Bring the tablet to the table: analyzing the use of extended screen in party games for mobile devices

Felipe Delazeri Riffel

Milene Selbach Silveira

School of Technology PUCRS Porto Alegre, Brazil felipe.riffel@gmail.com; milene.silveira@pucrs.br

Abstract— Party games are traditionally played by a group of two or more players, using analogical cards or boards, in the same physical environment. In electronic games, party games can be exemplified by multiplayer split-screen games, in which the screen is split in parts, each of which exposing a specific player view. In this work, instead of splitting one screen to multiple players, we decided to extend it through all players' device screens. We implemented a multi-screen game based on the classic Pong, and analyzed it through observing 16 users, playing in groups of two or four players. Results have shown user satisfaction regarding this kind of game, opening possibilities to deepen research and development of this game style.

Keywords: multiplayer game; extended screen; mobile games; Pong

I. INTRODUCTION

Games for mobile devices have been growing more than games designed for other platforms – such as consoles or computers – in recent years [5] [10].

Considering the specific case of multiplayer games nowadays, it is easy to find a great variety of genres and styles both on mobile platforms and on consoles and computers [9]: FPS (First-Person Shooter), games where players are commonly placed in an arena to battle under a first-person perspective; MMORPG (Massively Multiplayer Online Role-Playing Games), games where players must create and control his character through a story in a fantasy world shared by hundreds of players; Social Games, simple themed games whose main focus is on sharing their achievements in social networks; and, Party Games, which are commonly played face-to-face among friends and families, historically using analog means such as card and board games; among others.

In the research here presented, our focus is on Party Games. This multiplayer game style needs to be played by a group of two or more players in the same physical environment. Party games can be exemplified, in electronic games, by multiplayer split-screen games [14], in which the screen is split in different parts, each of which exposing a specific player view. In this work, instead of splitting **one** screen into multiple players, we decided to **extend it** through all players' device screens.

Although we have found different examples of multiplayer games that can be considered Party Games ([1][4][8][12][15]) we have not found any that allowed the extension of screens between devices. Considering related academic work, we have only found the work of Kauko and

Häkkilä [8], demonstrating that mobile devices can be a good platform to implement Party Games.

In this context, we aim at analyzing the extended screen idea through the implementation of a game based on the classic Pong and the observation of 16 users, bringing their impressions.

In the following sections we describe the implementation of the developed Pong version, and we discuss the analysis done, based on our observations of the game being played in groups of two and four players. Lastly, we present our final considerations, followed by the references used in this paper.

II. MULTISCREEN PONG

The game proposed for our analysis is a competitive multiplayer game that can be played by teams composed by 2 to 4 players. Its theme is based on the classic game Pong, whose first version was released in 1972 by Atari [11].

The game design [2][13] of Multiscreen Pong follows the original rules from classic Pong, having as its main difference the way the game is shown for players. For two players, the difference from the classic one is that the game area is extended between the screens of two mobile devices as exemplified on Figure 1.



Figure 1. Screen extension between two mobile devices.

For matches with four players, the game area is duplicated. Each team, composed by two players, will be positioned in one side of the field. The field will be split in four and each part will be visualized by a different mobile device, as exemplified on Figure 2.

In both game modes the ball will increase its speed over time to gradually increase the game difficulty. The victory relies upon the first team to reach 10 points.



Figure 2. Screen extension between four mobile devices.

A. Technology

The proposed game was implemented for iOS platform bearing in mind that it would be played using iPads. We used the Sprite Kit framework [16], a framework provided by Apple for 2D game development. The communication was implemented over Bluetooth Low Energy [3] using the BLE framework provided by Apple as well.

B. Implementation

To benefit the most from the Sprite Kit framework, we used the scene base class provided by it - SKScene - and for the generation of the objects in scene, like the ball and the rackets, lateral colliders, etc., we used the object class provided by the framework called SKShapeNode (Figure 3).



Figure 3. Class diagram.

