# Instinctive Computing Workshop

June 15-16, 2009, Carnegie Mellon University, Pittsburgh

"... The idea has been to get together a group of modest size, not exceeding some twenty in number, of workers in various related fields, and to hold them together for two successive days in all-day series of informal papers, discussions, and meals together, until they have had the opportunity to thresh out their differences and to make progress in thinking along the same lines..."

-- Norbert Wiener "Cybernetics", in 1948

# About the Workshop

Instinctive computing is a computational simulation of biological and cognitive instincts. Instincts profoundly influence how we see, feel, appear, think, and act. If we want a computer to be genuinely secure, intelligent and to interact naturally with us, we must give computers the ability to recognize, understand, and even to have primitive instincts.

At this workshop, we explore transformational developments in this area, including the building blocks for instinctive computing systems and potential applications such as security, privacy, human-computer interaction, next generation networks, and product design.

This two-day workshop includes topics in four tracks: Instinctive Architectures, Instinctive Cognition, Intelligent Systems, and Demos and Posters.

We want to engage in-depth dialogs in a small group with multidisciplinary minds. We would like to return to the the origin of workshops and focus on ideas.

The post-proceedings will be published by Springer as a book of the Lecture Notes in Artificial Intelligence (LNAI).

## Organizers

Yang Cai, Cylab, Carnegie Mellon, USA
Howard Lipson, CERT, Carnegie Mellon, USA

## Program Committee

Julio Abascal, University of Basque Country, Spain
Xavier Alaman, Autonomous University of Madrid, Spain
Jose Bravo, Universidad de Castilla-La Mancha, Spain
Andrew Cowell, Pacific Northwestern National Laboratory, USA
David Farber, Carnegie Mellon University, USA
Virgil Gligor, Carnegie Mellon University, USA
Fabian Hemmert, Deutsche Telekom Labs, Germany
Michael Leyton, Rutgers University, USA
Xiaoming Liu, GE Research Center, USA
Yvonne Masakowski, NAVY, USA
Adrian Perrig, Carnegie Mellon University, USA
Mel Siegel, Carnegie Mellon University, USA
Sylvia Spengler, National Science Foundation, USA
Brenda Wiederhold, Interactive Media Institute, Belgium
Mark Wiederhold, Virtual Reality Medical Center, USA
Brian Zeleznik, Carnegie Mellon University, USA

# Program on June 15, Monday

Location: Peter Room, University Center, Second Floor, 5000 Forbes Ave.

08:00 am – 09:00 am Reception and Breakfast

**09:00 am - 12:20 am Instinctive Architectures**

Yang Cai, Carnegie Mellon, "Welcome to IC-09"

Kevin Warwick, University of Reading, UK: "Robots with Biological Brains and Humans with Part Machine Brains"

[Tea Break]

Michael Leyton, Rutgers University, USA: "The Structure of Paintings"

[Tea Break]

David Farber, Carnegie Mellon, USA, "The Real Next Generation Internet and It's Impacts"

12:20 pm - 01:20 pm Lunch at Shatz Dinning Hall at the University Center

**01:30 pm - 04:30 pm Instinctive Cognition**

Howard Lipson, CERT, Carnegie Mellon, USA: "Built for Survival"

Yvonne Masakowski, NAVY, USA: "Application of Virtual World Technologies to Undersea Warfare: The Impact of Virtual Environments on Human Performance"

[Tea Break]

Adam Bryant, AFRL, USA: “Inconsistency, Bias, Construction and Abstraction - Challenges in Computational Cognitive Classification”

Christian Lebiere, Carnegie Mellon, USA: “Content Follows Form: From Cognitive Architectures and Generic Tasks to Robust Intelligence”

[Tea Break]

Suguru Ishizaki and David Kaufer, Carnegie Mellon, USA: “Recognizing Reader’s Experience”

Pierre Vemhes and Paul Whitmore, Carnegie Mellon, USA: “Texture Vision - A View from Art Conservation”

05:00 pm - 06:00 pm Reception at CIC Building and a tour at Google Pittsburgh

07:00 pm - 09:00 pm Dinner at the Founder's Room in Carengie Museum of Art

# Program on June 16, Tuesday

Location: Peter Room, University Center, Second Floor, 5000 Forbes Ave.

08:30 am - 09:00 am Breakfast

**09:00 am - 12:30 pm Intelligent Systems**

Chris Urmson, Carnegie Mellon: "The Urban Challenge and the Promise of Autonomous Vehicles"

[Tea break]

Manuel García-Herranz, Xavier Alamán, and Pablo A. Haya, Spain: “The Intelligence of Intelligent Environments”

Daniel Sonntag, German Research Center for Artificial Intelligence: “On Intuitive Dialogue-based Communication and Instinctive Dialogue Initiative”

[Tea Break]

Maria J. Santofimia, Francisco Moya, Felix J. Villanueva, David Villa, and Juan C. Lopez, University of Castilla-La Mancha, Spain: “Bringing Common-Sense to Ambient Intelligence Environments”

M.J O’Grady, G.M.P. O’Hare, S. Dobson R. Tynan, C. Muldoon, J. Ye, University College Dublin, Ireland: “Implicit Interaction: A Prerequisite for Practical AmI”

12:30 pm - 01:30 pm Lunch at Shatz Dinning Hall at the University Center

**01:30 pm - 03:00 pm Demos and Posters**
Location: Peter Room, University Center, 5000 Forbes Ave.

Emily Hart, et al: “Semantic Biometrics of Faces”
Stefan Kremser, et al: "Soft Biometrics"
Rafael Branco, et al: “Ambient Sound Classification”
Vincent Liu, et al: "Attention-Aware Network Video Interface"
Iryna Pavlyshak, et al: "Privacy-Aware Human Imaging"
Fabian Hemmert, Deutsche Telekom Laboratories: "The Living Mobile Phone with Instincts"
Andrew Rowe and Karthik S. Lakshmanan: "SenseWeaver: A Model-based Design Approach for Sensor Networks"
Ludmila Maria and Stefan Kremser, et al: "Real-Time Aerial Mixed Reality"
Rafael Branco, et al: "Human-Computer Vision for Anomaly Detection"
Elyse Corcoran, et al, Duquesne University: “Evolving Patterns of Jazz Improvisation"
…

03:00 pm Workshop closed

# Social Events

June 14, 07:00 pm - 09:00 pm, Informal Reception at Joe Mama's on 3716 Forbes Ave.

June 15, 05:00 pm - 06:00 pm, Reception at CIC Building and a tour at Google, 4720 Forbes Ave.

