YouDash3D - Exploring Depth-based Game Mechanics and Stereoscopic Video in S3D Gaming

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ABSTRACT
In our current work, we explore novel gameplay opportunities in stereoscopic 3D (S3D) gaming. Our game prototype, YouDash3D, showcases first results in the following challenges: (1) how can stereoscopic gameplay differ from current gameplay in a way that is especially effective with S3D display, and (2) how can S3D video contribute to interactive gameplay? In conclusion, we propose entertaining S3D video effects and depth-based game mechanics.

Categories and Subject Descriptors
K.3.2 [Computers and Information Science Education]: Computer science education; K.8.0 [Personal Computing]: General—Games

General Terms
Design

Keywords
games, stereoscopy, game design, s3d video, depth-based game mechanics

1. INTRODUCTION
Currently, several game console systems feature S3D effects in games, i.e. Playstation 3, Nintendo 3DS, or Nvidia 3D Vision offer S3D vision as an option for existing games. These often provide identical game mechanics but presented with S3D graphics. Only little impact is known to result from S3D vision in games. 85% of the participants preferred S3D over 2D in Quake III: Arena. The gaming performance initially was higher in S3D but equal to 2D after prolonged use [6]. LaViola and Litwiller also found that although participants preferred playing in S3D for the tested games, it would not provide any significant advantage in overall user performance. In addition, users’ learning rates were comparable in the 3D stereo display and 2D display cases [4]. All in all, we need to find games that work much better in S3D than in monoscopic vision to prove an effect [9].

Gameplay can potentially benefit from S3D presentation, e.g. S3D depth cues can provide more precise information for distance judgment than monocular cues. Consequently, players could perform tasks more efficiently (e.g. [3]). Based on an analysis of cognitive limits of S3D vision, we recently proposed a list of stereoscopic game design concepts [7], e.g. game mechanics that involve depth-estimation tasks. A second fascinating aspect is to see oneself filmed in S3D. In this paper, we explore depth-based gaming and integration of S3D video in a game engine using our prototype YouDash3D.

2. TECHNICAL SETUP
Our setup allows two people to play on a 3D display, filmed by a 3D camera (see Figure 1). S3D display is achieved through 3D Vision shutter glasses and a 120Hz LCD display. As the driver does not support quad-buffered stereo in DirectX rendering on consumer graphics cards [5], we use a multi-pass stereoscopic video rendering approach (MSVR) [8]. Our camera rig consists of two Fraunhofer microHDTV supporting Full HD resolution at 24 to 30 Hz (synchronized). The rig is connected to a professional video capture board (DVS Centaurus II) via HD-SDI. The software runs on a typical gaming PC running Windows 7, with Nvidia GeForce GTX 470, Intel i5 CPU, and 8 GB memory. Our implementation of MSVR was incorporated into the Havok Vision Engine, a professional game engine widely used for commercial games, e.g. The Settlers 7 [2]. Our software allows splitting the S3D camera image to distribute parts of the image across the 3D scene. Each split can be set independently within the scene [8]. Interaction through optical movement detection is provided through subtraction of subsequent images. Despite the huge amount of data due to a S3D HD
video stream of about 2.5 Gbit/s and the MSVR approach, our setup allows for interactive frame-rates of 25-30 fps.

3. S3D GAMEPLAY OF YOUDASH3D

The core game concept allows two contestants to race each other (see Figure 2). For getting closer to the finish line, they must destroy objects which fly in direction of the players. The players can induce damage to the flying objects by creating movements within the player video frame. The closer these objects explode to a player’s depth, the faster he/she gets to the goal. The player who reaches it first, wins. We describe the gameplay according to Fullerton’s formal elements of games [1].

Depth-based conflicts and objectives: We suggest creating the main game conflict around depth perception: Are two objects located in a similar depth range? The player has to interact when he or she estimates two objects to be at the same depth. The main idea is to constantly update the depth-estimation conflict: Each time a player destroys an object at correct depth, the player’s video moves in depth approaching the goal. Thus, each iteration of moving for a new object effectivly bears a new depth estimation task.

S3D video outcomes: We put the finish line slightly out of screen and let the competitors start deep in the background of the scene, running towards the finish line into the foreground. Seeing oneself in 3D video has a very positive effect. Starting with a small video and getting closer to the screen depth makes the video larger and shows more rewarding detail. The forward movements of the players’ efficiencies are non-linearly scaled: players in the foreground need to trigger more objects for the same amount of progress than in the background, effectively increasing suspense during the final stage of a race.

Rules and procedures: The objects need less time to reach the player’s video in the foreground than in the background, making it the more difficult the closer a player gets to the goal. The difficulty can be further varied through different object paths, sizes, or speed. The duration of a round can be changed by adding automatic braking: the players slowly go back into the background when no object is destroyed until a maximum distance. Players can perform only slowy go back into the background when no object is destroyed until a maximum distance. Players can perform only

4. DISCUSSION AND FUTURE WORK

Our prototype YouDash3D offers depth-based gameplay featuring high-definition S3D video within a professional game engine at interactive frame rates. It demonstrates novel presentation effects of S3D vision in games. Especially showing the players in stereo is a fascinating experience. It is also one of the first attempts to actually utilize stereoscopic presentation for game design through depth-based game mechanics. The actual effect in performance and gaming experience still needs to be evaluated. Furthermore, the current implementation does provide depth-information to the players through a detailed S3D HD video integration. Currently though, the players movements are mapped to the fixed plane of the video within the game scene. Hence, a perfect fit would be the integration of depth cameras, e.g. Microsoft’s Kinect platform.

5. REFERENCES


