Special Issue on Ubiquitous Games

Staffan Björk[1], Jussi Holopainen[2], Peter Ljungstrand[1] and Regan Mandryk[3]

[1]PLAY Studio, Interactive Institute, Sweden; [2]Nokia Research Center, Finland; [3]Edge Lab, Simon Fraser University, Canada

1. Introduction

Computer games have grown during recent years into a popular entertainment form with a wide variety of game types and a large consumer group spread across the world. An increasing number of people are playing electronic games, placing them among other favorite leisure activities. When surveyed on the most fun entertainment activities in the year 2000, 35 percent of all Americans identified computer and video games, where watching television fell second at 18 percent, followed by surfing the internet (15%), reading books (13 %) and going to the movies (11%) [8]. On-line gaming has offered people new means of having social interaction with people in faraway locations and let them access and play out fantasy-driven identities they are unable to manifest in the real world [12]. In 2002, the percentage of frequent game players that play games online rose to 31 percent up from 24 percent the year before [8]. Within the games, or through the use of websites based around the games, dedicated and long-lived communities have formed which have created new content, sometimes leading to commercial ventures. Electronic game play, however, is not limited to home use. Game parlors and LAN parties are becoming a popular means to play online games. Also, 37 percent of Americans who own game consoles (or computers used to play games), report that they also play games on mobile devices such as PDAs and mobile phones [8]. The popularity of computer games has thus not only made them important carriers of culture and trends but also a financially interesting area. They also function as a vehicle for the development and deployment of new hardware, software and user interface techniques.

According to Interactive Digital Software Association (www.idsa.com), the computer and video game software industry in the US generated $6.35 billon in sales from 225 million units in 2001 (up 7.9% and 4.5% from 2000 respectively). In the same year in the US, movie box office grosses were $8.41 billion [8]. In the UK in the year 2000, the entertainment software industries grossed £300 million more than the UK cinema box offices and almost double that of home video rentals [3]. The world entertainment software market is estimated to be almost $18 billion and to grow to $26.7 billion by the year 2005 [3].

Computer games are some of the applications available to the general public that have the very highest demands on ease-of-use, engagement, and aesthetical appearance. These demands have made developers of computer games use the latest techniques within artificial intelligence, multimedia, computer graphics, computer simulation, and human-computer interaction to be competitive against other games developers. For example, recently IBM, Sony, and Toshiba have partnered on creation of the 'Cell'. The Cell is a unique type of computer processor that contains several types of computing cores that are optimized for one type of task (e.g. communications, video processing). These processing cells can be interconnected to optimize a specific task [11]. This exciting research has not been driven for use in supercomputers, or high-end business PCs, but for use in the Playstation, a gaming console.

2. Ubiquitous Games

Although computer gaming has become a large industry and mainstream leisure activity, it has received relatively little attention from the research field. One indication of this is that there is currently work in organizing an international organization for promoting the studies of digital games, Digital Games Research Association (DIGRA, www.digra.org) to complement the International Game Developers Association (IGDA, www.idga.org). However, there are already exist a number of associations

Personal and Ubiquitous Computing (2002) 6:358–361

related to games (TASP – The Association for the Study of Play, ISAGA – The International Simulation and Gaming Association, ABSEL – Association of Business Simulation and Experiential Learning, JASAG – Japan Association of Simulation and Gaming, NASAGA – North American Simulation and Gaming Association, SAGSET - The Society for the Advancement of Games and Simulations in education and Training). Another example is the special issue on game engines for scientific research, recently published in the Communications of the ACM [9]. In addition to the work done within DIGRA, we have noticed a growing interest among researchers for new form of gaming which applies the techniques developed within ubiquitous computing to the creation of games. We have chosen to call these games ubiquitous games as they explore the possibility of taking the functionalities that ubiquitous computing offers and applying them to computer games. We believe that this merger can not only create new forms of traditional games (card games, board games, role-playing games) but can also make the act of playing computer games more social. In addition, we believe the high level of sociability, usability, aesthetics and ease of use that game design requires will ensure that results from developing ubiquitous games will benefit the ubiquitous computing community as a whole.