June 15, 07:00 pm - 09:00 pm, Dinner at the Founder's Room in Carnegie Museum of Art

June 16, 04:00 pm - 10:00 pm, Post-workshop activities at Station Square (TBD)

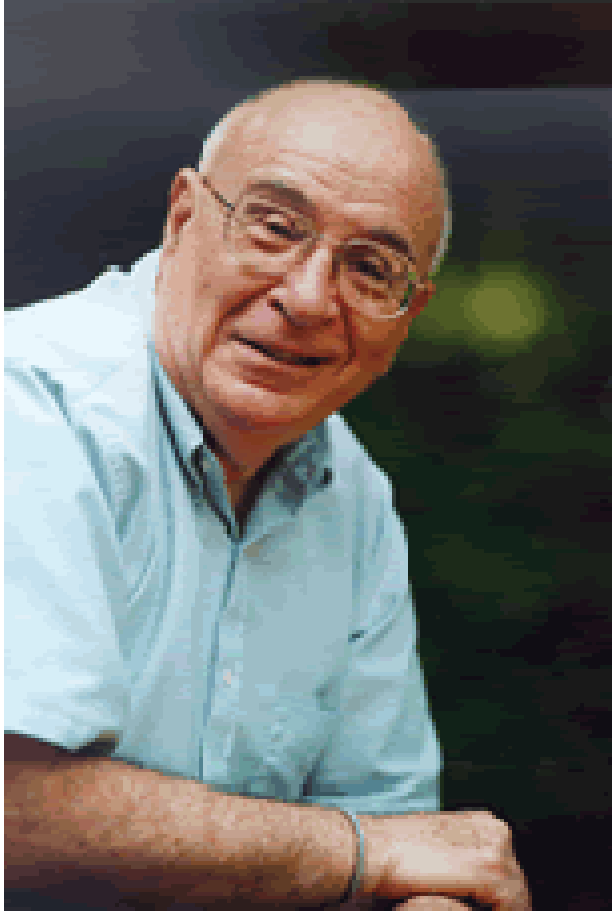
# Kevin Warwick

## Robots with Biological Brains and Humans with Part Machine Brains

In this presentation a look is taken at how the use of implant and electrode technology can be employed to create biological brains for robots, to enable human enhancement and to diminish the effects of certain neural illnesses. In all cases the end result is to increase the range of abilities of the recipients. An indication is given of a number of areas in which such technology has already had a profound effect, a key element being the need for a clear interface linking a biological brain directly with computer technology. The emphasis is clearly placed on practical scientific studies that have been and are being undertaken and reported on. The area of focus is notably the use of electrode technology, where a connection is made directly with the cerebral cortex and/or nervous system. The presentation will consider the future in which robots have biological, or part-biological, brains and in which neural implants link the human nervous system bi-directionally with technology and the internet.

**Bio:**

Kevin Warwick is Professor of Cybernetics at the University of Reading, England, where he carries out research in artificial intelligence, control, robotics and cyborgs. He is also Director of the University KTP Centre, which links the University with Small to Medium Enterprises and raises over £2.5 million each year in research income. Kevin was born in Coventry, UK and left school to join British Telecom, at the age of 16. At 22 he took his first degree at Aston University, followed by a PhD and research post at Imperial College, London. He subsequently held positions at Oxford, Newcastle and Warwick Universities before being offered the Chair at Reading, at the age of 33. As well as publishing over 500 research papers, Kevin's experiments into implant technology led to him being featured as the cover story on the US magazine, 'Wired'. Kevin has been awarded higher doctorates both by Imperial College and the Czech Academy of Sciences, Prague. He was presented with The Future of Health Technology Award in MIT, was made an Honorary Member of the Academy of Sciences, St. Petersburg and in 2004 received The IEE Achievement Medal. In 2000 Kevin presented the Royal Institution Christmas Lectures, entitled "The Rise of the Robots".



# David Farber

## The Real Next Generation Internet and It's Impacts

A critical complement of the future instinctive computing environment will be the networks that connect sources, computation and users together. This talk will give the author's perspective on where networking will go in the future. It will cover likely directions for not only terrestrial networks but also the evolution of wireless technology. It is essential for the profitable development of the network and its applications that we understand what the likely directions are to take advantage of them in our system design.

**Bio:**

David J. Farber is a professor of Computer Science, noted for his major contributions to programming languages and computer networking. He is currently Distinguished Career Professor of Computer Science and Public Policy at the School of Computer Science, Heinz College, and Department of Engineering and Public Policy at Carnegie Mellon University.

Dr. Farber graduated from the Stevens Institute of Technology in 1956 and began an 11-year career at Bell Laboratories, where he helped design the first electronic switching system (ESS-1) and the programming language SNOBOL. He subsequently held industry positions at the Rand Corporation and Scientific Data Systems, followed by academic positions at the University of California, Irvine, and the University of Delaware.
At Irvine his research work was focused on creating the world's first operational Distributed Computer System. While a member of the Electrical Engineering Department of the University of Delaware, he helped conceive and organize the major American research networks CSNET, NSFNet, and the National Research and Education Network (NREN). Dr. Farber subsequently was appointed Alfred Fitler Moore Professor of Telecommunication Systems at the University of Pennsylvania where he also held appointments as Professor of Business and Public Policy at the Wharton School of Business and as a Faculty Associate of the Annenberg School for Communication. He served as Chief Technologist at the US Federal Communications Commission (2000–2001) while on leave from the university.

Dr. Farber is an IEEE Fellow, ACM Fellow, and recipient of the 1995 SIGCOMM Award for life-long contributions to computer communications. He has served on the board of directors of the Electronic Frontier Foundation, the Electronic Privacy Information Center advisory board, the Board of Trustees of the Internet Society, and as a member of the Presidential Advisory Committee on High Performance Computing and Communications, Information Technology and Next Generation Internet. He runs a large (25,000+ member) mailing list called Interesting-People.

