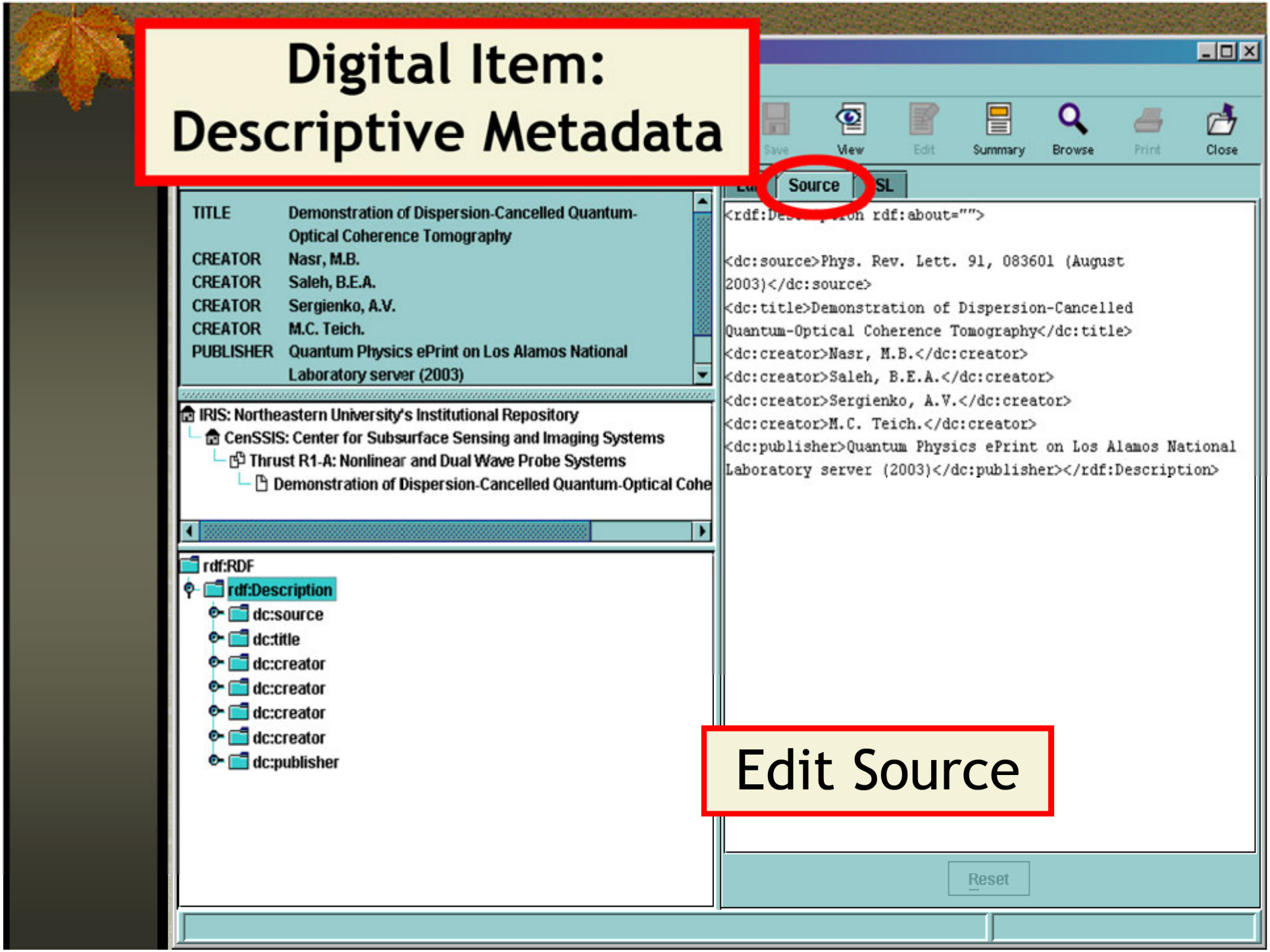

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ABSTRACT
Abstract: Prediction in chaotic nonlinear
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SYNOPSIS
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CenSSIS: Center for
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Demonstration of Dispersion-Cancelled Quantum-Optical Coherence Tomography
Medical Imaging Techniques Combining Light and Ultrasound systems
Polarization
Thrust research notes
Thrust R1-B: Effective Forward Models
Thrust R2-A: Multi-View Tomographic Methods
Thrust R2-B: Localized Probing and Mosaicing Methods
Thrust R2-C: MultiSpectral Discrimination Methods
Thrust R2-D: Image Understanding and Sensor Fusion Methods
Thrust R3-A: Parallel Hardware Implementation for Fast Subsurface Detection
Thrust R3-B: Solutionware Tools
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ABSTRACT Abstract: Prediction in chaotic nonlinear systems: Methods for time series with broadband Fourier spectra
SYNOPSIS Prediction in chaotic nonlinear systems: Methods for time series with broadband Fourier spectra
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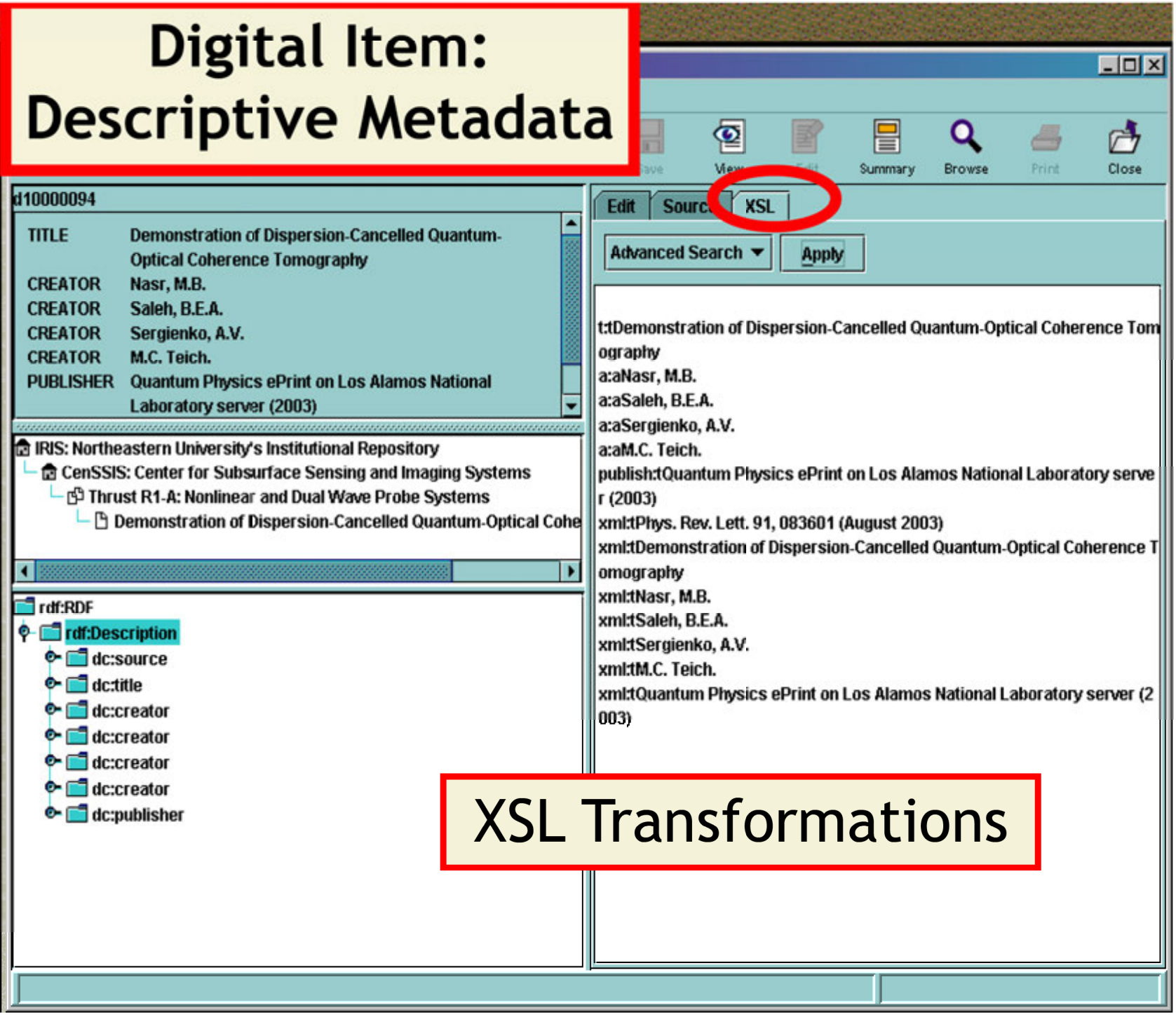