In the implementation of SKScene, there are several methods that are called during the lifetime of each frame and among them there is didSimulatePhysics. This method is called exactly once each frame, after running game events and prior to the consolidation of the scene for on-screen viewing. On the server, with the execution of the didSimulatePhysics method, the racket positions of each client user are updated and the current position of the ball is taken and sent to all clients. In clients this is the method in which the position of the ball received from the server will be updated.

Another interesting item of a SKScene is that it has a camera object, which sets the user's viewing window in the game. Thus, all client players will use the same scene having only a different camera positioning for each user, each user viewing a different portion of the scene.

SKShapeNode is a class that provides the entire implementation and structure for the insertion of objects in scene, as well as providing the possibility of coupling to this object of a physically simulated body and collision verification through a SKPhysicsBody.

By using SKShapeNode together with SKPhysicsBody it is possible to configure the scene to receive a new didBegin method, which will be triggered whenever two SKPhysicsBody come in contact with each other, that is, every time a contact is started. Through this method it is verified if the ball comes in contact with the wall behind each racket, thus controlling the score of the game.

Due to the purpose of the game - which can be played with 2 to 4 devices - the communication between them is a crucial point for its correct functioning and gameplay.

The connection to be used should be simple, fast and without the need for complex configurations, and ideally, it should not use the internet. The game communication was designed based on a client server communication, using the BLE protocol to simplify the communication process. Each device is responsible for its paddle position and the server is responsible for consolidating the information about everyone's paddles and keeping the information about the ball, player score, and game state.

By means of simplification, the server will be the device that starts the match. Thinking over BLE protocol, the game server will be BLE Central and all clients will be BLE Peripherals. Finally, GATT (Generic Attribute Profile) [6] protocol created for the game is presented in Figure 4.



Figure 4. GATT protocol.

Finally, the server device will be responsible for all the events that will occur in the game, such as checking points and moving the ball. The other devices will be the clients, who will only inform the server of their name and the current 'racket' position.

III. ANALYSIS OF USE

In order to analyze the users' impressions on the use of screen extension, we devised a user study.

A. Methodology

The study was carried out with 16 participants who were invited to voluntarily participate in the study. They were divided in groups of 4 and for each group the following script was followed:

- 1. Description of the main objectives of the study.
- 2. Presentation and signature of the Informed Consent Form.
- 3. Matches in pairs: 2 players.
- 4. Matches in group: 4 players.
- 5. Questioning session about the game impressions.
- 6. Thank participants for their help.

The authors of this paper and an undergraduate student observed each match (Figure 5). The undergraduate student does research in the Human-Computer Interaction and Games area and was responsible for taking notes during the interactions.



Figure 5. User observation during Multiscreen Pong use.

B. Participants

The age of the 16 participants of the study ranged between 15 and 37. Most of them (11 out of 16 participants) have the habit of playing board games. As for the habit of playing this kind of games, at least 7 of them usually play them eventually (Figure 6).

13 out of 16 participants usually play games on mobile devices, whereas only 6 of them have the habit of playing multiplayer games specifically on mobile devices. The most played genre by the participants in mobile devices is Puzzle (14 out of 16 participants), followed by Adventure (11). The remake of classic games (which is the focus of this article) was in the fifth position with 6 of the participants having indicated it (Figure 7).



Figure 6. Users' answers about board games frequency of use.



Figure 7. Users' answers about mobile games style used.

Furthermore, in relation to specific games with the dynamics of screen extension between devices, 15 of the 16 participants said they had never seen any such game.

C. Results

Considering Multi Screen Pong, 14 out of 16 participants found the dynamics of extension between good and great and affirmed they would like to play the game again.

Most users think that the best occasion to play it would be meeting friends (14 participants), or College/School (9 participants) or in a bar (6 participants).

Even with areas for improvement (to be discussed in the next section), Multi Screen Pong pleased and amused users, according to their own comments during games, such as: "Wow, that is fun!", "I thought that Multi Screen Pong was cool. I found it really fun, especially in the quartet mode.", "I really enjoyed the game...", "The game is a lot of fun".