# Howard Lipson

## Built for Survival

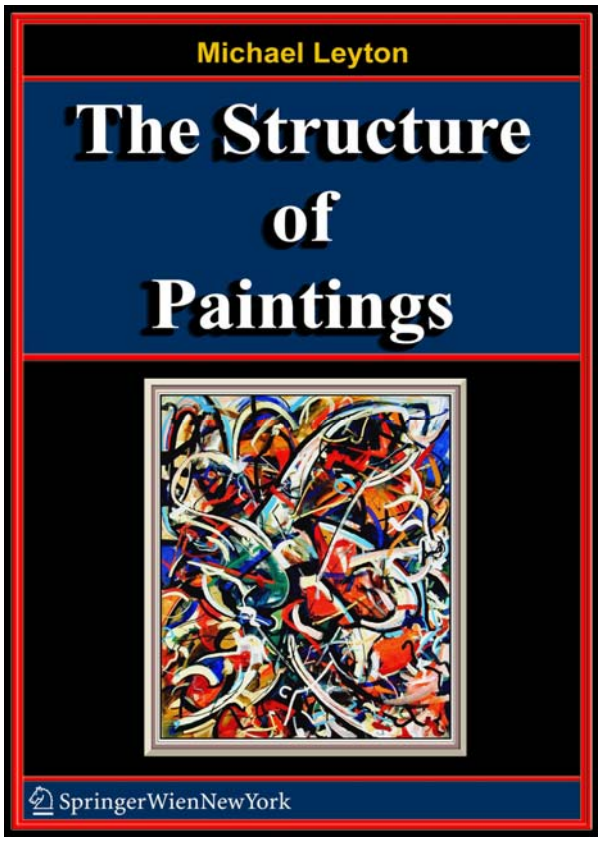
Critical national infrastructures are increasingly dependent upon open, large-scale, highly distributed, Internet-based applications. While there are substantial benefits there are also significant risks, such as those posed by common software vulnerabilities and the consequent susceptibility of networked systems to remote attacks. Traditional computer security cannot adequately protect these critical systems from current and emerging threats.

Survivability is the ability of a computing system to fulfill its mission, in a timely manner, in the presence of attacks, failures, or accidents. The mission must survive, not any individual component, nor (in the extreme) even the system itself. Does the concept of building instinctive survivability into computing systems offer insights that can help us achieve much higher degrees of critical infrastructure protection and assurance than today's prevailing approaches to cyber security? This talk will describe several of the key technical and policy research challenges associated with the general notion of survivability and with the concept of "building in" instinctive survivability. Finally, the potential impact that successful research in this area would have on the future capabilities of society's critical infrastructures will be discussed.

**Bio:**

Howard F. Lipson is a Senior Member of the Technical Staff in the CERT Program at Carnegie Mellon's Software Engineering Institute. Lipson has been a computer security researcher at CERT for seventeen years. He is also an adjunct professor in Carnegie Mellon University’s Department of Engineering and Public Policy and an adjunct research faculty member at the Carnegie Mellon Electricity Industry Center. He has played a major role in developing the foundational concepts and methodologies necessary to extend security research into the new realm of survivability, and was a chair of three IEEE Information Survivability Workshops. His May 2007 Capitol Hill briefing on survivability, "Cyber Security: Protecting Our Networks and Critical Infrastructure," was hosted by the US House of Representatives Committee on Homeland Security and sponsored by the American Association for the Advancement of Science. His research interests include the analysis and design of survivable systems and architectures, software assurance, critical infrastructure protection (specifically the electric power grid), and the technical and public policy aspects of Internet traceability and anonymity.

Prior to joining Carnegie Mellon, Lipson was a systems design consultant, helping to manage the complexity and improve the usability of leading-edge software systems. Earlier, he was a computer scientist at AT&T Bell Labs, where he did exploratory development work on programming environments, executive information systems, and integrated network management tools. Lipson holds a PhD in Computer Science from Columbia University.




# Michael Leyton

This talk gives an introduction to Leyton's book The Structure of Paintings in Springer-Verlag. In a series of 4 books, Leyton has developed new foundations for geometry in which shape is equivalent to memory storage. A principal argument of these foundations is that artworks are maximal memory stores. At the basis of this geometry are Leyton's fundamental laws of memory storage, and these laws are shown to determine the structure of artworks. That is, the central argument is that artworks are structured so that they allow the maximal extraction of stored memory.

Furthermore, the book demonstrates that the emotion expressed by an artwork is actually the memory extracted by the laws. Therefore, the laws of memory storage allow the systematic and rigorous mapping not only of the compositional structure of an artwork, but also of its emotional expression. This fundamentally opposes the view that the emotional expression of an artwork is undefinable. Leyton's methodology makes the structure and emotional content of an artwork fully definable, rich, systematic and complete. The argument is supported with detailed analyses of paintings by Picasso, Raphael, Cézanne, Gauguin, Modigliani, Ingres, De Kooning, Memling, Balthus, and Holbein.

**Bio:**

Michael Leyton's mathematical work on shape has been used by scientists in over 40 disciplines from aerospace engineering to radiology. His scientific contributions have received major prizes, such as a presidential award and a medal for scientific achievement. His new foundations to geometry are elaborated in his books in Springer-Verlag, MIT Press, and Birkhauser. He is president of the International Society for Mathematical and Computational Aesthetics, and is an advisor to NSF on innovation in computer and information sciences and engineering, as well as on software committees at ISO and NASA. Besides his scientific work, he is also a highly exhibited painter and sculptor, and his architecture designs have been published by Birkhauser-Architectural. He is the keynote and invited speaker in conferences on virtually every scientific and artistic discipline. Currently, he is writing a 4-volume work on the foundations of science, with particular emphasis on quantum mechanics. He also continues to work on the structure of software, as well as interoperability and large-scale engineering systems integration, in the mechanical-aerospace industry. Professor Leyton is on the faculty of the DIMACS Center for Discrete Mathematics and Theoretical Computer Science, at Rutgers.

# Yvonne Masakowski (with Steven Aguiar)

## Application of Virtual World Technologies to Undersea Warfare: The Impact of Virtual Environments on Human Performance

There are numerous advances in virtual world technologies that permit collaboration in an immersive 3D environment. In the real world environment, distributed teams collaborate via face to face communication, using social interaction and gestures, as well as a variety of tools to provide context and information to the human decision maker. Rapid information flow requires systems which will provide accurate and time-critical information among decision makers, further reduce cognitive workload, and enhance situation awareness among team members. A virtual environment, such as Second Life, provides a unique approach to model varying configurations and evaluating operator performance. The operational level of the decision maker is key to their ability to respond to dynamic situational context information (e.g. events, goals, objectives, etc.) in a complex distributed team environment.