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CREATOR Sergienko, A.V.
CREATOR M.C. Teich.
PUBLISHER Quantum Physics ePrint on Los Alamos National Laboratory server (2003)
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Publisher Quantum Physics ePrint on Los Alamos National Laboratory server (2003)
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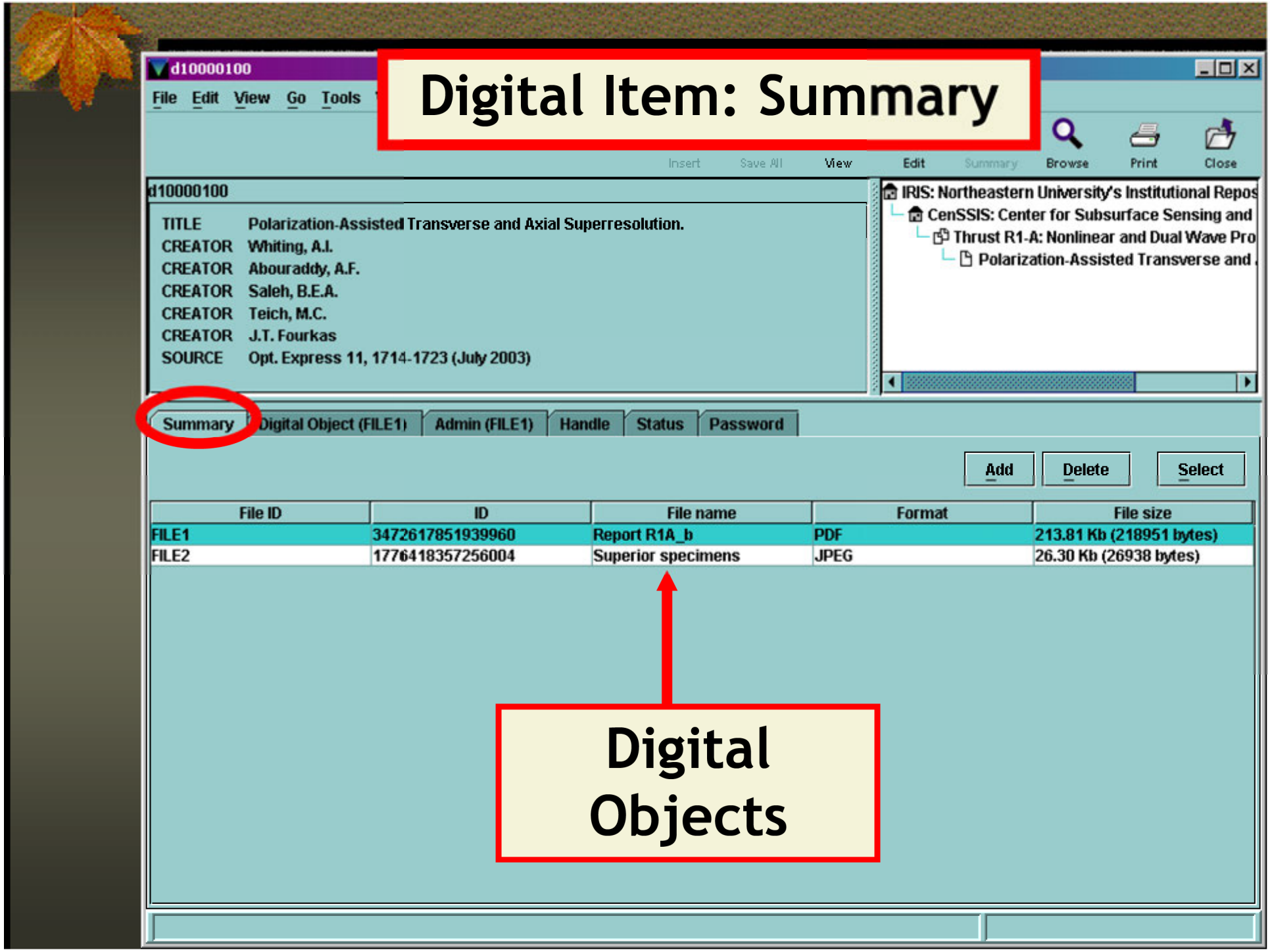
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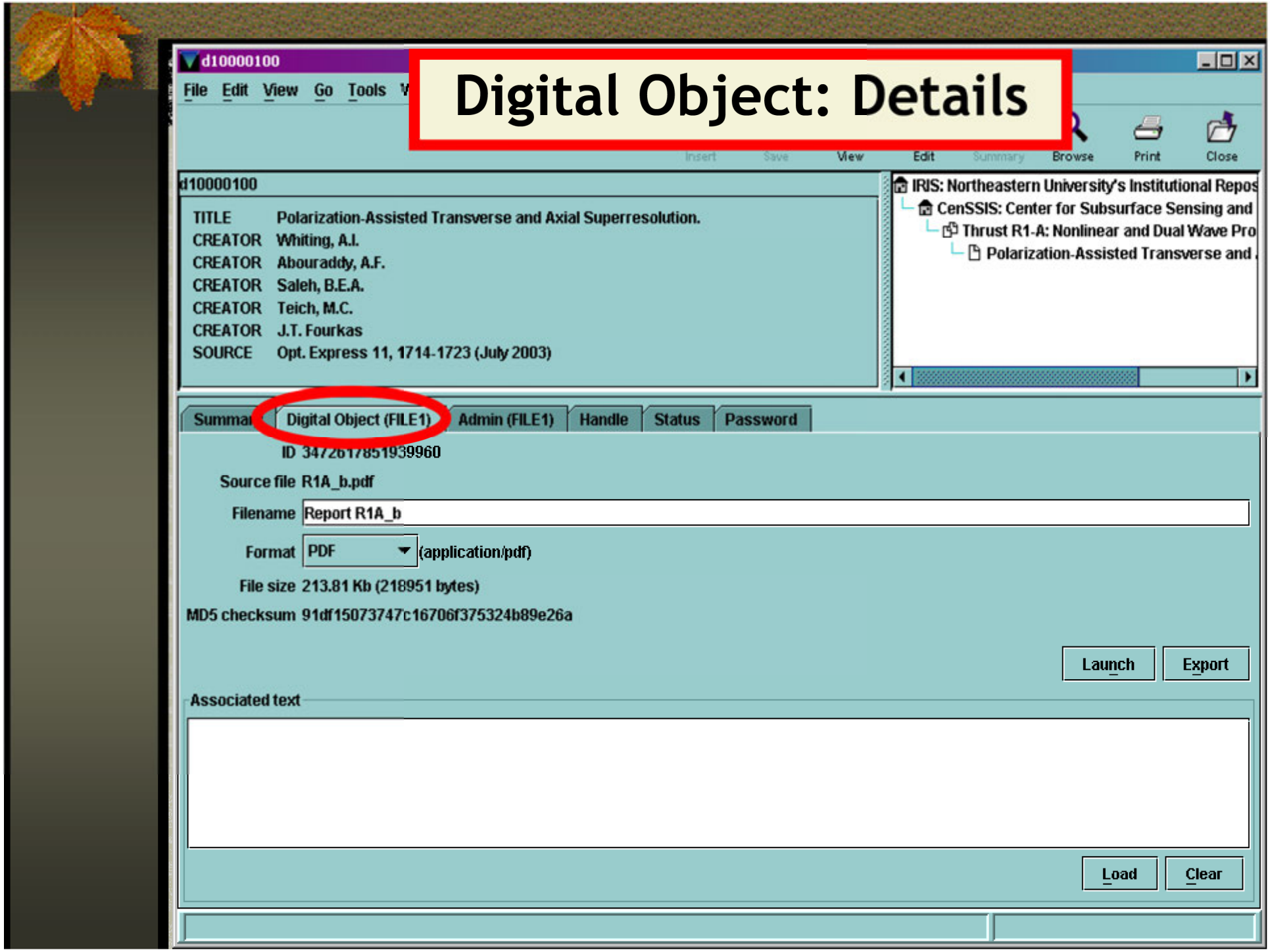


