“In Real Life” Games: 3D Blockbreaker

Hafez Rouzati
Georgia Institute of Technology
1100 Hammond Dr. Suite 410A-216, Atlanta, GA, 30328
hafez@gatech.edu

Professor Ellen Do
Georgia Institute of Technology
ABSTRACT
This paper describes the design and implementation of “3D BlockBreaker”, an augmented reality game in the vein of the arcade classic Breakout.

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Augmented reality, games

ACM Classification Keywords

INTRODUCTION
Social and geo-spatial games such as Assassin and GeoCaching have gained popularity particularly in the realm of mobile computing. As computer games move from desktops to network-aware mobile computing platforms such as the iPhone, these entirely new types of games have emerged that combine web sites / social networking platforms with aspects of the real world, such as physical locations & artifacts. In recent years we have again seen a new genre of commercial & research oriented games emerging in the form of mobile, handheld augmented reality games. 3D BlockBreaker is a prototype game that provides a proof-of-concept for the evaluation of social-spatial AR games.

MOTIVATION
The motivation for this game was to begin to understand how games that are played “in real life” can be different than traditional computer games as well as an example implementation for exposition of the capabilities of a still nascent augmented reality platform, which cannot be documented as it is currently part of ongoing research.

RELATED WORK
The game finds its roots in the existing genre of typical block breaker games that descend from the seminal original Breakout[1], all of which have the same basic premise: a ball is hurled towards several rows of “bricks” or “blocks” and the user must horizontally maneuver a “paddle” to prevent the ball from falling into abyss opposite the brick wall while at the same time striving to deflect the ball to collide with, and therefore break, the blocks. In simple versions of the game, all the blocks are breakable, but many variants change this behavior.

Several existing variations introduce additional game mechanics in addition to the above outline such as power-ups that are uncovered by breaking particular blocks. The power-ups typically include changes to the game such as lengthening of the paddle, multi-ball play, and in more recent variations, a pair of projectile firing additions to the paddle edges that can be used to shoot blocks rather than break them with the ball[2].

In the augmented reality realm, several much more advanced games such as Arhhh![3] have emerged that also attempt to leverage the space in which the game is played.

DESCRIPTION OF GAMEPLAY
Basic Gameplay
The 3D BlockBreaker board consists of a cube, with gameplay taking place on all but the bottom face of the cube. Although the underlying platform allows for the game to be positioned at any GPS location (and this can become important in networked play), by default, when the game is started a new cube appears approximately 1 meter in front of the user’s current location. The paddle is controlled using a finger to touch the screen and move the paddle horizontally.

Multiplayer Networked Play
The game also includes a networked mode wherein multiple players can play in either competitive or cooperative modes. In cooperative play, two paddles appear and players must break all the blocks. If the players are co-located, the players must navigate the same physical space, emphasizing the cooperative play of the game. In competitive play, the other player’s score is shown and each player endeavors to be the first to break all the blocks.
DESIGN & IMPLEMENTATION
The design process was rather ad-hoc and single-minded in its goal to spatialize a classic game in an AR context. Some other games were prototyped as well including AR Snake (the most played mobile phone game in cell phone history).

The game was implemented on an as yet unreleased augmented reality framework that allows for location based augmented reality applications to be developed. The framework allows for rapid prototyping of games using web technologies such as JavaScript, CSS, and HTML and the game was in fact programmed entirely in JavaScript using the HTML5 Canvas tag for 2D drawing. The 3D perspective and augmented reality aspects of the implementation are confidential information at this time.

DISCUSSION & CHALLENGES
As previously mentioned, this is certainly not the first game that attempts to leverage spatiality in augmented reality, but it is perhaps an early attempt to explicitly use spatial concepts as an integral part of the game’s construction. Since the game is much simpler than other AR games, it may perhaps be a good candidate as a testbed for understanding player’s spatial perceptions in when playing AR games.

Certainly working with technology that is still under development, namely the enabling platform, posed a challenge that many researchers are perhaps familiar with. There are also a number of user interface concerns that could perhaps be better addressed, such as the method in which the player must access the top face of the cube. This posed a challenge because it is not clear if the spatial metaphor should be embraced entirely, meaning that to see the top face, the device must be turned to “look down” upon the top face of the cube or to provide the user with some additional affordance to access the top face of the cube.

CURRENT AND FUTURE WORK
Due to delays in the release schedule of the underlying platform technology, the current implementation does not use any sort of registration or tracking that is typical of augmented reality applications, but rather strictly makes use of GPS data and three-dimensional orientation to manage the physical location. While this leads to what is sometimes described as a “swimming” experience, future versions will make use of marker or natural feature tracking in order to introduce tighter registration of the virtual objects to the physical world.

The current prototype implementation only has a single side of the cube implemented. The author hopes to implement the full 3D cube version as well as the multiplayer functionality in the coming weeks as a full-featured demonstration of the capabilities of the underlying platform.

The author hopes to evaluate the perception of the effects of spatialization of the game by conducting a user study as well as evaluating the effect of spatialization on cooperative play in both co-located and non-co-located settings.

CONCLUSION
3D Blockbreaker is an augmented reality game in the vein of Breakout or Araknoid. It leverages the physical space where the game is played to create an entirely unique hybrid in this family of classic games.

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