Using Audio as a Mechanism for Immersion in Pervasive Games

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-- Introduction --

Pervasive gaming is an extremely new field in game research; there has been very little research in terms of how to make pervasive games, how to make pervasive games fun and immersive, and how to use pervasive games for academic purposes, such as inspiring interest in science.

We hope to address some of these research topics by creating a game based on a completely auditory game mechanic, comparing the use of audio cues with visual cues, and determining whether or not use of audio manipulation is more effective than visual elements.

-- Background --

One of the first papers published about what constitutes as a pervasive game was written only five years ago. There has been research on how to make a fun and engaging pervasive game, but little research on whether such criteria are truly applicable to the average player (there have yet to be games that have been tested for these criteria and for their effectiveness in creating an immersive and interesting experience).

In addition, while there has been some research on visual immersion in pervasive games (which was shown to be counterproductive in creating a fun experience for players), there has been no research in either using auditory immersion in pervasive games, or determining whether audio immersion is more effective than visual immersion in such games.

-- Research --

Create a pervasive game in which game mechanics would depend almost exclusively on audio cues.

- Create a role-playing game (RPG), which will utilize audio cues to tell players what is happening in the game, and to tell them how to interact with either the world or with an enemy in battle
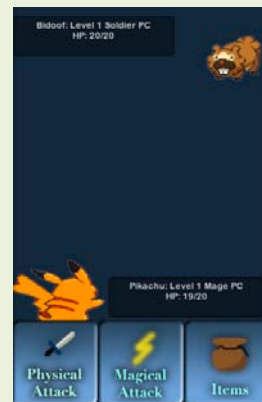 - The game must be on a mobile device (iPhone)

Figure 1: Battle interface

Design a battle system
- use the iPhone's accelerometer to read in full-arm gesture movements, translate the movements into attacks
  - log acceleration values from various gestures
  - create curve of best fit for each direction
  - account for calibration problems and tilting of the phone
  - use modified F-test to fit subsequent motions to these curves
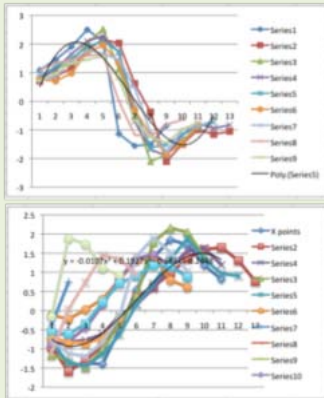
Figure 2: Graph of accelerometer values obtained while swinging iPhone to the left.

- Use audio panning and manipulation of music speed to indicate what is occurring in the battle
  - o Determine limitations of the iPhone / Unity iPhone package
    - Inability to play two compressed audio files at once
    - Inability to use 3D sound effects
    - Inability to increase tempo of music without changing pitch
    - Memory limitations

Test battle system, use of audio cues
  - Give system demo to # testers
  - Collect data from anonymous survey about system (completed after test); use of audio rather than visual signals; use of gestures to fight

-- Impact --

- Implemented audio cue interface
- Survey data on pervasive game
  - o Ability testing on audio-based pervasive game
- Tested the validity of creating a gesture-based game on iPhone using Unity package
  - o Research various interaction interfaces

Figure 3: diagram of iPhone and its accelerometer axes

-- Conclusion --

Overall, user reactions to the demo were very positive. Most users indicated that they enjoyed relying on the use of audio, and most indicated that they enjoyed the control structure employed in the demo, and that they could see the system being used as part of a larger game. Many of the testers also indicated that they would be willing to do the battles in public (indicating that the system could have realistic appeal in a pervasive game).

Most criticisms fit into three categories: gesture accuracy being too strict, the need for clearer sound cues that better describe the action, and the need for a tutorial of some sort. A couple of testers also indicated that while the use of audio was engaging, they did not see themselves battling without looking at the iPhone screen (these testers, perhaps not coincidentally, also commented on the need for clearer sound cues).

-- Future Work --

In order to fully explore the questions we hope to address, we will have to complete the low-concentration part of our game (including implementing missions and random-encounter battles). Additionally, we will have to modify the battle system based on the survey data we collected.

We will then be able to do testing to determine whether the audio truly does create a sense of immersion without being too intrusive to the player's life, or requiring too much involvement on the player's part. We will also be able to verify or counter the pervasive game flow model suggested by past researchers.