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Richard Harper
Matthias Rauterberg
Marco Combetto (Eds.)

Entertainment Computing – ICEC 2006

5th International Conference
Cambridge, UK, September 2006
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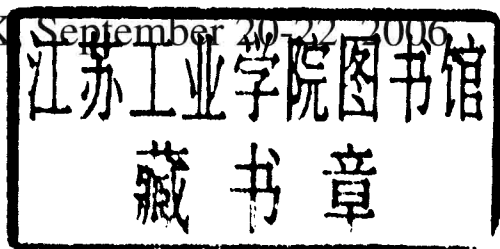


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Foreword

Welcome to the proceedings of ICEC 2006

Firstly, we are pleased with the solid work of all the authors who contributed to ICEC 2006 by submitting their papers. ICEC 2006 attracted 47 full paper submissions, 48 short paper submissions in total 95 technical papers. Based on a thorough review and selection process by 85 international experts from academia and industry as members of the Program Committee, a high-quality program was compiled. The International Program Committee consisted of experts from all over the world: 2 from Austria, 1 from Canada, 3 from China, 3 from Finland, 3 from France, 11 from Germany, 2 from Greece, 2 from Ireland, 5 from Italy, 10 from Japan, 1 from Korea, 7 from Netherlands, 2 from Portugal, 1 from Singapore, 3 from Spain, 3 from Sweden, 1 from Switzerland, 15 from UK, and 14 from USA. The final decision was made by review and conference chairs based on at least three reviewers' feedback available online via the conference management tool. As a result, 17 full papers and 17 short papers were accepted as submitted or with minor revisions. For the remaining submissions, 28 were recommended to change according to the reviews and were submitted as posters. This proceedings volume presents 62 technical contributions which are from many different countries: Belgium, Canada, P.R. China, Denmark, Finland, France, Germany, Italy, Japan, Korea, The Netherlands, Portugal, Singapore, Spain, Sweden, Taiwan, the UK, and USA. The technical papers accepted (17 full papers, 17 short papers) are compiled and presented in this volume in the order they were presented at the conference. In particular they are allocated to one of the following presentation sessions: (1) Agents; (2) Cultural and Psychological Metrics; (3) Transforming Broadcast Experience; (4) Culture, Place, Play (5) Display Technology; (6) Authoring Tools 1; (7) Object Tracking; (8) Edutainment (9) Networked Games; (10) Authoring Tools 2. All poster papers are listed separately and presented in a specific section of this book.

July 2006

Richard Harper
Marco Combetto

Preface

Entertainment has come to occupy an extremely important part of our life by refreshing us and activating our creativity and providing different media for expression. Recently, with the advances made in computing, sensors and networks, new types of entertainment have been emerging such as video games, edutainment, robots, and networked games. In the meanwhile various degrees of entertainment are valuable to improve teaching, learning and in general knowledge and information sharing. New form of entertainment are appearing and are investigated by different disciplines and different sciences. Regrettably, until recently, entertainment has not been among the major research areas within the field of information processing. Since there are huge industries and markets devoted to entertainment, this unbalance seems very uncomfortable and is the subject of large discussions.

The new forms of entertainment have the potential to change our lives, so it is necessary for people who work in this area to discuss various aspects of entertainment and to promote entertainment-related research.

With this basic motivation, the General Assembly of the International Federation of Information Processing (IFIP) approved in August 2002 the establishment of the Specialist Group on Entertainment Computing (SG16). The responsibility of SG16 is to monitor and promote research and development activities related to entertainment computing throughout the world. One of the major activities of SG16 is to organize and support the International Conference on Entertainment Computing (ICEC). The ICEC is expected to bring together researchers, developers, and practitioners working in the area of entertainment computing. The conference covers a broad range of entertainment computing topics, such as theoretical studies, social and cultural aspects, new hardware/software development, integrated systems, human interfaces and interactions, and applications.