One of the key questions which arises within virtual teams is: how do we evaluate human performance in terms of levels of expertise, strategies, and cognitive processes of decision makers within the context of specific scenarios conducted in both environments. We expect that virtual environments should provide a rich forum for sharing ideas, information and strategies and help to forge an integrated, collaborative team to achieve situational awareness and effective decision making. To this end, virtual world technologies provide a means to develop environments which foster collaboration among team members, support training and ensure effective decision making. This paper will discuss ways to evaluate human performance in Second Life synthetic environments and achieve an understanding of their impact on human performance. This paper also highlights the critical role that immersive 3D environments will play in future ship designs, as well as in command and control training and operational performance.

**Speaker's Bio:**

Dr. Yvonne Masakowski has a distinguished career in research and development of over 20 years professional experience in human factors, system design, test and evaluation for the United States Department of the Navy (DoN). She holds a Ph.D. in Psychology, a Master's Degree in Philosophy, a second Master's Degree in Psychology (Psycholinguistics), a Bachelor's Degree in Experimental Psychology and a Diploma from MIT for foreign policy and national security. She has served as the Associate Director for Human Factors for the Office of Naval Research Global, London, UK and as the Chief of Naval Operations (CNO) Science Advisor to the Strategic Studies Group at the Naval War College. Dr.Yvonne Masakowski currently serves as the Lead for the Human Performance Technology Group at the Naval Undersea Warfare Center (NUWC). She is responsible for the development and design of decision support systems within US Navy submarine and surface ship platforms. She serves on several international panels including the NATO Human Factors & Medicine's Multinational Operations Panel, and as a member of two International Technical groups: The Technical Cooperation Program: Maritime Systems Panel (TTCP MAR TP1) and The Technical Cooperation Program: Human Factors Integration for Naval Systems, Technical Panel 9 (TTCP HUM TP9). She has released a book, titled,"Decision Making in Complex Systems".

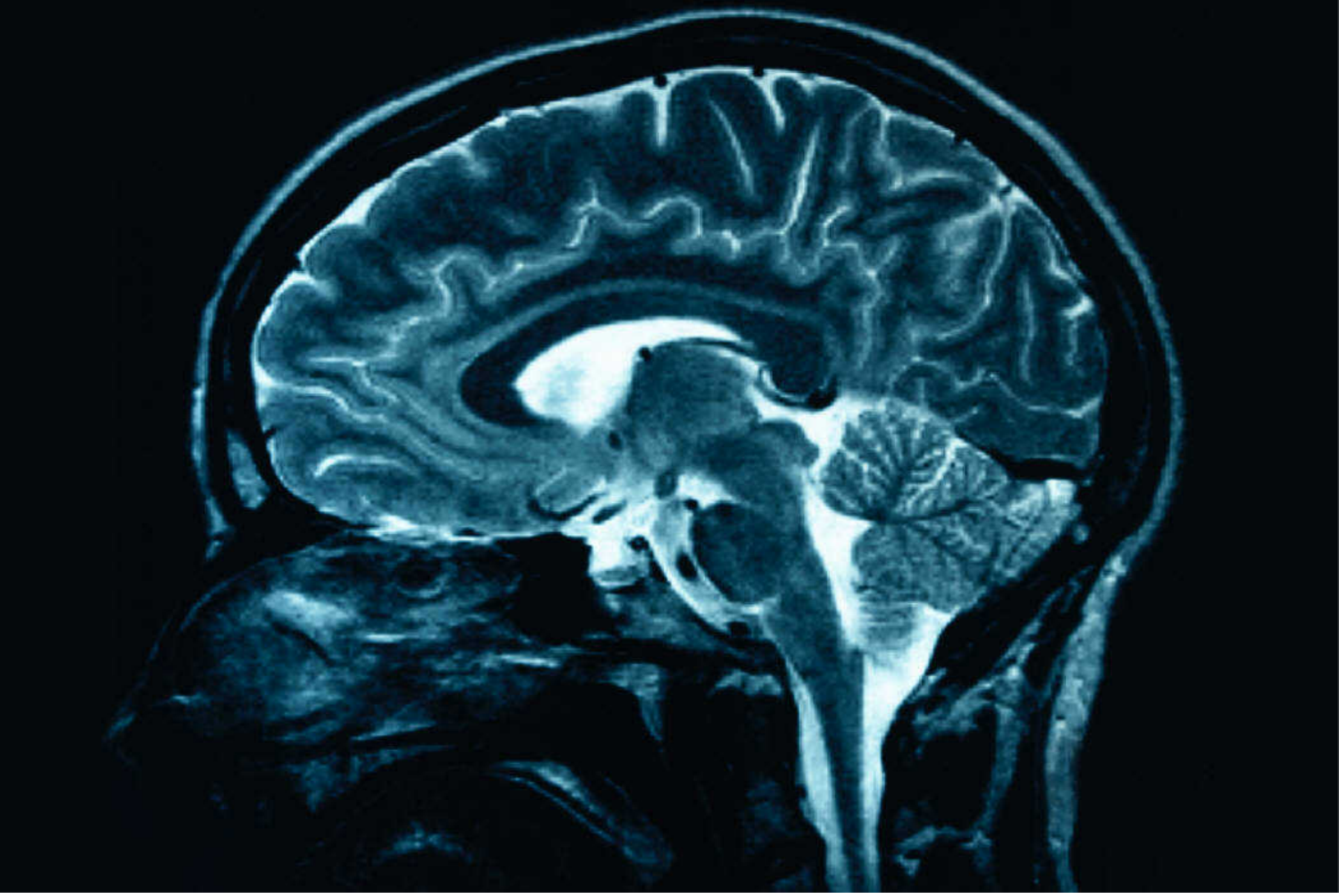
# Adam Bryant

## Inconsistency, Bias, Construction and Abstraction – Challenges in Computational Cognitive Classification

This paper has argued that the ability to have inconsistent knowledge, to hold decision-making bias, to construct concepts from low to high levels of representation, and to abstract away details may be the key to unlocking more human-like cognitive classication abilities in computer systems. Each of these areas holds very diffcult problems for future research. Technologies that could be derived from these capabilities could have a qualitative impact on how people use computer systems and how they affect their quality of life. In particular, some of the techniques that may be possible through these approaches and techniques are technologies that would allow a human teacher to teach a language to a computer, technologies that can detect types of malware that have never been seen, algorithms to classify data according to its information content rather than through matching text strings or by correlation with tagged content. Each of these areas also holds other ethical considerations, such as how these technologies should and should not be used. These considerations should be taken into account as research proceeds in these areas.