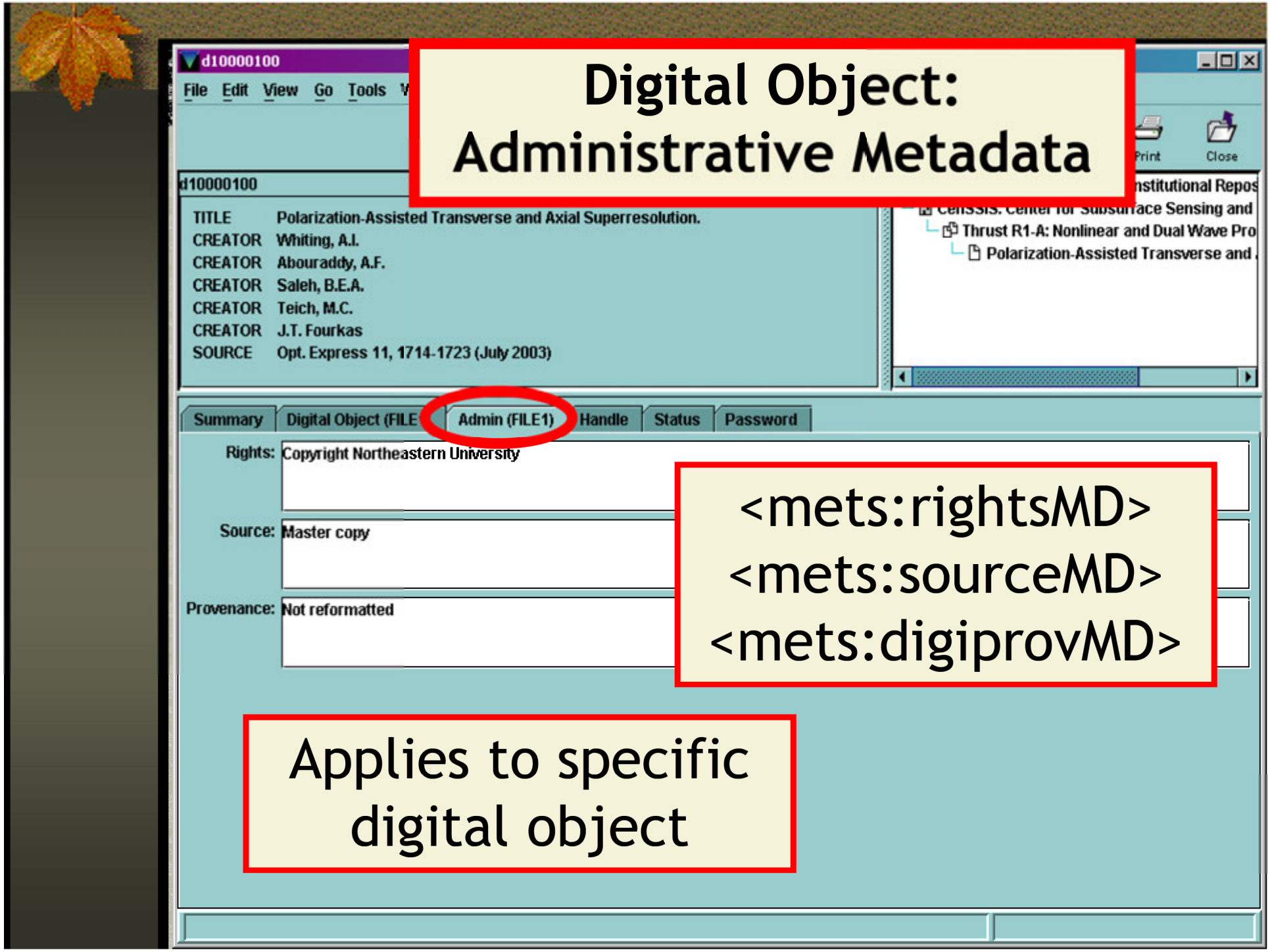
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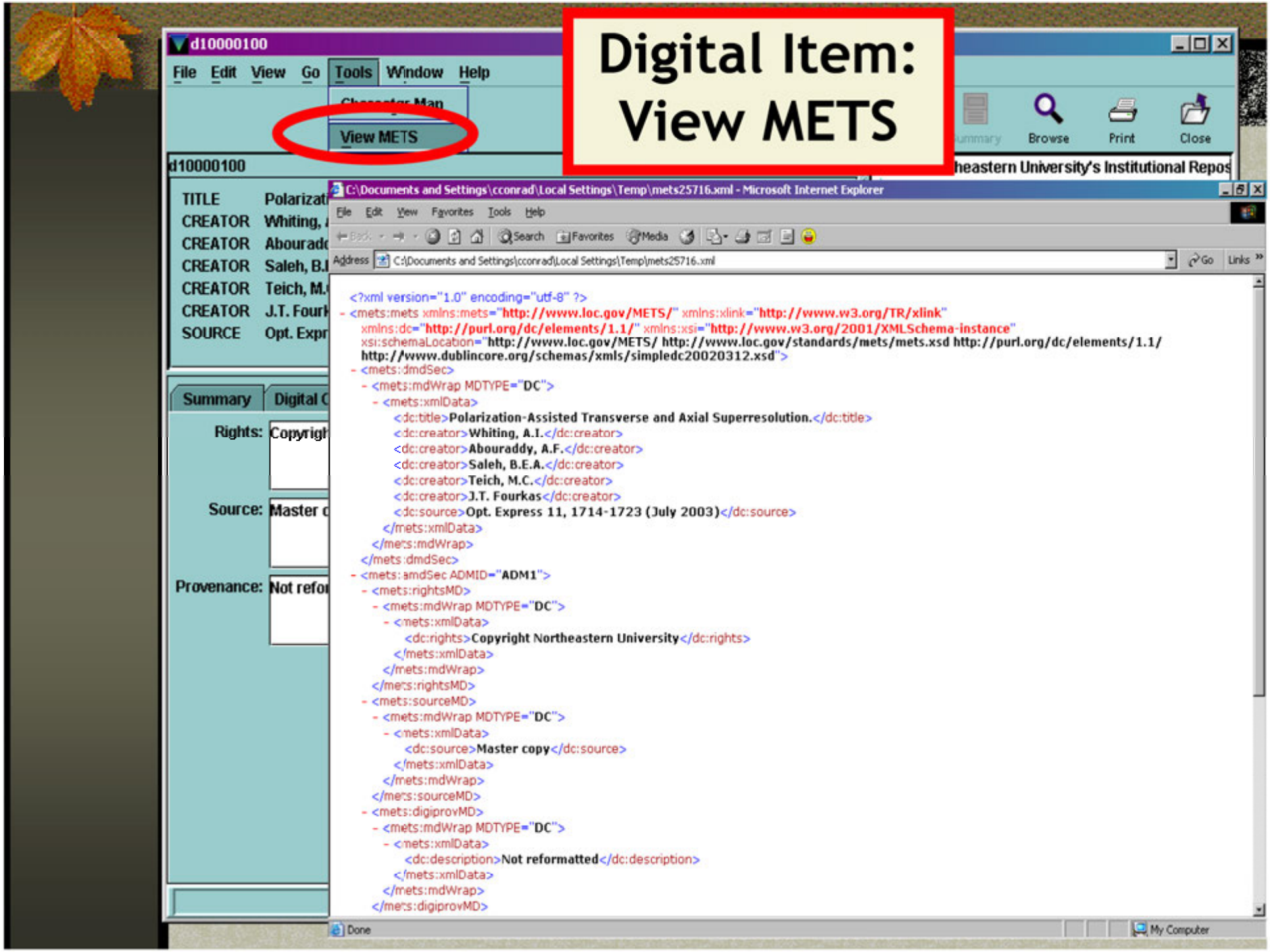


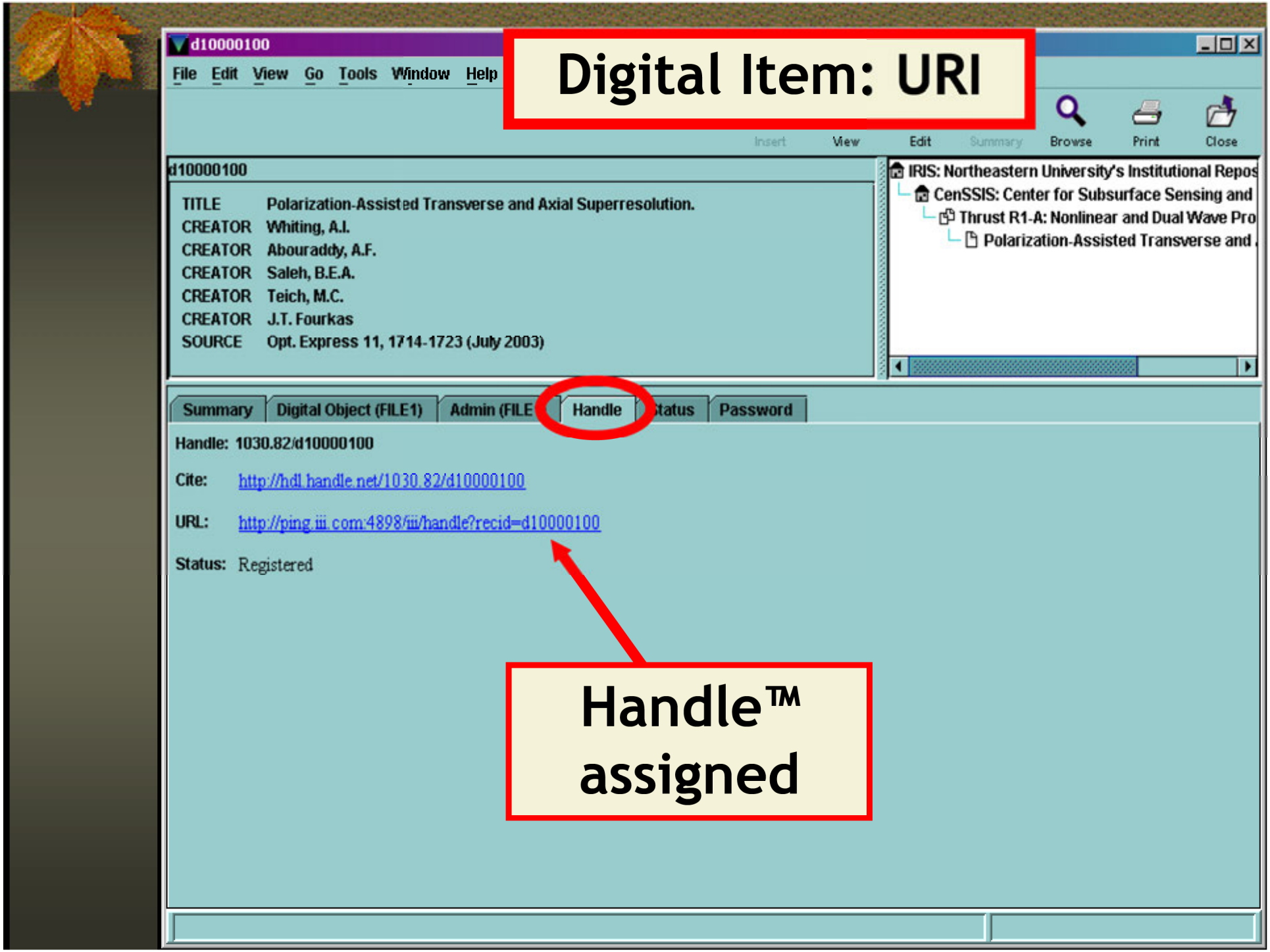
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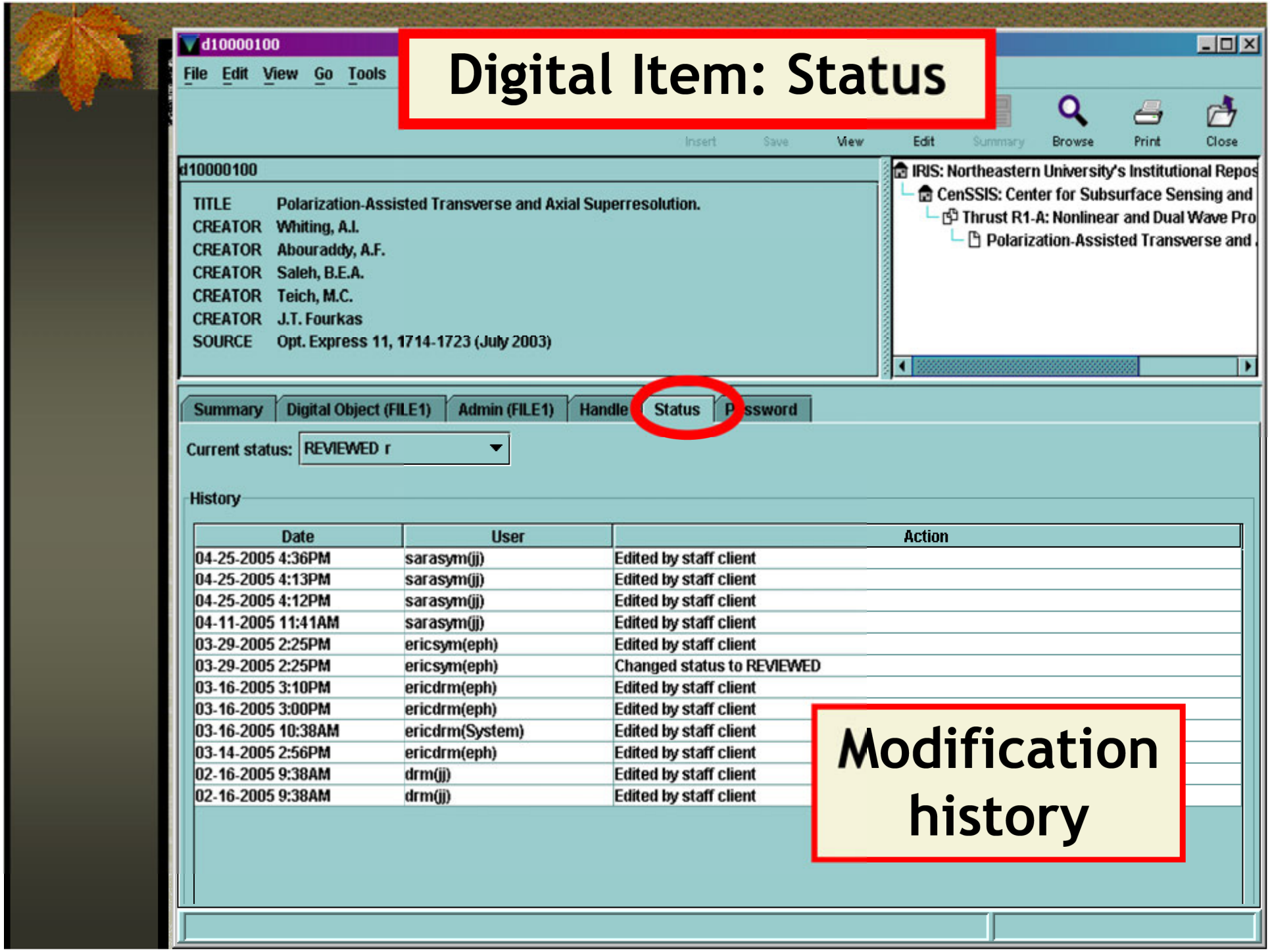