This special issue on ubiquitous games is mainly based upon a workshop that the authors organized at the Ubicomp 2001 conference to explore the subject [1]. The Designing Ubiquitous Computing Games workshop aimed at bringing together people interested in exploring the merger of computer entertainment with ubiquitous computing. Issues included various sensing technologies, capturing social and physical context, novel input such as bio-input, the blurring of physical and virtual worlds, characters and storylines, as well as specific game content and timeline issues unique to pervasive games. The ideas discussed can lead to a new type of game design where players' physical and social context influence the game play to create new styles of computer entertainment.

In order to ground the papers in this issue in both ubiquitous computing and current electronic game space, these two subjects are briefly presented in this introduction.

3. The Ubiquitous Aspect of Ubiquitous Games

When Weiser [13] introduced ubiquitous computing, he argued that computers would be embedded into everyday objects looking like jewelry, nametags, books, and walls, but that these objects would communicate with each other and adapt their behavior to different users, locations, and situations. The goal is to not only have ever-present objects that are always accessible, but also have them be aware of our context. Humans sense context naturally and use it in their human-human interactions. With commercially available sensors, networked computers, and a software support infrastructure, technology can be programmed to 'sense' aspects of a user's context [2].

A key point of Weiser's vision was that it should be as easy to interact with computers as with everyday objects in the physical world. One way of ensuring this is to support natural interactions with computers, leveraging the experiences we have had in the physical world in the digital domain. The papers in this special issue address the persistent aspect of ubiquitous games, but also focus on the second issue of making context aware games, and games with natural interfaces.

Ubiquitous gaming offers many opportunities for new game styles but also requires different approaches to game design than traditional computer games, in a way similar to how the design of any ubiquitous computing system is different from traditional computer application design. Several research projects and workshops have identified gaming as a fruitful field for doing research on ubiquitous computing issues (see the related work section in the paper "Designing Ubiquitous Computing Games – A report from a workshop exploring ubiquitous computing entertainment" in this issue for examples).

4. Computer Games Today

Networked Gaming

Currently, the dominant system for engaging in online play is the PC. However, the next-generation of internet-capable game consoles (X-Box, Sony Playstation2, Nintendo Gamecube) are here. Along with playing DVDs, CDs, and games, these consoles will be linked to other

devices such as digital cameras, MP3 players, and other web-enabled devices like mobile phones and handheld computers [4]. With Forrester Research predicting that there will be 70 million next-generation console sales by the year 2006 in Europe alone [4], the opportunities for novel ubiquitous gaming applications are enormous.

However, not all growth in networked gaming is coming from home PCs or game consoles. Recently, even those who play networked games online want to do so in a highly social environment. Game parlors are environments where multiple people gather in a face-to-face environment and play online games, video-chat, and meet others. Korea, in particular, has seen rapid growth of these parlors, known as "PC bangs". There were about 26,000 PC bangs in Seoul, which generated revenue of 6 billion dollars (US) in 2000 [7]. These rooms are social environments where virtual and physical are not mutually exclusive. In fact, "love seats" originally installed for couples to use together, have turned into an Internet-mediated bar stool where video-chatters can arrange to meet and interact online in close physical proximity [7].

Mobile Gaming

As on now, virtually all commercial mobile phones and PDAs that are released to the market come with preinstalled games. The use of these embedded games has been quite successful and Motorola predicts that by 2005, wireless services will hold 32% of the entertainment market [6], where they held only 8% in the year 2000. In 2001, four major wireless firms (Ericsson, Motorola, Siemens, and Nokia) combined their resources and knowledge to form the Mobile Games Interoperability Forum intended to create specifications to allow game producers to produce and deploy mobile games across a number of heterogeneous servers, networks, and devices [10].