**Bio:**

Adam Bryant is a computer science and cyber security researcher at the Air Force Research Laboratory interested in autonomic trusted sensing, computational intelligence, formal security modeling, and cognitive science. He served 9 years in the U.S. Air Force as a missile maintenance technician and later as a communications and information officer. He earned a bachelor of science degree in Social Psychology from Park University in 2002 and two master of science degrees from the Air Force Institute of Technology in Information Resource Management and Computer Science in 2007. He is currently enrolled as a Ph.D. student studying Computer Science at the Air Force Institute of Technology. Mr. Bryant also enjoys writing, performing, arranging, and recording music, drawing, and painting.



# Christian Lebiere

## Content Follows Form: From Cognitive Architectures And Generic Tasks To Robust Intelligence

This paper addresses the issue of the basic requirements for baseline intelligent systems from a cognitive perspective. The focus here is not on optimal performance on narrow specialized tasks, but of robust performance in everyday tasks and environments that might, in turn, provide the basis for expert performance. Historically the focus in cognitive architectures has been on providing a set of invariant mechanisms that underlie cognitive activity. Here we focus on content rather than form, specifically on the broad generic tasks characteristic of everyday intelligence and adaptivity. We discuss three such tasks, including: sequential prediction, frequency-based decision-making and system control. We describe cognitive models of those tasks and their fit to human performance, and discuss how to generalize those models. Finally, we speculate about which other tasks might share the same pervasive characteristics.

**Bio:**

Christian Lebiere is a Research Faculty in the Psychology Department at Carnegie Mellon University. He received his B.S. in Computer Science from the University of Liege (Belgium) and his M.S. and Ph.D. from the School of Computer Science at Carnegie Mellon University. During his graduate career, he studied connectionist models and algorithms and was the co-developer of the widely used Cascade-Correlation neural network learning algorithm. Since 1991, he has worked on the development of the ACT-R hybrid cognitive architecture and was co-author with John R. Anderson of the 1998 book The Atomic Components of Thought. His main research interest is cognitive architectures and their applications to psychology, artificial intelligence, human-computer interaction, decision-making, intelligent agents and neuromorphic engineering.

# Suguru Ishizaki (with David Kaufer)

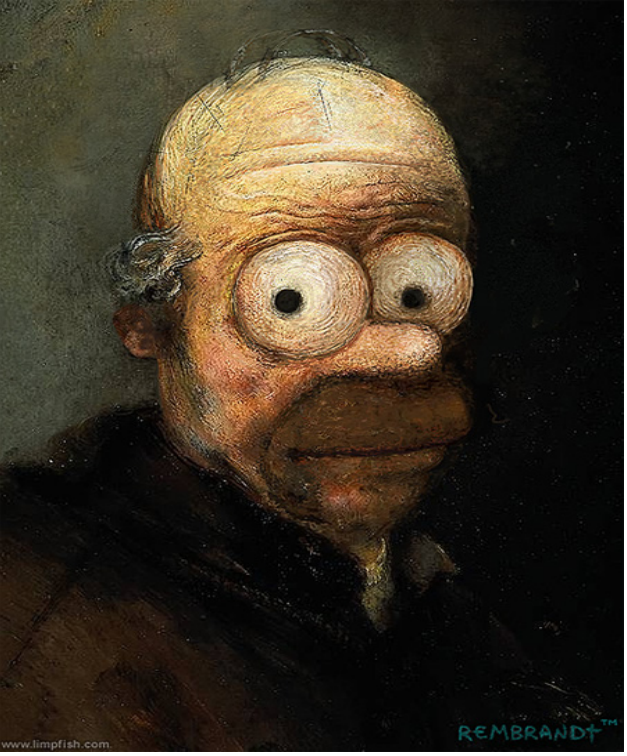
## A framework for recognizing the author's rhetorical strategies for creating a felt experience

Imagine you are reading an entry in an online discussion group, and you sense that the author is threatening (or flaming). You are flipping through a news magazine and stop at a page, and sense that the author is directly talking to you. You may pick up a brochure in your mailbox, and recognize intuitively that it is about negative values in our society. These feelings are not about the specific content. Instead, they are feelings about types of experiences the audience has had. This project aims to develop a computational method for recognizing the audience's experience that is felt through visual verbal communication, such as letters, magazine articles and brochures. In this presentation, we introduce a theoretical framework for modeling the author's rhetorical strategies through visual and verbal design choices that are used to create such feelings in the audience. An experimental computer-based flame detection program, one potential application area of this framework, will be demonstrated.

This framework is rooted in the notion of representational composition postulated in Designing Interactive Worlds with Words: Principles of Writing as Representational Composition by Kaufer and Butler. In this work, text is viewed as a representation of the world experienced by the reader, where the term world is used in a broader sense—including the external (physical and social) world, the private minds of the author and third party individuals, as well as the way the author relates to and interacts with the audience. Kaufer et al. take this framework of representation further in Power of Words: Unveiling the writer and speaker's hidden craft [5] and develop a specific set types of reader experiences that can be created in a text. This work parallels the recent findings in cognitive linguistics and corpus linguistics, which suggest that one's language ability develops through a number of situated exposures to language patterns within a community of language users. In this book, we suggest that not only do speakers and writers choose appropriate language patterns (i.e., strings of words) that represent the meaning of what they intend to communicate (i.e., content), they also select those patterns according to how the reader experiences the content.

**Speaker's Bio:**

Suguru Ishizaki is an Associate Professor of Rhetoric and Communication Design in the Department of English at Carnegie Mellon. Before this appointment, he worked at QUALCOMM on the research and development of mobile user interfaces. Prior to that, he was on the faculty of the School of Design at Carnegie Mellon. His professional experience ranges from user interface design to information visualization to traditional print design. His current research focuses on visual communication pedagogy for non-designers--including the development of intelligent critiquing systems and assessment methods. He earned his Ph.D. and M.S. at MIT's Media Laboratory, after receiving his Bachelor of Art & Design from Tsukuba University, Japan. He is the author of Improvisational Design: Continuous Responsive Digital Communication, and a co-author of The Power of words: Unveiling the Speaker and Writer's Hidden Craft.




**Pierre Vernhes and Paul Whitmore**

# Texture Vision:
## A View from Art Conservation

The appreciation of many works of visual art derives from the observation and interpretation of the object surface. The visual perception of texture is key to interpreting those surfaces, for the texture provides cues about the nature of the material and the ways in which the artist has manipulated them to create the object. The quantification of texture can be undertaken in two ways, by recording the physical topography of the surface or by analyzing an image that accurately portrays the texture. For the former, 3D mapping of a surface using an optical profilometer or AFM is usually used when the surface quality requirements are extremely precise. For most art objects, this description of texture on a microscopic level is not very useful, since how those surface features are observed by viewers is not directly provided by the analysis. For this reason, image analysis seems a more promising approach, for in the images the surfaces will naturally tend to be rendered as they would when viewing the object. In this study, images of textured surfaces of prototype art objects are analyzed in order to identify the methods and the metrics that can accurately characterize slight changes in texture. Three main applications are illustrated: the effect of the conditions of illumination on perceived texture, the characterization of changes of object due to degradation, and the quantification of the efficiency of the restoration.