Let's take a brief look at the history of ICEC. The annual conference started in 2002 as the International Workshop on Entertainment (IWECEC 2002), which was held May 14–17, 2002 in Makuhari, Japan. The workshop attracted more than 100 participants, and 60 papers were published in the proceedings by Kluwer. Based on the success of IWECEC 2002, SG16 upgraded the workshop to a conference and organized ICEC 2003. ICEC 2003 was held May 8–10, 2003 at the Entertainment Technology Center of Carnegie Mellon University, Pittsburgh, USA. ICEC 2003 was also successful, with more than 100 attendees and 20 highly select papers. All of the papers of ICEC 2003 were accepted by ACM for inclusion in their ACM online digital library. The following year, ICEC crossed the Atlantic Ocean to move to Europe, and ICEC 2004 was held September 1–3, 2004 at the Technical University of Eindhoven in The Netherlands.

The conference attracted more than 150 attendees, and 27 full papers were published by Springer in the *Lecture Notes in Computer Science* (LNCS) series.

In 2005, ICEC came back to Japan, and was held at Kwansei Gakuin University, Sanda. In this conference the Committee selected more than 50 papers, and these papers are published in this LNCS volume.

Finally, in 2006, ICEC was hosted for the first time in the UK, in Cambridge, hosted by Microsoft Research and the University of Cambridge.

For the success of ICEC 2006, we express our special thanks to all the people who worked so hard to organize the conference: the University of Cambridge for the support and to all people of Microsoft Research Cambridge that supported the organization from end to end in the Local Organization Committee.

We are also grateful for the contribution of all the paper reviewers as well as the sponsors and cooperating societies.

July 2006

Richard Harper
Marco Combetto

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IFIP SG16

SG16 (Specialist Group on Entertainment Computing) was established at the General Assembly of IFIP (International Federation on Information Processing) in 2001. A new Technical Committee (TC) on Entertainment Computing was proposed to IFIP (approval pending) in the following way:

Aims:

To encourage computer applications for entertainment and to enhance computer utilization in the home, the Technical Committee will pursue the following aims:

- To enhance algorithmic research on board and card games
- To promote a new type of entertainment using information technologies
- To encourage hardware technology research and development to facilitate implementing entertainment systems, and
- To encourage haptic and non-traditional human interface technologies for entertainment.

Scopes:

1. Algorithms and strategies for board and card games

- Algorithms for board and card games
- Strategy controls for board and card games
- Level setups for games and card games

2. Novel entertainment using ICT

- Network-based entertainment
- Mobile entertainment
- Location-based entertainment
- Mixed reality entertainment

3. Audio

- Music informatics for entertainment
- 3D audio for entertainment
- Sound effects for entertainment

4. Entertainment human interface technologies

- Haptic and non-traditional human interface technologies
- Mixed reality human interface technologies for entertainment

5. Entertainment robots

- ICT-based toys
- Pet robots
- Emotion models and rendering technologies for robots

6. Entertainment systems

- Design of entertainment systems
- Entertainment design toolkits
- Authoring systems

7. Theoretical aspects of entertainment

- Sociology, psychology and physiology for entertainment
- Legal aspects of entertainment

8. Video game and animation technologies

- Video game hardware and software technologies
- Video game design toolkits
- Motion capture and motion design
- Interactive storytelling
- Digital actors and emotion models

9. Interactive TV and movies

- Multiple view synthesis
- Free viewpoint TV
- Authoring technologies

10. Edutainment

- Entertainment technologies for children's education
- Open environment entertainment robots for education

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- Pedro Gonzalez Calero - Complutense University of Madrid, Spain
- Natanicha Chorphothong - Assumption University, Thailand
- Marc Cavazza - University of Teesside, UK
- Donald Marinelli - Carnegie Mellon University, USA

WG Chair persons

- **WG16.1** Marc Cavazza - University of Teesside, UK
- **WG16.2** Hitoshi Matsubara - Future University-Hakodate, Japan
- **WG16.3** Matthias Rauterberg – TU Eindhoven, The Netherlands
- **WG16.4** Jaap van den Herik - University of Maastricht, The Netherlands
- **WG16.5** Andy Sloane - University of Wolverhampton, UK

Working Groups (WG)

WG16.1 Digital Storytelling

Storytelling is one of the core technologies of entertainment. Especially with the advancement of information and communication technologies (ICT), a new type of entertainment called video games has been developed, where interactive story development is the key that makes those games really entertaining. At the same time, however, there has not been much research on the difference between interactive storytelling and conventional storytelling. Also, as the development of interactive storytelling needs a lot of time and human power, it is crucial to develop technologies for automatic or semiautomatic story development. The objective of this working group is to study and discuss these issues.