Location-based Gaming

Currently, the computer game industry has shown a strong interest in various forms of networked gaming as high availability of cheap and fast computer networks have become more common. Game consoles are being networked to compete with networked PC games while mobile phones are increasingly used as gaming platforms that rely on information about players' location as part of the experience. Other handheld gaming devices allow for similar networked, mobile games and truly multimedial games have been launched by computer game companies (e.g. Majestic by Electronic Arts) that make use of multiple heterogeneous devices such as mobile phones, fax, email and the Internet. These trends have established a new genre of computer games called Pervasive Gaming, which means a game that is always present, available to the player. These games can be location-sensitive and use several different media to convey the game experience. According to Forrester Research, pervasive gaming will appeal to a mass-market audience and generate $26 billion by 2005 [5].

5. The work in this issue

The special issue of Personal & Ubiquitous Computing has collected papers that represent a variety of viewpoints on how computer games and ubiquitous computing can be combined or make use of each other. The papers present results on enhancing traditional games, novel interfaces that allow new game genres, studies of what these new game genres may be, how to encourage user-based content, how to model user interaction and how to create viable business models for these new types of games.

Enhancing traditional games

Kay Römer: Smart Playing Cards – A Ubiquitous Computing Game

New Computer Game types

Adrian David Cheok, Xubo Yang, Wang Weihua, Mark Billinghurst, Hirokazu Kato: Touch-Space: Mixed Reality Game Space Based on Ubiquitous, Tangible, and Social Computing

Staffan Björk, Jussi Holopainen, Peter Ljungstrand, Karl-Petter Åkesson:

Designing Ubiquitous Computing Games – A report from a workshop exploring ubiquitous computing entertainment

Novel interfaces

Robert Headon, Rupert Curwen: Movement Awareness for Ubiquitous Game Control

Ana Paiva, Gerd Andersson, Kristina Höök,

Dario Mourao, Marco Costa, Carlos Martinho: SenToy in FantasyA: Designing an Affective Sympathetic Interface for a Computer Game

Authoring participants

Françoise Decortis, Antonio Rizzo: New active tools for supporting narrative structures

Models for interaction

Tony Manninen: Contextual Virtual Interaction as Part of Ubiquitous Game Design and Development

Economy

Nizami Cummins: G-Commerce: Democratising Interactive Narratives

6. Conclusion

Ubiquitous gaming is an exciting area of research. We believe that the papers in this special issue show that games can be used as a domain to investigate questions related to ubiquitous computing in general as well as explore gaming in its own right. The proliferation of mobile and networked devices provides a landscape rich in opportunities to develop and quickly deploy games that exemplify the vision of ubiquitous computing.

References

1. Björk, S., et al. Designing Ubiquitous Computing Games Workshop, UbiComp 2001, Atlanta, 30 September 2001. http://www.playresearch.com/workshops/ubigame.ubicomp/
2. Dey, A.K. & Abowd, G.D. (1999). Towards a better understanding of context and context-awareness. GVU Technical Report GIT-GVU-99-22, College of Computing, Georgia Institute of Technology.
3. ELSPA. http://www.elspa.com/research/screendigest.html
4. Forrester Report, "Game Consoles Connect", January 2002.
5. Forrester Report, "Pervasive Gaming Goes Mainstream", August 2000.
6. Game Research. http://www.game-research.com/wireless.asp
7. Herz, J.C. The Bandwidth Capital of the World. In *Wired Magazine*, Issue 10.08 (August 2002). http://www.wired.com/wired/archive/10.08/korea_pr.html
8. Interactive Digital Software Association. http://www.idsa.com
9. Lewis, M. and Jacobson, J. (2002). [Special issue of ACM] Game engines in scientific research: Introduction, Communications of the ACM , Volume 45 , Issue 1 (January 2002), Pages: 27–31.
10. Mobile Games Interoperability Forum, http://www.mgif.org/
11. Sony Computer Entertainment Inc., Press release about the Cell. http://www.scei.co.jp/corporate/release/pdf/020402e.pdf
12. Turkle, S. (1995) Life on the Screen: Identity in the Age of the Internet. Touchstone: New York.
13. Weiser, M. (1991) The computer for the 21st century. Scientific American, 265(3), 94-104.