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CREATOR Abouraddy, A.F.
CREATOR Saleh, B.E.A.
CREATOR Teich, M.C.
CREATOR J.T. Fourkas
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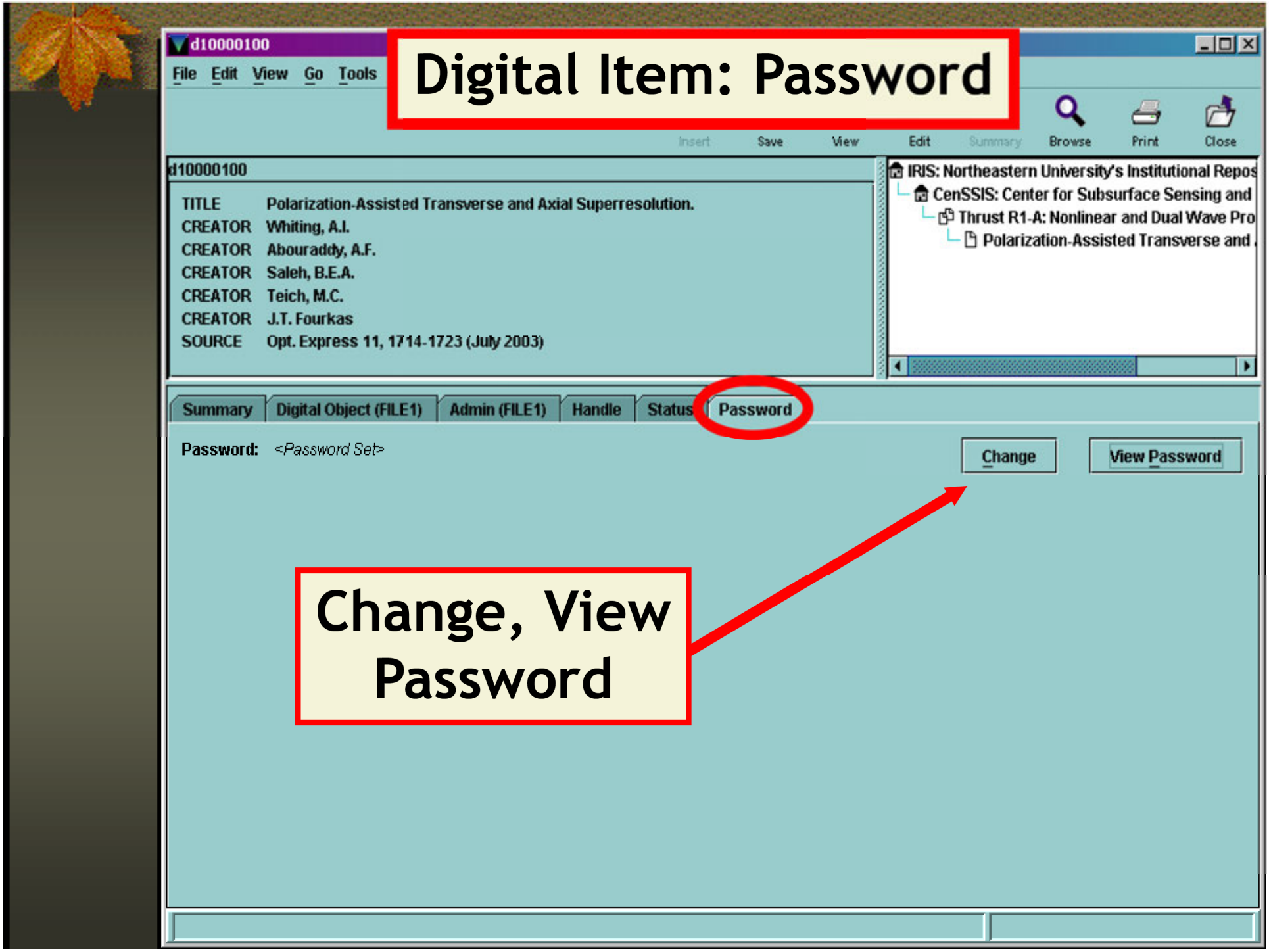

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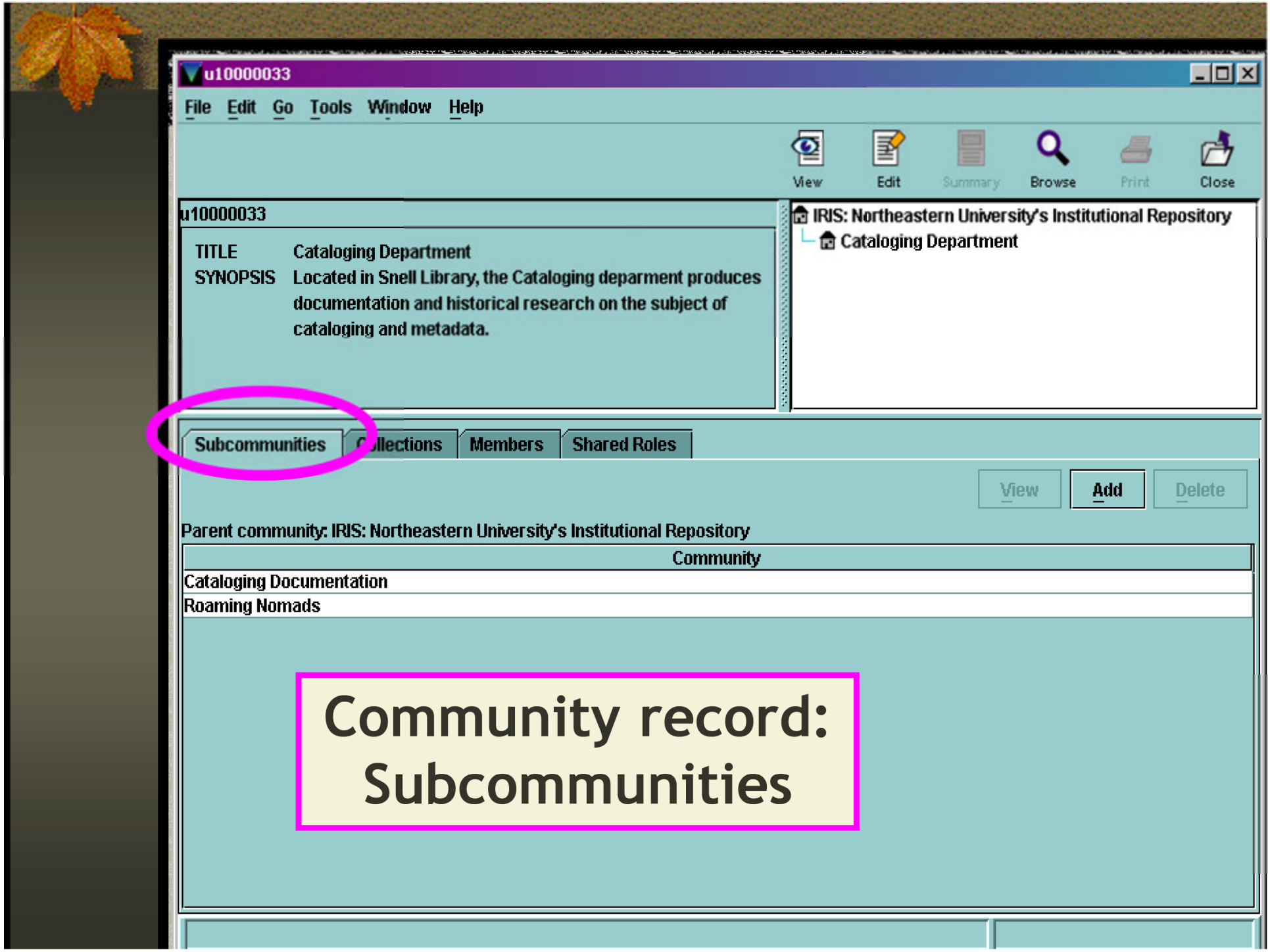