WG16.2 Entertainment Robot

Robots are becoming one of the most appealing forms of entertainment. New entertainment robots and/or pet robots are becoming popular. Also, from a theoretical point of view, compared with computer graphics-based characters/animations, robots constitute an interesting research object as they have a physical entity. Taking these aspects into consideration, it was decided at the SG16 annual meeting that a new working group on entertainment robots is to be established.

WG16.3 Theoretical Basis of Entertainment

Although the entertainment industry is huge, providing goods such as video games, toys, movies, etc., little academic interest has been paid to such questions as what is the core of entertainment, what are the technologies that would create new forms of entertainment, and how can the core technologies of entertainment be applied to other areas such as education, learning, and so on. The main objective of this WG is to study these issues.

WG16.4 Games and Entertainment Computing

The scope of this work group includes, but is not limited to, the following applications, technologies, and activities.

Applications:

- Analytical games (e.g., chess, go, poker)
- Commercial games (e.g., action games, role-playing games, strategy games)
- Mobile games (e.g., mobile phones, PDAs)
- Interactive multimedia (e.g., virtual reality, simulations)

Technologies:

- Search Techniques
- Machine Learning
- Reasoning
- Agent Technology
- Human Computer Interaction

WG16.5 Social and Ethical Issues in Entertainment Computing

The social and ethical implications of entertainment computing include:

- Actual and potential human usefulness or harm of entertainment computing
- Social impact of these technologies
- Developments of the underlying infrastructure
- Rationale in innovation and design processes
- Dynamics of technology development
- Ethical development
- Cultural diversity and other cultural issues
- Education of the public about the social and ethical implications of Entertainment computing, and of computer professionals about the effects of their work.

WG 16.5 explicitly cares about the position of, and the potentials for, vulnerable groups such as children, the less-educated, disabled, elderly and unemployed people, cultural minorities, unaware users and others.

Anyone who is qualified and interested in active participation in one of the working groups is kindly invited to contact one of the WG chairs.

Invited Speakers

Nicole Lazzaro

Nicole Lazzaro is the leading expert on emotion and the fun of games. President of XEODesign, her 14 years of interactive research has defined the mechanisms of emotion that drive play. The result for her clients is that XEODesign has improved over 40 million player experiences, transforming them from boring time wasters to emotionally engaging games by reshaping the fun. To do this she has heightened the emotions that create more captivating play. More and more her clients ask her to explore new game mechanics to create new genres and reach new audiences.

Her research on "Why People Play Games: 4 Keys to More Emotion without Story" has expanded the game industry's emotional palette beyond the stereotypical range of anger, frustration, and fear. Working for clients including Sony, LeapFrog, Sega, Ubisoft, PlayFirst and EA, Nicole has improved the player experiences for all levels of gamers in a wide range of genres and platforms including 3D adventures, casual games, camera based play and smart pens. Prior to founding XEODesign in 1992 and co-founding San Francisco State University's Multimedia Studies Program, Nicole earned a degree in Psychology from Stanford University and worked in film. Free white papers on emotion and games: www.xeodesign.com.

Margaret Wallace

Margaret Wallace is a Co-founder and CEO of Skunk Studios, a San Francisco-based game development group, known for creating high-quality original games for the mass market. Prior to the establishment of Skunk Studios, she produced and designed games and other interactive content for Shockwave.com and for Mattel's Hot Wheels brand. Margaret also collaborated on CDROM and online content while at Mindscape Entertainment (then encompassing SSIGames Online and RedOrb Games) and also at PF.Magic, creators of the pioneering "virtual life" series of "Petz" programs. Margaret is a Steering Committee member of the International Game Developers Association (IGDA) Online Games Group. She holds a B.S. with Distinction in Communication from Boston University and an MA from the University of Massachusetts/Amherst in Cultural Studies. Because her academic interests dealt largely with the intersection of popular culture and emerging technologies, Margaret was drawn into the world of games and its potential for engaging people on a worldwide scale.

