Gemini: Accumulating Context for Play Applications

Regan L. Mandryk
School of Computing Science
Simon Fraser Univeristy
rlmandry@cs.sfu.ca

Kevin G. Stanley
School of Engineering Science
Simon Fraser Univeristy
kstanley@ cs.sfu.ca

INTRODUCTION

Ambient intelligence and ubiquitous computing [4] offer more than just the promise of devices and infrastructure; they promise new interaction paradigms inspired by access to information and computational capabilities [1]. Weiser envisioned new applications that would emerge in this world rich with computation, leveraging off these new devices and infrastructures. One such application domain is computer games. There is a growing interest among researchers for new forms of gaming that apply the techniques developed within ubiquitous computing to the creation of games. These games have been called ubiquitous games as they explore the possibility of taking the functionalities that ubiquitous computing offers and applying them to computer games [2].

We believe that this merger will not only create new forms of traditional games (e.g. card games, board games, role-playing games) but can also make the act of playing computer games more social, drawing users from new demographics not currently represented. In addition, we believe that the high level of sociability, usability, and aesthetics that game design requires will ensure that results from developing ubiquitous games will benefit the ubiquitous computing community as a whole.

The goals of our project are to create a method of sensing and capturing aspects of an individual's context and injecting this "personality" into a gaming environment. This will result in a game environment that meaningfully responds to a player's context rather than players responding to preconceived gaming challenges. Although we will make efforts to create natural interfaces and automate the capture of experiences, our focus will be on sensing and utilizing cumulative context.

A recent effort by EA to deploy a truly pervasive game (Majestic) failed due in part to the fact that the game was too intrusive. Around the same time, some types of virtual pets were banned from schools because they needed to be maintained on a strict time schedule. Our proposed solution, called Gemini, is a passive sensing device that does not interrupt the player. The player chooses when to play with Gemini. When they are not playing, Gemini will play itself by collecting sensor data about the player and their activities, synthesizing this data into information meaningful to the end applications(s). We believe that:

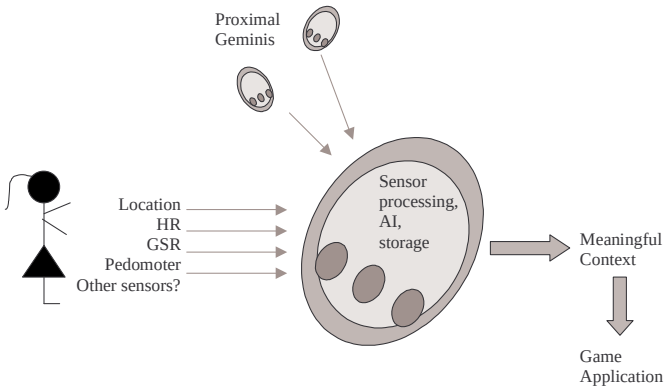
- Gemini will make games more compelling, especially for demographics not currently represented in the gaming community.
- Gemini will blur the distinction between playing in the real world, and playing in the virtual world.
- Gemini and the accompanying application will enable fantastical game experiences grounded in our real world activities. By grounding these magical experiences in our real world experiences, we can enhance the suspension of disbelief when playing computer games.

GEMINI: A DEVICE TO SUPPORT CONTEXT AWARENESS

In order to sense aspects of an individual's context and apply this context effectively in a gaming environment, we propose a small, mobile object that travels with a player and communicates gathered information into a game environment. This smart object, called Gemini, would: travel with people, interpret contextual information, recognize proximal Geminis, be connected to a network, and store data.

As such, the concept of a Gemini is a smart agent embedded in a smart object. We use the phrase Gemini to denote a virtual twin. Rather than active game response based on real time input, Gemini gathers and accumulates context about the players' actions from a network of sensors (e.g. location, proximity, biometric sensors, number of steps taken, light, RFID). Information gathered from the sensors is processed on board the Gemini, then a reduced set of meaningful information is sent for use in the end application. The end application would consist of a game that uses the gathered contextual information to create a different playing experience for different players.

In the diagram below, three mappings between four distinct regions exist. Sensors perform an inherent mapping between the real world and data through physical processes. Sensor data, through accumulation algorithms is mapped into the Gemini's data set. This data set is interpreted by the local AI on the Gemini altering the intermediate game state of the piece, and finally, the game state of the piece is mapped into the shared virtual gaming environment. Each of these mappings reduce the total dimensionality of the system, reducing the infinite dimensionality of the real world into a manageable gaming data set.