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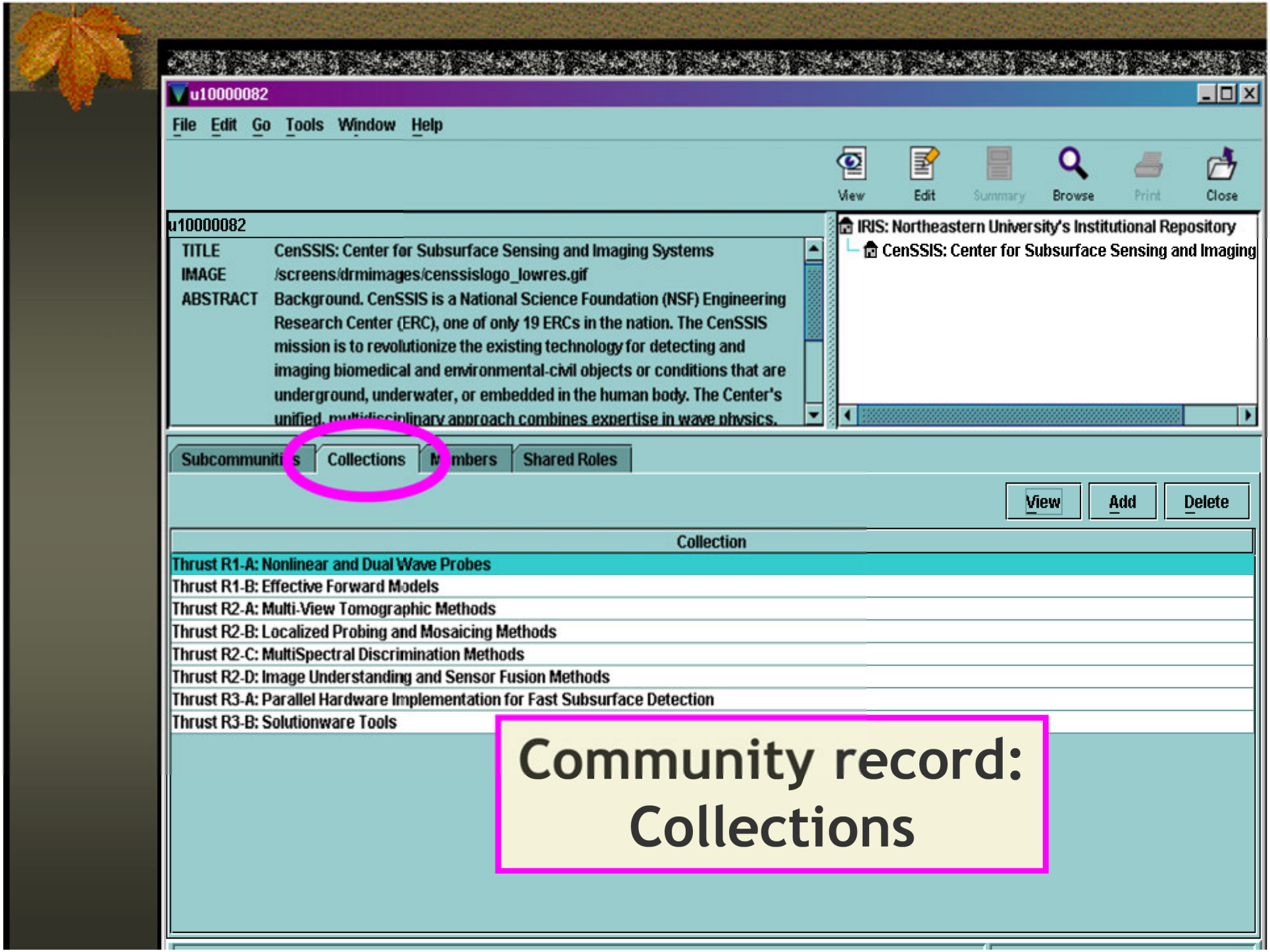

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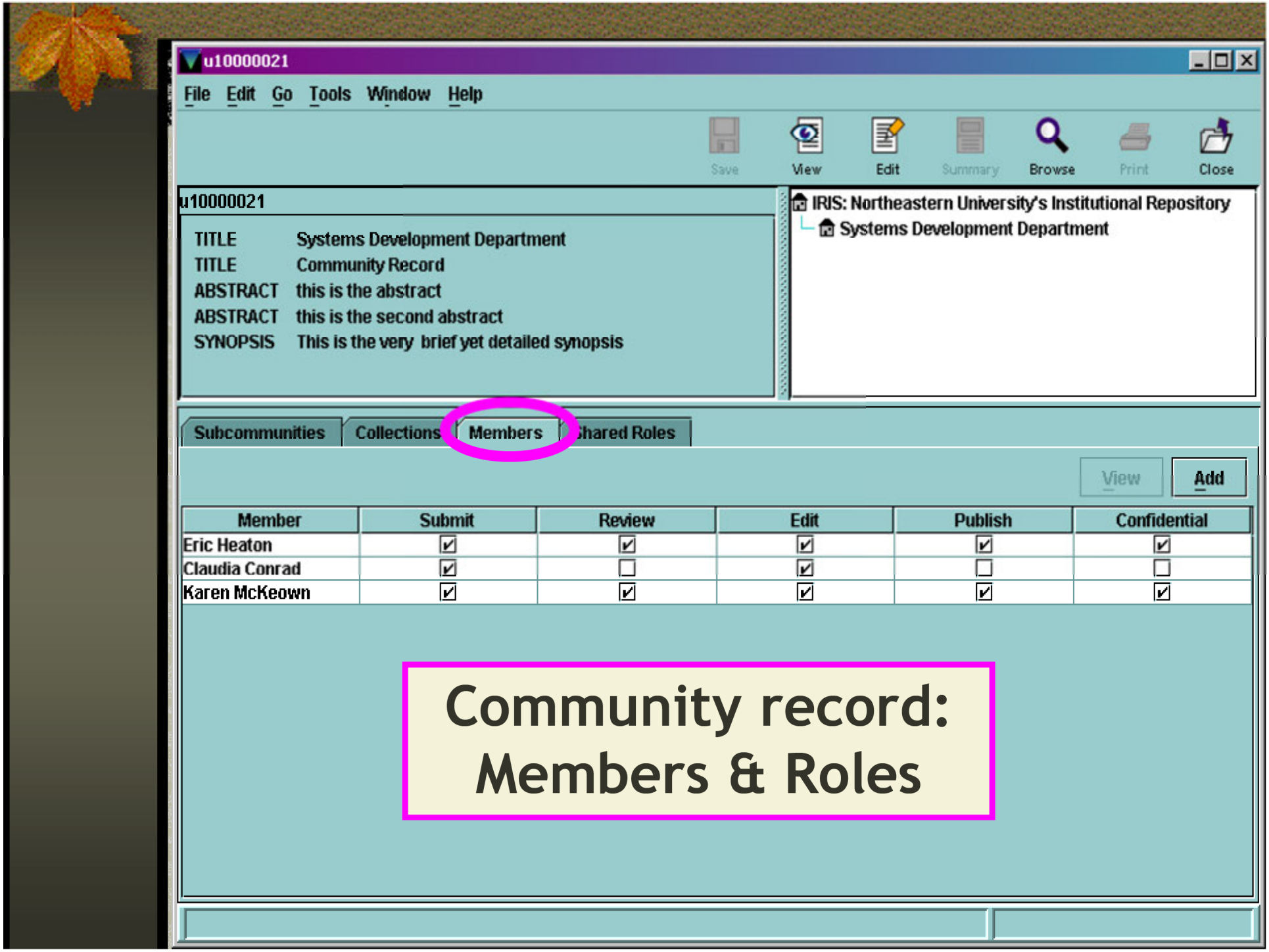

