Developing an Augmented Reality Game: Lessons Learned from Gray Anatomy

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Abstract:

The paper describes the process undertaken to develop an Augmented Reality (AR) curriculum that fosters groupworking, data gathering and critical thinking skills along with math and English/Language Arts content. Augmented Reality merges digital virtual objects with the real-world environment in a interactive and content-rich simulation.

Introduction:

Azuma (1997) defined Augmented Reality (AR) as a type of Virtual Reality. While Virtual Reality technologies “completely immerse a user inside a synthetic environment… AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world” (p. 2). In effect, the individual utilizes technology to interact with digital information while functioning in a real-world setting.

Most commonly, AR is operationalized using wearable technology (e.g. headsets that provide digital information to the user on the inside of the glasses), however, it has also included projected digital elements on real-world objects (see Raskar, Welch & Fuchs, 1998 for an example).

More recently, there has been a movement to create AR environments that function through handheld computers. The Handheld Augmented Reality Project (HARP), a collaborative project between Harvard’s Graduate School of Education, MIT and the University of Wisconsin, utilizes handheld computers to deliver academic content and skills to Middle School students. Using GPS enabled Dell handheld computers, HARP is able to present AR activities that engage students in the learning process. Using such technology to provide simulations, especially ones that take advantage of computer game technology and theory, is intended to teach academic material to students who might otherwise not be engaged with the instruction.

Currently, HARP has one fully functioning AR curriculum, Alien Contact!, which is based on a scenario where aliens have crash landed near the school, and the students are responsible for determining the purpose of these aliens’ visit. Each member of the group plays a role throughout the game (in Alien Contact! there are four roles: Chemist, Cryptologist, Computer Hacker, and FBI Agent), and is provided a GPS-enabled handheld computer. As the students walk around the physical environment, a virtual representation of them travels around a map of their location on their handheld. During
their travels around the game space, each student interacts with virtual characters and items that provide them information that they can use to understand the reason for the aliens’ visit.

**Presentation**

This paper will describe the development and testing of a second AR curriculum called *Gray Anatomy*. In this scenario, a gray whale has beached itself near the students’ school, and they are teamed up to determine why this has occurred. For instructional purposes *Alien Contact!* does not have a “correct” answer at its conclusion. Rather, data can be used in multiple ways to defend any of numerous possibilities. In order to study the impact of this variable on learning; however, *Gray Anatomy* is being developed to have a “correct” answer. The students will be presented with several plausible hypotheses for the whale beaching, however all but one of them will have a “fatal error” built in that would make it impossible to be true. The students’ task, as they work through the project, will be to work in their groups to find the correct answer.

Due to the relative novelty of this as an instructional paradigm, the development of curricula that effectively leverage the technology is difficult. The research done to date on *Alien Contact!* demonstrates that students are engaged with the process, while oftentimes still being unprepared to function as a group in the game space. This paper will describe the process of developing, testing and piloting the *Gray Anatomy* curriculum with middle school students. Discussion will focus on the benefits as well as difficulties associated with AR instruction.

**References:**