Steve Benford

Steve Benford is Professor of Collaborative Computing. His research concerns new technologies to support social interaction across computer networks. Recently, this has focussed on collaborative virtual environments (CVEs) and has addressed issues

such as socially inspired spatial models of interaction, user embodiment, information visualization and mixed reality interfaces. His research group has developed the MASSIVE CVE system and has collaborated with social scientists and psychologists to evaluate social interaction within MASSIVE through field trials and public demonstrations. Since 1992 he has been a principal investigator on four EPSRC grants (Virtuosi, The Distributed Extensible Virtual Reality Laboratory, Large-Scale Multi-user Distributed Virtual Reality and Multimedia Networking for Inhabited Television); an ESPRIT III Basic Research grant (COMIC); two ESPRIT IV Long-Term Research grants (eRENA and KidStory); an ACTS grant (COVEN); two UK HEFCE grants and four direct industry-funded grants. He has also been a co-investigator on two UK ESRC and one UK MRC funded grants. Research income for these grants has exceeded £3 million pounds. Professor Benford is an editor of the CSCW journal and has served on the program committees of VRST 1998, SIGGROUP 1997, ECSCW 1993, ECSCW 1995 and ECSCW 1997. He presented his work at the Royal Society in 1995 and at the Royal Society of Edinburgh in 1996. He has published over 100 works including recent papers in ACM TOCHI, *The Computer Journal*, *Presence* and also at the ACM CHI, ACM CSCW, ACM VRST and IEEE ICDCS conferences.

Robert Stone

Professor Bob Stone holds a Chair in Interactive Multimedia Systems at the University of Birmingham, UK, where he is Director of the Human Interface Technologies Team within the Department of Electronic, Electrical and Computer Engineering. He graduated from University College London in 1979 with a BSc in Psychology, and in 1981 with an MSc in Ergonomics (Human Factors), and currently holds the position of Visiting Professor of Virtual Reality (VR) within the Faculty of Medicine at Manchester University. As a result of his pioneering in-theatre human task analysis research, which led to the development of the world's first commercial VR keyhole surgery trainer (Procedicus MIST), now marketed by Mentice of Sweden, Bob holds the position of Director of Virtual Reality Studies for the North of England Wolfson Centre for Human-Centred Medical Technologies. In 1996, he became an Academician of the Russian International Higher Education Academy of Sciences (Moscow) and an Honorary Cossack in 2003. In 2000, Bob was accredited by General Klimuk, Director of Russia's Gagarin Space Centre as responsible for "introducing virtual reality into the cosmonaut space programme". Bob undertakes research into the human factors aspects of virtual/synthetic environments and serious gaming, with regular contributions to projects in the fields of defense part-task training, defense medicine and general surgery/health care.

Thore Graepel

Thore Graepel is a researcher in the Machine Learning and Perception Group at Microsoft Research Cambridge. His current work is focused on the application of machine learning techniques to games. Previously, he was a postdoctoral researcher

at the Department of Computer Science at Royal Holloway, University of London working on learning theory and machine learning algorithms with Prof. John Shawe-Taylor.

Before that, he worked with Nici Schraudolph and Prof. Petros Koumoutsakos as a postdoctoral researcher at the Institute of Computational Science (ICOS) which is part of the Department of Computer Science of the Swiss Federal Institute of Technology, Zürich (ETH). Topics of research were machine learning and large-scale nonlinear optimization. He received his doctorate (Dr. rer. nat) from the Department of Computer Science of the Technical University of Berlin, where he was first a member of the Neural Information Processing group of Prof. Klaus Obermayer and later joined the Statistics group of Prof. Ulrich Kockelkorn

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