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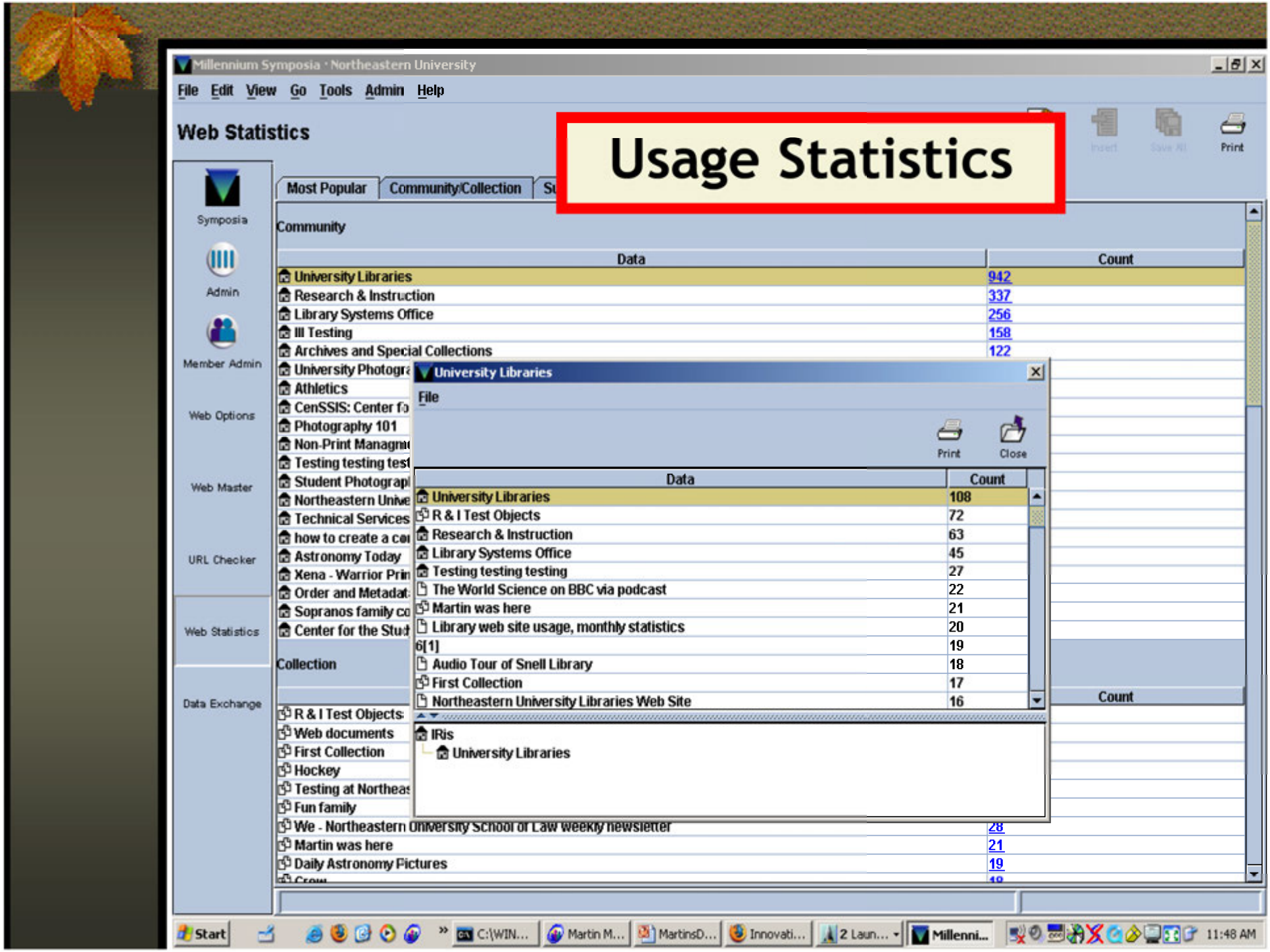

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04-25-2005 4:13PM sarasym(jj) Edited by staff client
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03-16-2005 3:00PM ericdrm(eph) Edited by staff client
03-16-2005 10:38AM ericdrm(System) Edited by staff client
03-14-2005 2:56PM ericdrm(eph) Edited by staff client
02-16-2005 9:38AM drm(jj) Edited by staff client
02-16-2005 9:38AM drm(jj) Edited by staff client
Modification history


Digital Item: Password
d10000100
File Edit View Go Tools
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d10000100
TITLE Polarization-Assisted Transverse and Axial Superresolution.
CREATOR Whiting, A.I.
CREATOR Abouraddy, A.F.
CREATOR Saleh, B.E.A.
CREATOR Teich, M.C.
CREATOR J.T. Fourkas
SOURCE Opt. Express 11, 1714-1723 (July 2003)
IRIS: Northeastern University's Institutional Repos
CenSSIS: Center for Subsurface Sensing and
Thrust R1-A: Nonlinear and Dual Wave Pro
Polarization-Assisted Transverse and
Summary
Digital Object (FILE1)
Admin (FILE1)
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Password: <Password Set>
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u10000033
File Edit Go Tools Window Help
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TITLE Cataloging Department
SYNOPSIS Located in Snell Library, the Cataloging deparment produces documentation and historical research on the subject of cataloging and metadata.
IRIS: Northeastern University's Institutional Repository
Cataloging Department
Subcommunities
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Community
Cataloging Documentation
Roaming Nomads
Community record: Subcommunities


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File Edit Go Tools Window Help
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TITLE CenSSIS: Center for Subsurface Sensing and Imaging Systems
IMAGE /screens/drmimages/censsislogo_lowres.gif
ABSTRACT Background. CenSSIS is a National Science Foundation (NSF) Engineering Research Center (ERC), one of only 19 ERCs in the nation. The CenSSIS mission is to revolutionize the existing technology for detecting and imaging biomedical and environmental-civil objects or conditions that are underground, underwater, or embedded in the human body. The Center's unified, multidisciplinary approach combines expertise in wave physics,
IRIS: Northeastern University's Institutional Repository
CenSSIS: Center for Subsurface Sensing and Imaging
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Thrust R1-A: Nonlinear and Dual Wave Probes
Thrust R1-B: Effective Forward Models
Thrust R2-A: Multi-View Tomographic Methods
Thrust R2-B: Localized Probing and Mosaicing Methods
Thrust R2-C: MultiSpectral Discrimination Methods
Thrust R2-D: Image Understanding and Sensor Fusion Methods
Thrust R3-A: Parallel Hardware Implementation for Fast Subsurface Detection
Thrust R3-B: Solutionware Tools
Community record: Collections


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TITLE Systems Development Department
TITLE Community Record
ABSTRACT this is the abstract
ABSTRACT this is the second abstract
SYNOPSIS This is the very brief yet detailed synopsis
IRIS: Northeastern University's Institutional Repository
Systems Development Department
Subcommunities Collections Members Shared Roles
View Add
Member Submit Review Edit Publish Confidential
Eric Heaton
Claudia Conrad
Karen McKeown
Community record:
Members & Roles


Millennium Symposia - Northeastern University
File Edit View Go Tools Admin Help
Web Statistics
Usage Statistics
Print
Symposia
Admin
Member Admin
Web Options
Web Master
URL Checker
Web Statistics
Data Exchange
Most Popular
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Research & Instruction 337
Library Systems Office 256
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Archives and Special Collections 122
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Martin was here 21
Daily Astronomy Pictures 19
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File
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University Libraries 108
R & I Test Objects 72
Research & Instruction 63
Library Systems Office 45
Testing testing testing 27
The World Science on BBC via podcast 22
Martin was here 21
Library web site usage, monthly statistics 20
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First Collection 17
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Appendix E

LIMITED WARRANTY

Honeywell International Inc., acting through its Security & Custom Electronics business ("Seller") 165 Eileen Way, Syosset, New York 11791, warrants its product(s) to be in conformance with its own plans and specifications and to be free from defects in materials and workmanship under normal use and service for 24 months from the date stamp control on the product(s) or, for product(s) not having a manufacturer's date stamp, for 12 months from date of original purchase unless the installation instructions or catalog sets forth a shorter period, in which case the shorter period shall apply. Seller's obligation shall be limited to repairing or replacing, at its option, free of charge for materials or labor, any product(s) which is proved not in compliance with Seller's specifications or proves defective in materials or workmanship under normal use and service. Seller shall have no obligation under this Limited Warranty or otherwise if the product(s) is altered or improperly repaired or serviced by anyone other than Honeywell factory service. For warranty service, return product(s) transportation prepaid, to Honeywell Factory Service, 165 Eileen Way, Syosset, New York 11791.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. IN NO CASE SHALL SELLER BE LIABLE TO ANYONE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, OR UPON ANY OTHER BASIS OF LIABILITY WHATSOEVER, EVEN IF THE LOSS OR DAMAGE IS CAUSED BY THE SELLER'S OWN NEGLIGENCE OR FAULT.

Seller does not represent that the product(s) it sells may not be compromised or circumvented; that the product(s) will prevent any personal injury or property loss by burglary, robbery, fire or otherwise; or that the product(s) will in all cases provide adequate warning or protection. Customer understands that a properly installed and maintained alarm system may only reduce the risk of a burglary, robbery, fire, or other events occurring without providing an alarm, but it is not insurance or a guarantee that such will not occur or that there will be no personal injury or property loss as a result. CONSEQUENTLY, SELLER SHALL HAVE NO LIABILITY FOR ANY PERSONAL INJURY, PROPERTY DAMAGE OR OTHER LOSS BASED ON A CLAIM THAT THE PRODUCT(S) FAILED TO GIVE WARNING. HOWEVER, IF SELLER IS HELD LIABLE, WHETHER DIRECTLY OR INDIRECTLY, FOR ANY LOSS OR DAMAGE ARISING UNDER THIS LIMITED WARRANTY OR OTHERWISE, REGARDLESS OF CAUSE OR ORIGIN, SELLER'S MAXIMUM LIABILITY SHALL NOT IN ANY CASE EXCEED THE PURCHASE PRICE OF THE PRODUCT(S), WHICH SHALL BE THE COMPLETE AND EXCLUSIVE REMEDY AGAINST SELLER.

This warranty replaces any previous warranties and is the only warranty made by Seller on this product(s). No increase or alteration, written or verbal, of the obligations of this Limited Warranty is authorized.

FCC STATEMENT

FCC ID: CFS8DL5806 **Canada: 1748-K1430**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference (2) This device must accept any interference received, including interference that may cause undesired operation.