**Bios:**

Dr. Pierre Vernhes received his Industrial Engineer and PhD degrees from Polytechnic University of Grenoble, Grenoble, France, in 2005 and 2008, respectively. Since 2009, he has been at the Art Conservation Research Center (ACRC) at Carnegie Mellon University (USA) as a postdoctoral research associate. His main research interests include texture and image analysis, structure analysis, optical properties of paper and prints, morphological processing and roughness analysis. He has published several international papers.

Dr. Paul Whitmore was trained as a chemist, getting a B.S. in chemistry from Caltech and a Ph.D. in physical chemistry from the University of California at Berkeley. He has worked in art conservation science for his entire professional career, starting at the Environmental Quality Laboratory at Caltech, working with Professor Glen Cass studying the effects of air pollution on works of art. From there, he went to the Fogg Art Museum at Harvard University, where he worked as a scientist in what is now the Straus Center for Conservation. Since 1988 he has been at Carnegie Mellon University, directing the Art Conservation Research Center. He has recently been appointed a Research Professor in the Department of Chemistry at CMU. His current research interests are in material degradation chemistries, intrinsic and environmental risk factors for those processes, remote sensors for material aging, and the consequences of conservation treatments. He has published on paper deterioration, its treatment, and damage induced by humidity changes; acrylic paint media stability and the physical damage to acrylic coatings from shrinkage stresses during drying; fading of colorants from air pollutant exposure; fading of transparent paint glazes from light exposure and the relationship between photochemical degradation and color changes; and projects utilizing a non-destructive probe of light stability for colored artifact materials. He has edited a book, *Contributions to Conservation Science*, a compilation of research papers published by the first director of the Center, Robert Feller. He is currently senior editor of the *Journal of the American Institute for Conservation.*


# Chris Urmson

## The Urban Challenge and the Promise of Autonomous Vehicles

The Urban Challenge was a robotic vehicle race through a simulated urban environment. Full size autonomous vehicles were required to complete a 60 mile course, while independently reasoning about other autonomous and human driven vehicles. The vehicles were required to safely handle intersections, multi-lane roads, parking lots and unusual situations. Teams from around the world attempted the competition with eleven qualifying for the final challenge.

In this talk I describe the Urban Challenge and Boss, the vehicle that won the challenge. Boss is a modified Chevy Tahoe that fuses data from many sensors to interpret the world around it and drive safely. I will highlight how Boss incorporates radar and lidar data to track moving vehicles and how this information is used. I will also speculate on the future of autonomous vehicles and the critical open challenges.

**Bio:**

Chris Urmson is an assistant research professor at Carnegie Mellon University and a member of the technical staff at Google. He was the Director of Technology for Tartan Racing at Carnegie Mellon University, helping the team to win the 2008 DARPA Urban Challenge. Chris has developed numerous robotic navigation architectures and software systems currently in use by Carnegie Mellon University, NASA JPL and NASA Ames. He has made significant contributions to the development of over a half dozen robots, with an emphasis on software development and system integration. He earned his PhD in 2005 from Carnegie Mellon University and his B.Sc. in Computer Engineering from the University of Manitoba in 1998. Chris has earned a variety of corporate and academic awards including being named a Siebel Scholar, and receiving technology innovation awards from Boeing Phantom Works and SAIC.

# Xavier Alamán

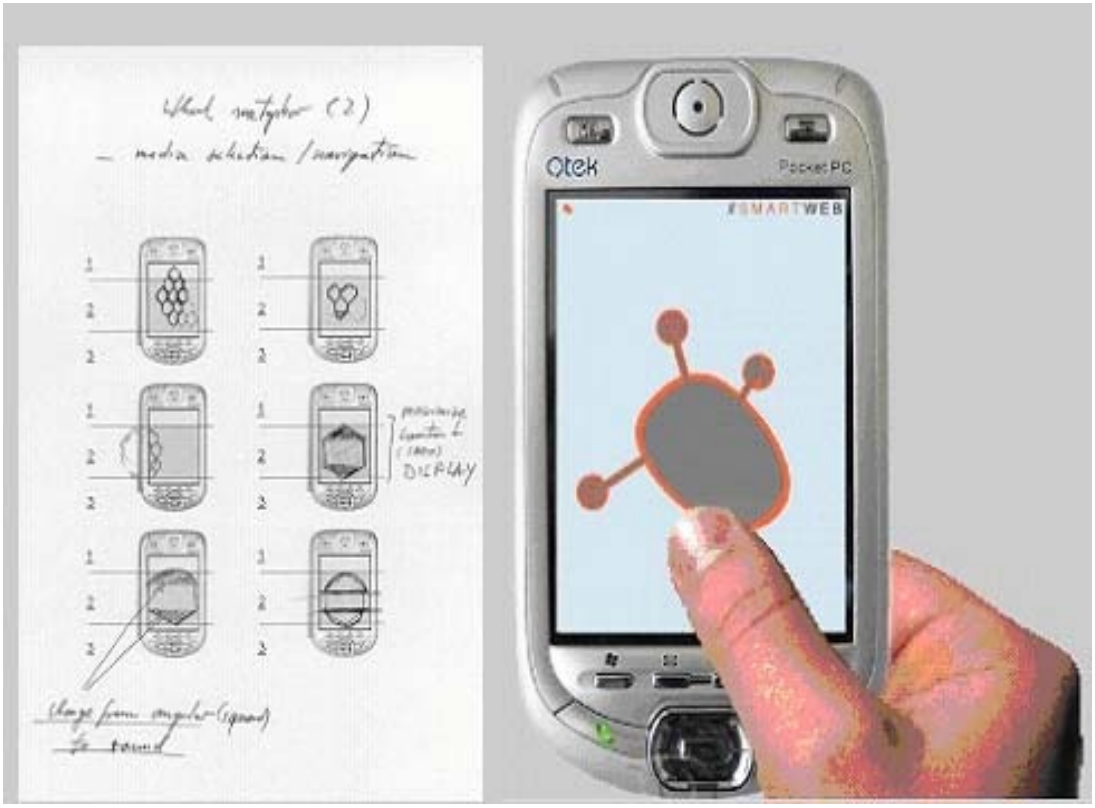
## (with Manuel García–Herranz and Pablo Haya)

## The Intelligence of Intelligent Environments

As Ambient Intelligence and Artificial Intelligence evolve, the possibilities of their synergy become wider. Focusing on Intelligent Environments, and with particular stress on personal environments, this contribution raises a question over what type of Intelligence should be provided to the environments in which people construct their lives. Using Minsky's six-level model of mind to categorize intelligence, this paper defends a limited intelligence of the environment to provide a stronger human control. For doing so, it proposes and describes a multi-agent architecture and a rule-based programming language for users to program the instinctive reactions of their environments. The proposed mechanism supports expression and management of preferences in a multi-user environment, allowing the translation of the natural human hierarchies of coordination into the Intelligent Environment domain. The proposed system has been developed and tested in various real environments.