We use the phrase accumulation to mean an algorithm which reduces a time sequence of data points to a single value within the Gemini. Different possible accumulation algorithms include: maximum, minimum, threshold counts, averages, summation, departure from norm and statistical methods. For sensor data where noise and uncertainty is undesirable, statistical or summation techniques can be used to diminish the impact of noise on the Gemini's state.

The sensors chosen, the accumulation algorithms used, and the final mappings to game state will have a dramatic effect on the feel of the game. The encoding of context happens in the mapping algorithms. For straight-forward role playing mappings, single contexts can be used, such as taking total number of steps as the character's endurance. For a horror genre game, it may be more desirable to make the mappings counter-intuitive, exploit the inherent uncertainty, or even add uncertainty built into the system. For a puzzle genre game, deducing the mappings from physical to virtual could be part of the challenge.

EXAMPLE SCENARIO

For example, Gemini could be a physical instantiation of a character for a multiplayer game. The following scenario describes what interactions Gemini could enable.

Colleen carries her Suki character (physical playing piece) with her when she goes to university, to swimming practice, and even out grocery shopping. Suki has characteristics that Colleen admires; she's a great warrior, can catch a fish with her bare hands, and can climb a tree without any low branches. Colleen can't do these things but has enabled Suki to through her own activities (e.g. swimming, hiking, kayaking). In the online community where Suki lives and plays, Suki will become more successful if she learns how to fly. Suki has become aware of this and let Colleen know that she wants to learn to fly and it is up to Colleen to figure out how to do it. While Colleen is waiting by the bus stop to get home from university one day, Suki perks up because one of her friends is near by and she wants to say hello. Colleen doesn't recognize anyone she knows already so she looks around. She notices a holding a character and also looking around. Colleen holds Suki up and smiles at the girl who comes over and begins to talk. Turns out that the girl, Emily, recently helped her character Jackson learn to fly. No wonder Suki was so excited! On the bus the girls talk and trade ideas about the game

This scenario addresses multiple ways that contextual input can be used to enhance the experience of playing digital games. In this scenario, Gemini is used to capture and store contextual data about the real, physical world while the player is mobile. This could be when players are out with friends, waiting for the bus, out pursuing hobbies, or even at the laundry-mat. Gemini also interfaces with a computer or game console (much in the way a memory card does) to allow the character to inhabit the virtual world, both when the player is controlling the character, and when the player is simply going about their daily routine.

Some research issues that the proposed technology and scenario addresses are: how technology can facilitate social interactions; how to build next-generation entertainment environments; forming communities around digital media; and deploying smart objects. There are many interesting peripheral issues such as how to facilitate mobile games, and gender issues in the computer game market.

FUTURE WORK

A prototype Gemini is currently being constructed, with a limited sensing capability and on-board processor. We could consider physical, social, emotional, and intellectual context, however, choosing one aspect of context would significantly reduce the problem space for the prototyping stage. Initially, we are focusing on aspects of a person's physical context, such as their biometric signals, their location, who is around them, and aspects of their physical activity. In order to interface Gemini with an end application, we plan to use an existing project called False Prophets [3]. False Prophets is a hybrid board/video game system that utilizes tangible objects to create a compelling, collaborative game environment. The cumulative context gathered from Gemini will give players of False Prophets advantages or disadvantages when beginning a new game.

REFERENCES

1. Abowd, G.D. and Mynatt, E.D. (2000). Charting Past, Present, and Future Research in Ubiquitous Computing. *ACM Transactions on Computer-Human Interaction, 7*(1): pp. 29-58.

2. Björk, S., Holopainen, J., Ljungstrand, P., and Mandryk, R.L. (2002). Introduction to Special Issue on Ubiquitous Games. *Personal and Ubiquitous Computing, 6*: pp. 358–361.

3. Mandryk, R.L., Maranan, D.S., and Inkpen, K.M. (2002). False Prophets: Exploring Hybrid Board/Video Games. In *Extended Abstracts of CHI, Conference on Human Factors in Computing Systems.* Minneapolis, MN, USA, April 2002

4. Weiser, M. (1991). The computer of the 21st century. *Scientific American, 265*(3): pp. 66-75.