A Dice Game in Third-Person Augmented Reality

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Abstract

We describe a prototype entertainment application of the Augmented-Reality Toolkit[1] based on a fantasy dice game. Two players roll dice bearing glyphs that are interpreted by a computer, which provides graphical and auditory feedback. Our prototype uses entirely consumer-grade equipment: A USB webcam, a projector, and a 2 GHz desktop with 5.1 surround speakers. Unlike many AR-Toolkit applications, our players are not encumbered by head-mounted displays. Face-to-face gameplay, integrated with the physicality of a traditional dice game, display results on a shared projection screen from a third-person point-of-view. This combination of elements provides a unique application of AR-Toolkit for merging the spectacle of modern video games with a tangible interface.

Keywords

Augmented reality, dice, entertainment, game, interface

1. Introduction

Dice have been part of the way that humans play games probably about as long as they have been playing games at all. Recognizable six-sided dice have been found near Rome dating back to 900 B.C.[2]. Dice are most often associated with gambling games and strategy war games, which both use dice in highly abstract ways. Gambling games, such as craps, usually require exogenous value (money) in order to be entertaining. War games, such as *Risk*[3], derive most of their entertainment value from strategy and planning, not from rolling dice. Augmented Reality (AR), affords us with new opportunities to change this perspective.

Constructing six-sided dice with a glyph on each face and tossing them underneath a computer's camera allows us to directly associate content with the roll of a die, and use the computer's processing capabilities to instantaneously determine the result of a roll. Not only can we determine the results of a complicated roll significantly faster, but we can also provide visual and auditory feedback, directly communicating the result of the roll.

Moreover, we are able to provide this additional spectacle to the gaming experience without taking away the physicality of throwing dice, as in computerized versions of board games.
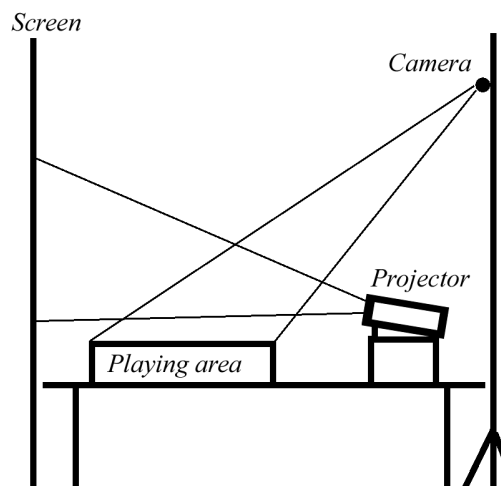

Figure 1. Third-person augmented reality table.

2. System description

Most augmented reality applications are designed around the use of expensive, delicate head-mounted displays (HMDs)[4]. Our augmented reality system consists mainly of a wooden, felt-covered "rolling pit" that rests crosswise on a long folding table, and an

inexpensive camera. The camera is tilted to offer a three-quarters view of the rolling pit, which provides acceptable glyph recognition, while still giving a three-dimensional feel from a fixed camera position.

At the head of the table is the screen for our projector. Each corner of the table has a speaker from our sound system, with the "front" speaker located directly beneath the screen, and the sub-woofer beneath the table. The computer running our software, a 2 GHz Micro Pro running Windows XP, is to the side of the table.

Our user-tests find that players have no problem adapting to the third-person screen. We also find that leaving guests fully unencumbered of HMDs naturally encourages communication[5], and fosters a sense of shared space.

Covering the rolling pit in felt not only makes the interface feel more like a place where dice should be rolled, it also improves AR-Toolkit's glyph recognition by reducing glare, and prevents damage to the dice due to excessive rolling. However, the dark green felt also forced us to leave white borders around the usual black squares of the glyphs on each face of the dice in order to prevent severe recognition problems.

3. Game Mechanics

Our intention was to provide just enough entertainment that our players could see the potential for this sort of interaction.

Our dice game, AR Wizard Duel, depicts a battle between two powerful wizards, who summon creatures out of spell cubes to attack each other. There are three levels of creature: goblin, cannon, and dragon. Each creature defeats anything weaker than itself, and, if up against a creature of the same type, ties. Each creature's glyph appears twice on each wizard's die. The wizards continue dueling until one wizard has suffered three losses.

4. Future Improvements

From the perspective of game mechanics, AR Wizard Duel can grow in many ways, but we would prefer to focus on those ways that would accentuate AR Wizard Duel's ability to combine videogame logic and effects with a real, tangible interface. One example would be time-delayed spells, which must be stopped by playing certain cards, or rolling certain results on dice before they make their way across the table.

We also find that our table easily lends itself to developing other kinds of games. We are particularly interested in exploring new AR game designs that leverage the physicality of the table, with the graphics and sound afforded by the computer.
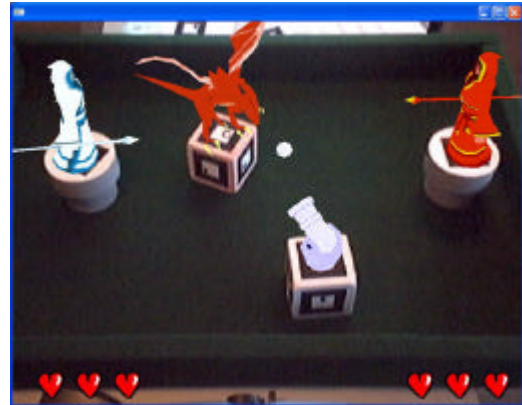

Figure 2. AR Wizard Duel in action.

From a hardware standpoint, the fact that our AR gaming table was built entirely out of consumer-grade materials allowed for rapid prototyping. In future versions, we would like to incorporate a higher-resolution camera and a more reliable lighting system. We believe that continuing to develop applications that use inexpensive, durable hardware will help bring augmented reality into the eye of the public[6].

5. Acknowledgements

6. References

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[2] http://members.aol.com/dicetalk/history1.htm

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[5] Grasset, R., Gascuel, J., "MARE : Multiuser Augmented Reality Environment on table setup," SIGGRAPH 2002 p. 213.

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