**Speaker's Bio:**

Xavier Alamán, PhD. Computer Science (Universidad Complutense de Madrid - 1993), MSc. Artificial Intelligence (Univ. California Los Angeles - 1990), MSc. Computer Science (Universidad Politecnica de Madrid - 1987), MSc. Physics (Universidad Complutense de Madrid - 1985). He served as the Dean of the School of Engineering, Universidad Autónoma de Madrid (2004-2008), where he got the tenure in 1998, as professor of Computer Science. He previously was an IBM researcher for 7 years. His research interests include Ambient Intelligence, Knowledge Management cooperative tools, and multimedia systems. He has been main researcher in several R&D projects in these areas, and he has more that 50 publications in journals, books and conferences.




# Daniel Sonntag

## On Intuitive Dialogue-based Communication and Instinctive Dialogue Initiative

Maxims of conversation and the resulting (multimodal) constraints may be very much related to instinctive computing. At least, one could argue that cognitive instincts and (meta)cognitive dialogue strategies use the same class of actual sensory input. In my model, however, the dialogue partner's (instinctive?) competence arises from adaptable models he learns from the environment. For example, some information resources are more reliable than others, some people always or never tell the truth, which affects the dialogue action models---over time.

**Bio:**

Dr. Daniel Sonntag is a senior research scientist at the Intelligent User Interface Department (IUI) at DFKI. He received a doctor's degree in computer science and a diploma (Msc.) in computational linguistics from Saarland University in Saarbrücken, Germany. Daniel has worked in natural language processing, text mining, interface design, and dialogue systems for over 10 years and has been affiliated with DFKI, Xtramind Technologies, and Daimler/Chrysler Research. His current research interests include multimodal interface design, ontology-based question answering, and semantic search engines. At the moment he is working on a situation-aware dialogue shell for semantic access to media and services in the THESEUS research program.

# Bringing Commonsense to Ambient Intelligence Environments


## Francisco Moya

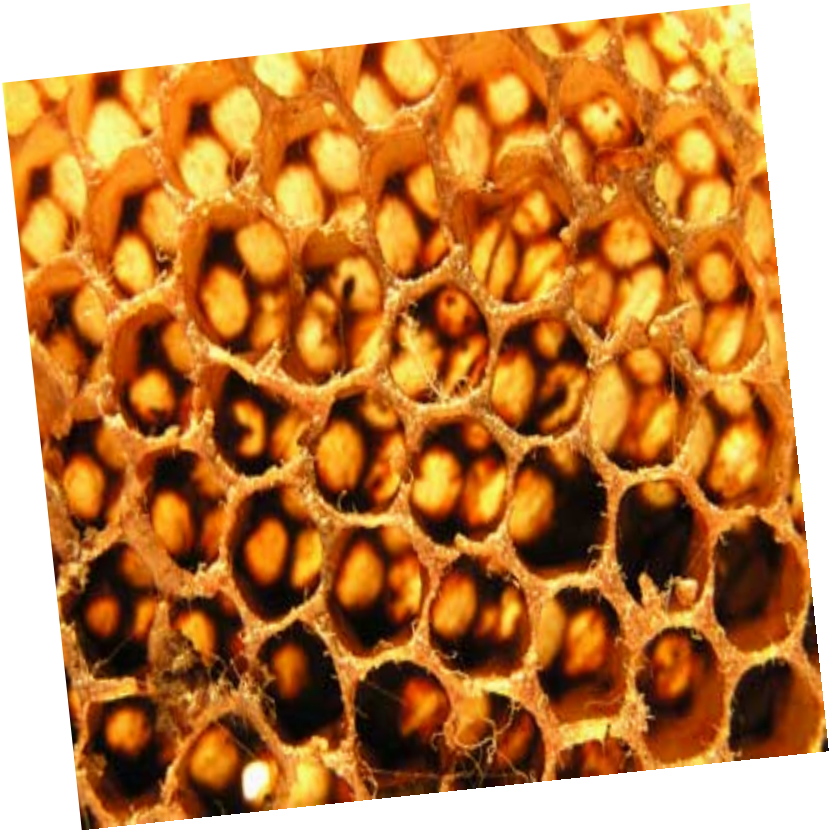
### (with Maria J. Santofimia, Felix J. Vilanueva and Juan C. Lopez)



Applications for Ambient Intelligence environments tend to focus their endeavours in anticipating user actions and needs. Nevetheless, not only users should be considered but also the environment itself, as a constituent part of the ambient system. When it comes down to it, this issue is left behind in most solutions presented to date. In this regard, extending the user-centered view, in order to encompass the sys- tem services and main intentions, arises as a key requirement towards real Ambient Intelligence. The lack of self-managed systems is not accidental, but finds its roots in the complexity of the reasoning and inference processes. Although there is a wide range of available tools supporting these processes, the incapacity to acquire the appropriate knowledge is revealed as the main shortcoming found when trying to achieve autonomous and intelligent system behaviour. This paper proposes the combination of BDI agents and common-sense reasoning to handle the dynamism, ambiguity, and uncertainty of ambi- ent intelligence. It should be noticed that the middleware framework is an essential component of the system, since it provides the foundation for the multi-agent system and for the reasoning and decision making support.


**Speaker's Information:**

Francisco Moya received his MS and PhD degrees in Telecommunication Engineering from the Technical University of Madrid (UPM), Spain, in 1996 and 2003 respectively. In 1999 he joined the Computer Architecture and Networks group at the University of Castilla-La Mancha (UCLM) where he currently works as an Associate Professor. His research interests include a wide variety of problems related to heterogeneous distributed systems and networks, electronic design automation, and its applications to large-scale domotics and systems-on-chip design.