Honeywell

165 Eileen Way, Syosset, New York 11791

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N6353V5 7/04 Rev A

N6353V5 7/04 Rev A

Honeywell

ADEMCO 5806

Smoke Detector With Built-In Wireless Transmitter

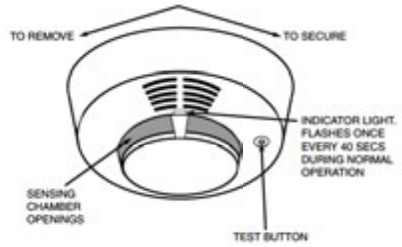
INSTALLATION INSTRUCTIONS

General Information

The ADEMCO 5806 Photoelectric Smoke Detector/Transmitter is intended for use with wireless alarm systems that support 5800 Series devices, and contains a built-in transmitter that can send alarm, supervisory and battery condition messages to the system's receiver/control unit. Refer to the wireless system's instructions for the maximum number of transmitters that can be supported.

Alarms: The smoke detector is powered by two 9-volt batteries and will sound its built-in horn when smoke reaches the detector (the LED indicator will also flash rapidly). A message will also be sent to the wireless control and the smoke detector's ID number will be displayed at the keypad. The alarm message will be transmitted every 4 seconds, until the smoke condition has cleared and the detector has reset. About 1 second after the horn has stopped, a Restore message will be transmitted to the control and it will then be possible to clear the ID number from the display. During normal or low battery conditions, the LED indicator will flash about once every 40 seconds.

Low Battery: The detector indicates a low-battery condition by emitting a "chirp" about once every 40 seconds. A low-battery message will be sent to the control unit upon any transmission following the first battery chirp (with the detector's ID number displayed at the keypad). The battery should be replaced within 30 days following the low-battery signals.



False Alarm Protection: In order to reduce the possibility of false alarms due to cigarette smoke, dust, steam, insects, etc., the detector will not transmit an alarm signal until its horn has sounded continuously for about 6 seconds. A delay also occurs when the detector is tested. Therefore, the test button must be held down for about 20 seconds before the horn will sound. The first alarm signal will be transmitted within 6 seconds after the horn sounds.

Programming: Note that the control system must "enroll" the smoke detector's ID during installation of the system. The control should be programmed to "enroll" the 5806 as an "RF" type unit (i.e., supervised RF). See the *PROGRAMMING* section in this instruction book and the control unit's Installation Instructions for further details.

Tamper Protection: The detector has provision for a tamper function if desired. When the tamper function, is enabled, the detector will cause a CHECK to be displayed if it is removed from its installed location. See *TAMPER PROTECTION* for detailed instructions.

Battery Installation and Replacement

The 5806 is equipped with two 9-volt batteries, which can double the time between battery replacement (compared to a single 9-volt alkaline battery). Refer to the *SPECIFICATIONS* section for acceptable batteries. The batteries should be changed within 30 days following the low battery beeps (about once every 40 seconds). There will also be a low-battery display on the system's keypad. Be sure to replace BOTH batteries with fresh ones.

Important: Do not mix battery types.

1. Remove the smoke detector from its mounting plate by twisting the detector counterclockwise. If you are replacing batteries, remove the existing batteries from their compartments and disconnect the battery clips.
2. Install the new 9-volt alkaline batteries in their respective compartments as follows: Snap the battery contacts onto the terminals of the first battery (be sure to observe correct polarity and do not force battery clips). Holding the contacts on the battery, install the battery into its compartment. Make sure the battery is fully seated (see Figure 1).

   Connect the second 9-volt alkaline battery in a similar manner and install it in the second compartment.
3. Re-install the smoke detector onto the mounting plate by turning it clockwise, and test its operation as described in the *TEST* section.
4. The LED indicator should flash about once every 40 seconds, indicating normal operation. If the batteries are not installed correctly, the smoke detector will not function. If the unit appears not to be sending a signal during any of the tests, check for correct battery installation.

Note: If the detector's ID has not been programmed into the system (i.e., this is an initial detector installation), refer to the *PROGRAMMING* section below and perform the ID "enrolling" procedure before mounting or testing the detector.

Programming

The control system must "enroll" the smoke detector's ID during installation of the system. The control should be programmed to "enroll" the 5806 as an "RF" type unit (i.e., supervised RF), with a loop number of "1." With the control in the programming mode, you can either manually enter the serial number or transmit from the device (push the "Enroll" button [see Figure 1], install the battery, etc.). See the control unit's installation instructions for further details.

Be sure to verify that the detector has been enrolled into the system by using the procedure provided in *TESTING THE SMOKE DETECTOR* section on page 6.

If a "low battery" message is displayed and you suspect that the batteries are not actually low, remove both batteries, wait 20 seconds, re-insert them, and re-test the detector. Repeat this procedure, if necessary.

Tamper Protection

For tamper protection, cut the wire jumper indicated in Figure 1. After the detector has been mounted, a magnet must then be installed on the wall or ceiling next to the detector.

To ensure proper positioning of the magnet after the detector has been mounted, place a light pencil mark on the side of the detector near the center of the reed switch (see Fig. 1).

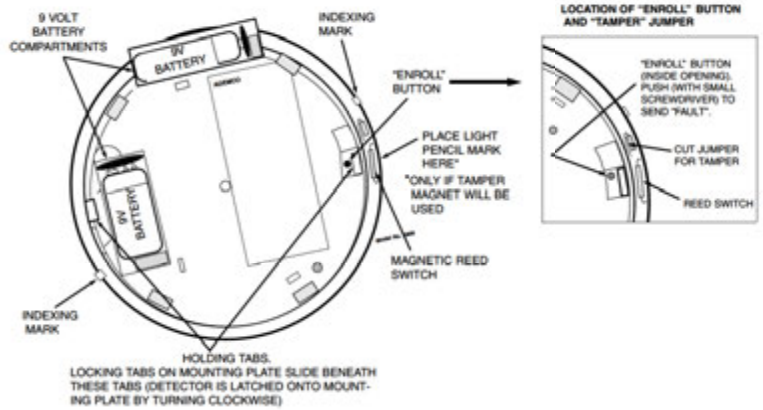


Figure 1. Bottom View of Smoke Detector (without mounting plate)

Mounting the Smoke Detector

First, determine the best location for the smoke detector (one that provides strong wireless transmission paths AND proper smoke detector protection). See *RECOMMENDED LOCATIONS FOR SMOKE DETECTORS* (on next page).

A good RF transmission path must be established from the proposed mounting location before permanently installing the detector. To check, perform the test in *TESTING THE SMOKE DETECTOR*.

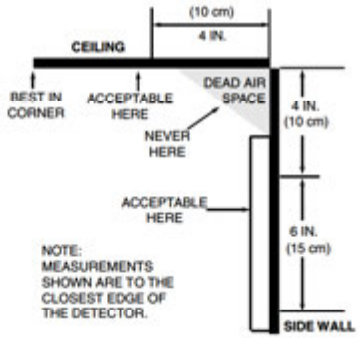
Mounting Locations

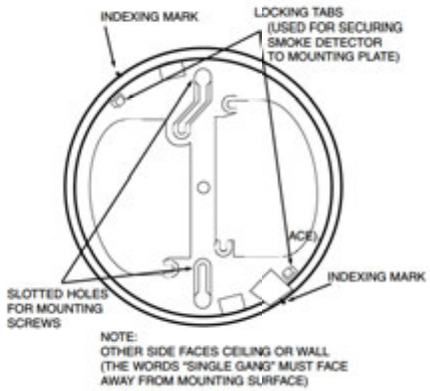
Detectors should be located as close to the center of the ceiling as possible. If this is not practical, detectors may be located on the ceiling up to 4 inches (10cm) from the ceiling-wall junction. Do not install near forced-air heating or air conditioning ducts (outlets or returns). For sloped, gabled, or high-peaked ceilings, detectors must be mounted between 4 and 6 inches (10 and 15cm) from the highest point in the ceiling.

Detectors may also be wall-mounted. Check with your local Fire Department about code requirements. Wall-mounted detectors should be located 4–6 inches (10–15 cm) from the ceiling.

In mobile homes, battery-operated detectors are not generally installed by the manufacturer. Mount detectors ONLY on an interior wall.

1. Once a suitable location has been determined, install the mounting plate on the ceiling or on the wall. Use the two screws and anchors provided.
2. Latch the detector onto the mounting plate as follows: Position the detector onto the plate, mating the small center post on the detector with the "dimple" at the center of the mounting plate, and aligning the index marks on the sides of the plate and the detector. Then turn the detector in a clockwise direction so that the holding tabs on the detector engage the locking tabs on the mounting plate.
3. If the tamper has been enabled (as indicated previously), a magnet (No. 39WH-M) should be mounted on the wall or ceiling surface next to the detector (1/4" max) in the specified location (see Fig. 2).
4. Test the detector immediately after completing the installation and refer to the control system's instructions for additional information concerning the use of wireless smoke detectors.





