
Capture The Flag Demo: Engaging In A Multi-Device Augmented Reality Game

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Abstract

We present a Capture the Flag based game that investigates the possible engagements in a multi-device game. The distinction between a publicly used space and a player's private space is made and utilized to display different information to players. The tablet and the Augmented Reality component are used to see how players can be drawn to a certain physical space, to create a social and engaging game. The demo allows the users to experience a different setup for a multi-device game that attempts to engage the users with the space and each other.

Author Keywords

Augmented Reality; Multi-device; tablet;

ACM Classification Keywords

H.5.2. User Interfaces: Input devices and strategies, Interaction styles

Introduction

There are many different devices used in all aspects of everyday life. Many games typically are played using one main device (e.g. a smartphone, computer, television). Multiplayer computer games are often created so that users can play remotely and do not rely on the physical presence of the other players. However, games are also often played in a social setting. Families and friends often play board or card games together to pass the time.

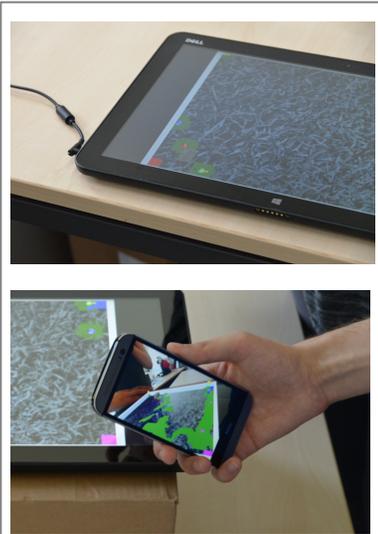


Figure 1. The game was developed to be played on a large multi-touch tablet and multiple smartphones.

This project challenges the traditional setup of a multi-player game and examines the possibility of engaging a group of players in a single game, while still allowing the possibilities that a computer or video game provides. It uses Augmented Reality (AR), an indirect view of the physical world, to provide each player with his or her own information unavailable to other players. Augmented Reality involves “augmenting the real world with computerized information” [2]. In this case, the real world is locked on top of a shared tablet screen that displays certain aspects of the game to users. This project experiments with different information being displayed on different devices to highlight important information.

Related Work

Previous work has been done to investigate the shared and private spaces to allow the multiple users to interact at once with media facades [5]. This project found that one could avoid cluttering up the space on a shared interface, by augmenting a live feed of the video on a smartphone to give the users more information. Interactions using a live video have not always allowed a natural interaction for the user. Object-oriented interactions use tracking to allow the smartphone to be physically oriented in the real world [3]. This gives the user a more natural of sense of how their interactions will affect the video. This is incorporated through the movement interactions of the user.

Through the implementation of a Tower Defense game, the use of a smartphone as more than a controller was investigated [4]. The game involved using a tablet to provide certain input and using motions and touches on the smartphone as a different source of input. This project focused on a game that did not require time

sensitive input from the user, allowing the acceleration and position of the smartphone to be used. In the capture the flag game, certain interactions that require more precision, such as moving artificially into a tower, were avoided due to the real time nature of the game.

Game Implementation

In order to investigate the possibilities to engage the user with multiple devices, a Capture the Flag game was implemented. The game was created to be run using a XPS 18 Windows Multi-touch Tablet and 2-4 Android smartphones.

The game was created using Unity and written in C#. The UNET networking system from Unity is used to accommodate the multi-device aspect of the game. In order to include features specific to the Android platform, Java plugins were also incorporated. To incorporate the augmented reality features used in the game play, Vuforia was chosen as a free option that could be easily incorporated into a Unity game.

Game Play

The implemented 2-4 player game is based off of Capture the Flag [1]. There is a public space, the tablet, that hosts the game. On this public space, each player’s location and their immediate surroundings are displayed, as well as each of the bases and flags. In addition to the information the players can see on the public tablet, each player receives additional information on the Android smartphone they use to connect to the game. The player’s view of the playing field is enhanced using Augmented Reality, to show the objects and obstacles, or lack thereof, at the locations the player has already visited. This private information is only available to a single player at each location,

providing that player with additional expertise of the terrain at that location.

