AudiOdyssey: An Accessible Video Game for Both Sighted and Non-Sighted Gamers

Eitan Glinert

Graduate Student, Singapore-MIT GAMBIT Game Laboratory
5 Cambridge Center, Suite 300
Cambridge, MA 02139
(+01)-617-416-6863
glinert@mit.edu

Lonce Wyse

Associate Professor, National University of Singapore
Communications and New Media Programme
National University of Singapore
11 Law Link, Singapore 117570
cnmwll@nus.edu.sg

ABSTRACT

Despite the growing number and demographics of video game players, most games are still completely inaccessible to disabled populations. To study the issue of gaming accessibility, we created AudiOdyssey, a prototype video game designed to be usable by both sighted and non-sighted audiences. Featuring multiple input control schemes, rhythm based game play, and fully accessible menus and play levels, the prototype allows all individuals to share a common gaming experience, regardless of level of vision.

Categories and Subject Descriptors

I.2.1 [**Applications and Expert Systems**]: Games

General Terms

Design, Human Factors, Theory, Management.

Keywords

Human Computer Interaction, Accessible User Interface, Accessible Video Game, Accessible Design, Experimental Game Design, Sight Impaired, Vision Impaired.

1. INTRODUCTION

Video games (used here to refer to both computer games and console games) have become a driving force in the entertainment market. In 2004, video game sales in the United States topped $7.3 billion, with over 200 titles selling more than 250,000 units [1]. These numbers are growing every year, and more tellingly, the user demographics are expanding as well [2]. Despite their increasing and widespread appeal, video games remain inaccessible to many people with disabilities, who are frequently unable to succeed at or even play the very same games their friends enjoy. This affects a significant portion of the population, as roughly 18.6% of persons aged 16 to 64 in America have some form of disability [3]. These range from cognitive challenges, to physical disabilities, to technological deficiencies, and other medical conditions. Indeed, the range is so wide and varied that the US government has recently passed

legislation requiring all federally funded software research to meet certain accessibility requirements to help address the issue [4]. Despite this, with the exception of a few notable attempts [5], games which address these issues are in short supply.

One of the more common forms of disabilities among the general population are visual impairments, with 2.76% of America having some form of visual impairment [6]. However, as of the writing of this paper there are fewer than 300 publically available games that are accessible to blind and low vision individuals. Many of the games that do exist are derivative from existing genres, instead of being designed from the ground up for this audience. They do not take advantage of some of the more recent advances in audio and haptic technology to create novel and compelling experiences for the visually impaired, that could also engage the broader gaming market. We believe there would be a strong interest in innovative designs and best practices that demonstrate the potential of games accessible to both the visually impaired as well as the sighted. Such research would also benefit the field of accessible user interfaces. Furthermore, we believe the creation of such games will likely have social benefit by allowing disabled people to play together in ways previously unfeasible. Therefore, the goal of our collaborative effort is to create a prototype visually impaired accessible video games that is also designed for the mainstream market, and associated best practice guidelines

2. AUDIODYSSEY

AudiOdyssey is our first such prototype game, developed at the Singapore-MIT GAMBIT Game Laboratory. Released in August 2007, the game is designed around several research goals:

- Implementing a game design that allows visually impaired and sighted users to play the game in the same way, with the same level of challenge, and share a common gaming experience.
- Designing online multiplayer that allows for identity masking, at least in the sense that users in remote locations should not be aware of the visual status of their gaming counterpart.
- Designing alternative control schemes for improved accessibility to the visually impaired.
- Creating a fun, engaging game that relies on audio more than visuals to simulate an exciting experience.

AudiOdyssey is a rhythm game in which the user takes the role of Vinyl Scorcher, an up and coming DJ new to the club scene. Using a keyboard or a Nintendo Wiimote as input, the user overlays tracks to create songs in an effort excite the audience on the dance floor. During special "freestyle" sections, one can play dynamically generated sound effects to the beat of the song. Coded in flash, the game is currently only for the PC, however future variants may be created for Mac and Linux operating systems as well. The game employs many innovations to achieve the projects research goals. By using the Wiimote as input, blind individuals are able to use this popular new device in a video game for the first time, and the game has a more natural and intuitive user interface. Spatial sound cues from stereo speakers tell the user where and how to swing the Wiimote. The focus on music ensures that both sighted and non-sighted users will have a similar gaming experience, while keeping the difficulty of the game the same for both groups. Finally, the multiplayer aspect allows visually impaired users to play with others using an abnormally high level of interactivity, regardless of their lack of sight.

AudiOdyssey was developed at MIT by a group of seven Singaporean and MIT undergraduates working together in a scrum management team, under the author's supervision. The finished prototype is available for free download at http://gambit.mit.edu/loadgame/index.php. Deliverable materials such as best practice guidelines and journal articles serve as the basis for future game creation, and will be distributed to industry via conference presentations and journal publications to further the development of visually impaired accessible games.

3. OUTCOMES AND APPLICATIONS

AudiOdyssey will be formally tested with statistically significant numbers of both sighted and non-sighted groups in November 2007. Individuals will be asked to evaluate the game based on usability, frustration and challenge levels, and overall play experience. AudiOdyssey's development has yielded several notable outcomes. To create a game that is accessible to the visually impaired yet compelling enough for sighted individuals, we have devised an intuitive and engaging Wiimote and keyboard based user interface that is easy for both parties to use. The lessons learned during this UI development will be applicable in the development of future games. Likewise, while socially based multiplayer games are wildly successful in the mainstream arena, accessible versions are extremely rare. Future derivative versions of AudiOdyssey will demonstrate new techniques for the creation of such components, encouraging similar future efforts both in academia and in industry.

Best practice guidelines based on this research will have further benefit, as they will be available to future game development teams. We expect that these materials will help show others not only how to make games for the visually impaired, but methodology for making games based on compelling research. Finally, it is our hope that by demonstrating the creation of a fun and accessible game, others groups, especially in industry, will follow suit with the development of similar games.

4. COLLABORATIONS

This project is a joint effort between Prof. Eric Klopfer at MIT and Prof. Lonce Wyse at the National University of Singapore.

Klopfer is a co-founder of the Education Arcade, a research laboratory at MIT that is dedicated to making novel educational video games. He has lead research on the game development tool Starlogo and in augmented reality games 7, 8]. Wyse heads the Arts and Creativity Lab at the NUS Interactive and Digital Media Institute pursuing research in interactive sound synthesis [9], musical networks, sound models [12], and music cognition.

Eitan Glinert, a graduate student at MIT working under Prof. Klopfer, is the research manager for the project. He has worked on the educational video game Immune Attack at the Federation of American Scientists [11], and has background in computer science, biology, and project management.

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