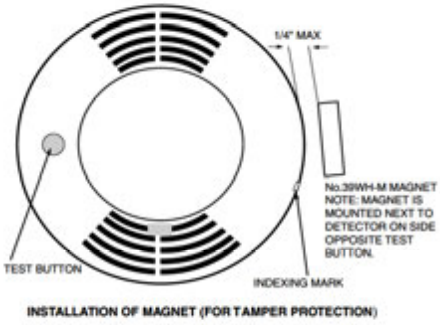


Figure 2. Mounting Details

RECOMMENDED LOCATIONS FOR SMOKE DETECTORS

To minimize the risk of fire causing injury, loss of life, or loss of property, detectors should be located on every level of a residence – basements, first floor, second-floor, and attic, if it is furnished – and in every separate sleeping area. More specifically, detectors should be located:

1. Between sleeping areas and potential sources of fire such as kitchen, garage, basement, or utility room. In homes with only one sleeping area on one floor, a detector should be put in the hallway outside the bedrooms as shown below. In single-floor homes with two separate sleeping areas, **two** detectors are required, one outside each bedroom area as shown below. In multi-level homes, detectors should be located **in bedroom areas and at every finished level of the home** as shown below. Basement-level detector should be located in the **bottom** of basement stairwells. Second-floor detector should be located at the **top** of the first-to-second-floor stairwell so long as no door or other obstruction blocks the path of smoke.
2. Inside every bedroom where a smoker sleeps or an electrical appliance is operated. This detector should be **in addition to** the hallway detectors as described above.
3. Inside all bedrooms where people sleep with the door closed. Smoke and poisonous combustion gases are significantly blocked by a closed door. This detector should be **in addition to** the hallway detectors described above.
4. At each end of a hallway serving the bedrooms if the hallway is in excess of 40 feet (12m) in length.

In addition to the above, we also strongly recommend the following:

Install smoke detectors in any room where an alarm control is located, or in any room where alarm control connections to an AC source or phone lines are made. If detectors are not so located, a fire within the room could prevent the control from reporting a fire or an intrusion.

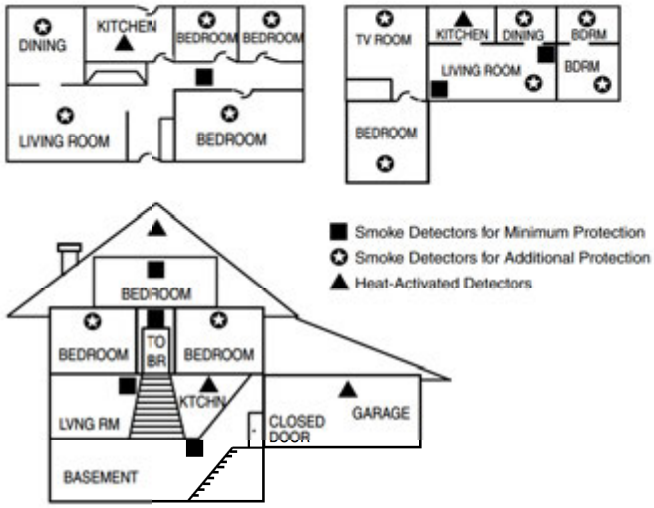
Where Not to Locate Detectors

To avoid false alarms and/or improper operation, avoid installation of smoke detectors in the following areas:

- KITCHENS - Smoke from cooking may cause a nuisance alarm. LOCATE DETECTORS AT LEAST 20 FEET (6m) FROM KITCHENS, IF POSSIBLE.
- IN AIRSTREAMS PASSING BY KITCHENS - Smoke from cooking may enter normal air movement paths between outlets and returns if these paths run by kitchens, causing a nuisance alarm. LOCATE DETECTORS AWAY FROM SUCH AIRSTREAMS, IF POSSIBLE.
- BATHROOMS - Excessive steam from a shower may cause a nuisance alarm. LOCATE DETECTORS AT LEAST 10 FEET (3m) FROM BATHROOMS, IF POSSIBLE.
- NEAR FORCED-AIR DUCTS used for heating or air conditioning - Air movement may prevent smoke from reaching the detector.
- NEAR FLUORESCENT LIGHT FIXTURES - "Noise" generated by these fixtures may cause a nuisance alarm.
- NEAR FURNACES OF ANY TYPE - Air and dust movement and normal combustion products may cause a nuisance alarm.
- THE PEAK OF AN "A" FRAME TYPE OF CEILING - "Dead air" at the top may prevent smoke from reaching the detector.
- GARAGES - Products of combustion are present from running automobile engines and may cause a nuisance alarm.

- UNHEATED BUILDINGS - Temperature limits are 40°–100°F (5°–38°C). The detector will not function properly in locations where the normal ambient temperature exceeds these limits.
- INSECT INFESTED AREAS - Insects entering the sensing chamber may cause a nuisance alarm.

IF YOU EXPERIENCE NUISANCE ALARMS, CAREFULLY CHECK YOUR DETECTOR'S LOCATION FOR POSSIBLE CAUSES AS LISTED ABOVE. RELOCATE AND CLEAN YOUR DETECTOR, IF NECESSARY. REMEMBER THAT THE MAJOR CAUSES OF NUISANCE ALARMS ARE DIRTY OR IMPROPERLY LOCATED DETECTORS.



Testing The Smoke Detector

The following procedure should be performed to determine strong radio path communication with the control, and again after installation is completed. THIS TEST SHOULD ALSO BE PERFORMED ON A REGULAR BASIS (AT LEAST WEEKLY) BY THE USER.

1. Activate the wireless system's TEST mode via the keypad.
2. Depress and hold the smoke detector's TEST button. Within 20 seconds, the detector's horn will start to sound. The detector will begin to transmit alarm signals (about once every 4 seconds) within 6 seconds of the horn sounding.
3. The wireless system's keypad should emit at least 3 audible sounds when the alarm transmission is received, and will display the transmitting detector's ID number.
4. When satisfied that the keypad has received the test signal, release the TEST button. Within 10 seconds the detector's horn will stop. A few seconds later, the smoke detector's ID number will be cleared from the keypad display.
5. If the keypad does not respond as noted, check battery connections and be sure batteries are fresh. If this is an initial installation, try moving the detector to another location that provides proper reception. Repeat test.

   NOTE: Be sure that the detector's ID has been "enrolled" by the control during programming (see information on Programming on pages 1 and 2).
6. Turn off the system's TEST mode via the keypad (security code + OFF).

Testing the Tamper Function (if used) after Mounting the Detector

With the system in the normal disarmed mode, temporarily detach the smoke detector from its mounting plate. The system's keypad should display a CHECK message. If it does not, check that the magnet has been installed in the correct location next to the detector. Also, check that the wire tamper jumper in the detector has been cut.

SUMMARY OF DETECTOR FUNCTIONS

POWER/ALARM LED	HORN	STATUS
Pulses every 40 seconds	Silent	Normal, functioning properly
Pulses every 40 seconds	Beeps once every 40 seconds	Low battery or detector malfunction
Rapid flashing	On continuously	Alarm, detecting smoke

Specifications

Power Source: Two 9-volt alkaline batteries. Use ADEMCO 464, Eveready 522, Duracell MN1604, or equivalent.

Power/Alarm LED: Standby = flashing once every 40 seconds. Alarm = rapid flashing.

Low-Battery Signal: One horn "chirp" every 40 seconds.

Size: 5-5/8" inch (14cm) diameter, 2-1/2" inch (6.4cm) high.

TO THE INSTALLER

Regular maintenance and inspection (at least annually) by the installer and frequent testing by the user are vital to continuous satisfactory operation of any alarm system.

The installer should assume the responsibility of developing and offering a regular maintenance program to the user as well as acquainting the user with the proper operation and limitations of the alarm system and its component parts. Recommendations must be included for a specific program of frequent testing (at least weekly) to insure the system's proper operation at all times.

THE LIMITATIONS OF THIS SMOKE DETECTOR / TRANSMITTER

While this smoke detector/transmitter is a highly reliable device that is part of an advanced wireless security system, it does not offer guaranteed protection against fire. While smoke detectors have played a key role in reducing residential fire deaths, they may not activate or provide early warning for a variety of reasons in as many as 35% of all fires. Some of the reasons smoke detectors used in alarm systems may not work are as follows:

- Smoke detectors will not work without power. Battery-operated devices will not work without batteries, or if the batteries are not put in properly.
- Smoke detectors may have been improperly installed and positioned. Smoke detectors may not sense fires that start where smoke cannot reach the detectors, such as in chimneys, in walls, on the roof, or on the other side of closed doors. Smoke detectors also may not sense a fire on another level of a residence or building. A second-floor detector, for example, may not sense a first-floor fire or basement fire. In addition, smoke detectors have sensing limitations. No smoke detector can sense every kind of fire every time. In general, detectors may not always provide adequate warning about rapidly spreading fires caused by carelessness and safety hazards like smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, children playing with matches, or arson. Depending on the nature of the fire and/or location of the smoke detectors, the detector, even if it operates as anticipated, may not provide sufficient warning to allow all occupants to escape in time to prevent injury or death.
- Alarm signals sent by the wireless transmitter in this device may be blocked or reflected by metal before they reach the alarm receiver. Even if the signal path has been recently checked during a weekly test, blockage can occur if a metal object is moved into the path.
- Alarm warning devices such as sirens, bells, or horns may not alert people or wake up sleepers if they are located on the other side of closed or partly open doors. If warning devices are located on a different level of the residence from the bedrooms, then they are less likely to waken or alert people inside the bedrooms. Even persons who are awake may not hear the warning if the alarm is muffled by noise from a stereo, radio, air conditioner, or other appliances, or by passing traffic. Finally, alarm warning devices, however loud, may not warn hearing-impaired people or waken deep sleepers.
- This smoke detector/transmitter, like other electrical devices, is subject to component failure. Even though this device is designed to last as long as 20 years, the electronic components in it could fail at any time. We recommend that smoke detectors be replaced every 10 years as a precautionary measure against component failure.

The most common cause of an alarm system not functioning when a fire occurs is inadequate maintenance. The alarm system should be tested weekly to make sure all smoke detectors and their transmitters are working properly. Detectors must be repaired or replaced when they do not function properly.

Installing an alarm system may make the owner eligible for lower insurance rates, but an alarm system is not a substitute for insurance. Homeowners, property owners, and renters should continue to act prudently in protecting themselves and continue to insure their lives and property.

We continue to develop new and improved protection devices. Users of alarm systems owe it to themselves and their loved ones to learn about these developments.

Petitioner Ex 1002, Page 307 of 307