The game begins with each player at their own base. The players can gain the view of the playing field on their devices by pointing the smartphone's camera at the tablet. The Vuforia system can recognize the target, and the objects will appear as a 3D representation over the board. Each player can then move by touching the target location on the game world representation on his or her smartphone. The player can also blow into the microphone on his or her smartphone in order to move faster.

In order to steal a flag from another player, the player must first move into the base of the other player. Then he or she must tap 5 times on the tablet in the base of the player whose flag they are trying to steal. This then sends a vibration notification to the player whose flag is being stolen. Once the player brings the other flag back to his base, the player whose flag was stolen is eliminated from the game. The last player remaining at the end of a round, wins the game.

To defend his or her flag, a player can take a couple of measures. Once their flag is stolen, a player can no longer steal another flag, but must go defend his or her own flag. To do this, the player essentially needs to run down the other player. If he or she hits against the other player who is carrying his or her flag, the flag is immediately returned to the base and the other player is stunned. To aid in catching a player, or escaping a player, each player can set traps using the volume controls on the smartphones. Although there is no limit to how many traps a player can place, there is a time interval after each placed trap before another can be

placed. These traps stun the other players if run over, but will not affect the player that placed them.

Demo

The demo will allow four users each with a smartphone to play Capture the Flag with a large, multi-touch tablet. The tablet will lay flat on an elevated surface, as shown in Figure 2. The players will stand around the tablet, holding a smartphone in hand. The users will have the opportunity to play a round of the game.

The initial screen that is displayed on a users application, asks if they would like to connect as a player or as the host. Once a user connects to the host game he or she is in the lobby. As soon as all connected users in the lobby click that they are ready, the game will start.

Once the game begins, the users will be able to move their players, place traps, and steal flags as described in this paper to try to be the last man standing.

Conclusion

Attendees will be able to interact with a game in a new, nontraditional way. The controls and setup of this Capture the Flag game seek to engage the users in the experience in a way that has not been done. The real time game will provide the users with the challenge of where to focus their attention as they try to move, place/avoid traps, and protect their flags. The method chosen for movement experiments with a possibly natural movement, although it will be up to the user on whether this is actually intuitive. The users will also experience the draw of the 3D augmentation of the 2D tablet, and will get to experience a social, multi-device game played in a common physical space.

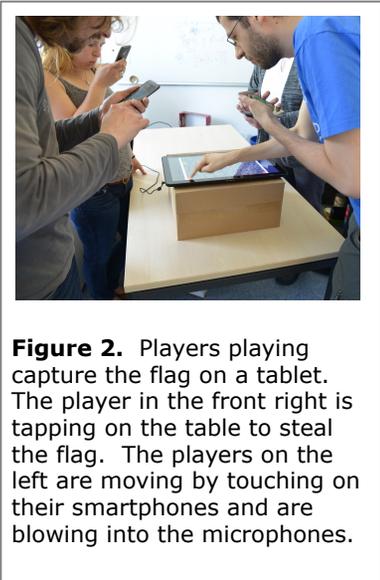


Figure 2. Players playing capture the flag on a tablet. The player in the front right is tapping on the table to steal the flag. The players on the left are moving by touching on their smartphones and are blowing into the microphones.

References

1. Capture the Flag - wikipedia, the free encyclopedia. http://en.wikipedia.org/wiki/Capture_the_flag, 2015.[Online; last accessed 16-08-2015].
2. Emmanuel Dubois and Laurence Nigay. 2000. Augmented reality: which augmentation for which reality?. In *Proceedings of DARE 2000 on Designing augmented reality environments* (DARE '00). ACM, New York, NY, USA, 165-166.
3. Masayuki Tani, Kimiya Yamaashi, Koichiro Tanikoshi, Masayasu Futakawa, and Shinya Tanifuji. 1992. Object-oriented video: interaction with real-world objects through live video. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '92), Penny Bauersfeld, John Bennett, and Gene Lynch (Eds.). ACM, New York, NY, USA, 593-598.
4. Paul Tolstoi and Andreas Dippon. 2015. Towering Defense: An Augmented Reality Multi-Device Game. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems* (CHI EA '15). ACM, New York, NY, USA, 89-92.
5. Sebastian Boring, Sven Gehring, Alexander Wiethoff, Anna Magdalena Blöckner, Johannes Schöning, and Andreas Butz. 2011. Multi-user interaction on media facades through live video on mobile devices. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '11). ACM, New York, NY, USA, 2721-2724.