# Implicit Interaction: A Prerequisite for Practical AmI


## Richard Tynan

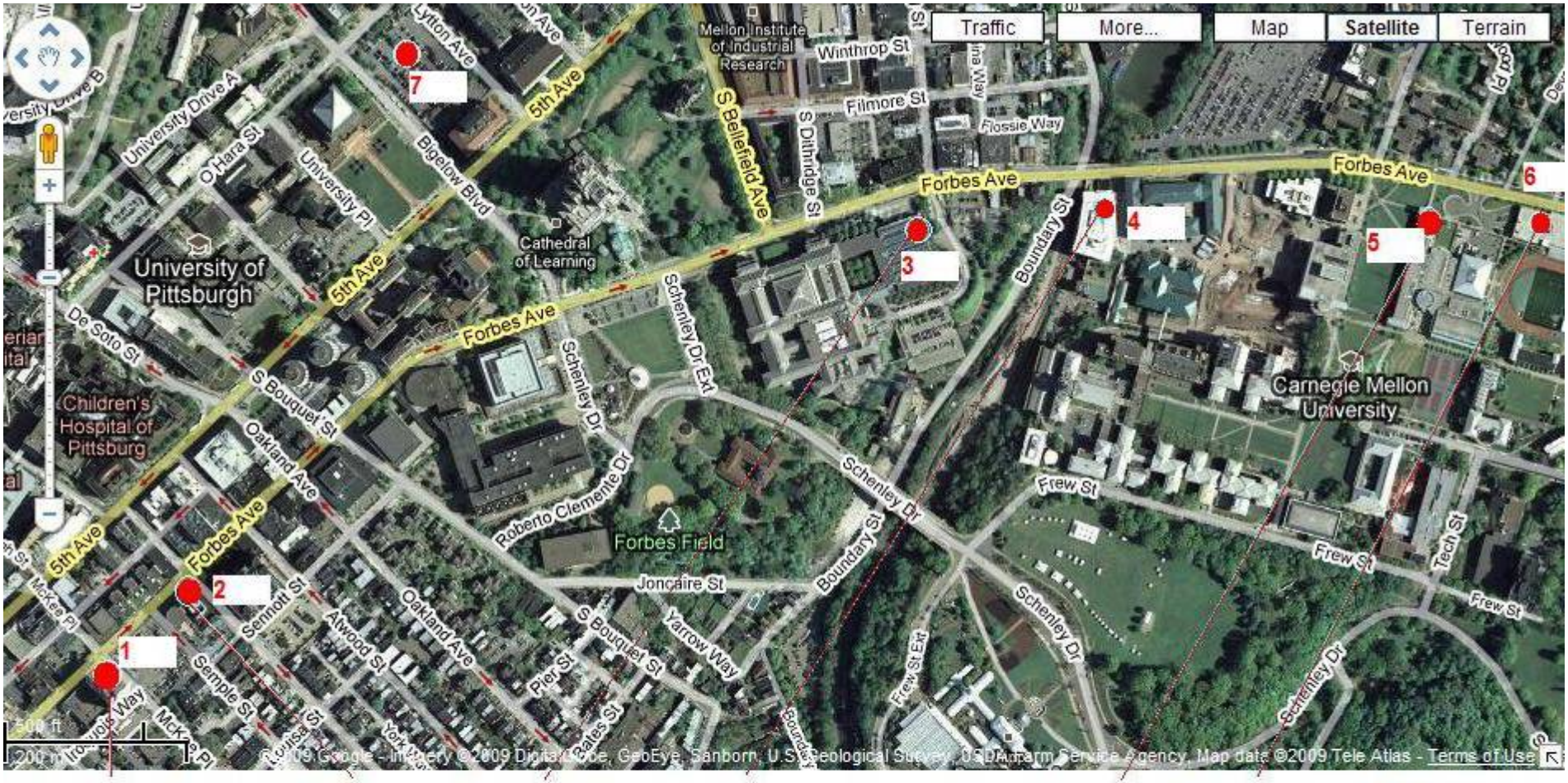
### (with M.J O'Grady, G.M.P. O'Hare, S. Dobson, C. Muldoon, J. Ye)



Intelligent User Interfaces represent one of the three distinguishing characteristics of AmI environments. Such interfaces are envisaged as mediating between the services available in an arbitrary physical environment and its inhabitants. To be effective, such interfaces must operate in both proactive and passive contexts, implicitly and explicitly anticipating and responding to user requests. In either case, an awareness of the prevailing situation is essential – a process that demands a judicious combination of data and decision fusion, as well as collaborative and centralized decision making. Given the constraints of AmI environments realizing a distributed lightweight computational infrastructure augmented with a need to address user needs in a timely manner poses significant challenges. In this paper, various issues essential to enabling seamless, intuitive and instinctive interaction in AmI environments are explored.


**Speaker's Information:**

Dr. Richard Tynan is currently a Post Doctoral Research Fellow with CLARITY: The Centre for Sensor Web Technologies. In 2008, he received his Ph. D. from University College Dublin for his thesis titled: Interpolation for Wireless Sensor Network (WSN) Redundancy Identification and Sensor Hibernation. In 2003, he received a Bachelor of Science Degree (Honors) from University College Dublin. In the summers of 2004, 2005 and 2006 he was awarded a research internship at the prestigious IBM T.J. Watson Research Center at Yorktown, New York. He was the recipient of a coveted IRCSET scholarship for his Ph. D. and has been successful with two funding proposals submitted to the National Access Programme at the Tyndall Institute. His work is focused on intelligent power management for WSNs, simulation and benchmarking of Intelligent Sensor Networks and he works on a number of demonstrator projects in which his work is leveraged in real world scenario e.g. SmartBay, Ambient Assisted Living and TennisSense. He has authored over 40 peer reviewed publications in various international journals, conferences and workshops.




1. Wyndham Hotel 2. Joe Mama's 3. Museum of Art 4. CIC Building (Google) 5. University Center 6. East Garage 7. Holiday Inn

* June 14, the informal reception will be held at Joe Mama's restaurant, 3716 Forbes Ave.
* June 15-16, the workshop will be held at University Center of Carnegie Mellon University, 5000 Forbes Ave.
* June 15, 5:00 pm - 6:00 pm, the reception and Google tour will be in CIC Building, 3720 Forbes Ave.
* June 15, 7:00 pm - 9:00 pm, the dinner wil be in Carnegie Museum of Art, 4400 Forbes Ave.

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