D. Areas for Improvement

Some areas for improvement in game design had been highlighted by the users during the matches and based on free comments left at the end of the post-test questionnaire.

Several users commented that the game difficulty was very low. Increasing the initial speed and the speed rate of the ball could be interesting to make it more challenging and fun. One of the users even mentioned the following during the matches: "*Won't it be faster?*". Another time, one of the users commented: "*If we wait until the number of points is five, it will take a long time at the current pace*".

Another point of improvement is that there are few angles of rebound of the ball on the racket, which caused a vicious cycle in several moments of the game, as stated by a player during the games: "*It has got a physics problem*"; and some other participants commented that it would be interesting if the angle was narrower at the racket's edges and less closed in the center, which could solve this problem.

Several users commented that some game information such as the score or who belonged to which team, was not clear on the screen: "Is it 2x0 for whom?", "Is there a limit value to finish?", "How long do we have to play?", "I cannot see the score?".

In addition, it was detected an instability in the closure of the matches, with the final scoreboard not even being shown at times. This happened more often in the game server devices. It was also noticed an instability in the connection when an older device was a client of a newer device, causing lags in one of the matches, which prevented the game from continuing.

Finally, the game among 4 players had its beginning thought to be confusing by the players, mainly because they could not understand where each device should be positioned. One of the players found such confusion amusing and proposed that a game mode with this theme would be interesting.

IV. FINAL CONSIDERATIONS

The growing development and use of mobile games open up space for new development possibilities. Party games, traditionally played in groups, using analogical cards or boards, are one of these possibilities. The prospect of combining the multiplayer style with traditional (and face to face) board games in a single (and not virtual) environment, allows users not only to play with each other but to interact *in vivo* with each other.

In this scenario, we developed a multiplayer, multi and extended screen of the traditional Pong game. Not only did the observed matches allow us to identify a series of improvements to be implemented in the game, but also to experience the possibilities of fun and joy that the interaction through this kind of game allows. Our initial results point out the possible acceptability of this kind of game, introducing new market and new research possibilities. Let us bring the tablet to the table!

As next steps, in the technical side, we mainly need to refine the BLE communication process to fix the game instability. Considering playability, we need to improve the game as a whole, including possibilities to configure the ball speed, and new mechanics to increase competitiveness, among others. Users' ideas to new game modes, such as shuffling the screens, could also be explored as well as new users' studies to help us analyze the possibilities of use of this style of game.

ACKNOWLEDGMENT

We thank all the participants from the Multi Screen Pong analysis. We also would like to thank Mayara Jesus de Oliveira for the support taking notes during the interactions.

REFERENCES

- [1] Bam Fu, Game Oven, June 20, 2013. APP. Available for iOS and Android.
- [2] B. Bates. Game Design: The Art & Business of Creating Games. United States of America: Prima Publishing, 2001.
- [3] Bluetooth. Bluetooth Low Energy. Available in https://www.bluetooth.com/what-is-bluetooth-technology/how-itworks/low-energy>. Accessed in April 12, 2017.
- [4] Bounden, Game Oven, May 21, 2014. APP. Available for iOS and Android.
- [5] Gaming's Mobile Growth: A Special Report with IDC. Available. February 22, 2017. Available in https://www.appannie.com/en/insights/mobile-gaming/gamingsmobile-growth-special-idc-report/. Accessed in June 18, 2017.
- [6] Generic Attributes (GATT) and the Generic Attribute Profile, Bluetooth SIG. Available in https://www.bluetooth.com/specifications/generic-attributesoverview >. Accessed in June 12, 2018.
- [7] J. Kauko, and J. Häkkilä. "Shared-Screen Social Gaming with Portable devices,", Proc. International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI'10), ACM, 2010.
- [8] King of Opera, Tuok10, November 20, 2013. APP. Available for IOS and Android.
- [9] B. E. Mian, and N. Thakrar. Development Guidelines for Mobile Multiplayer Games. 2013. Bachelor of Science Thesis (Degree project, in Computer Science). KTH Royal Institute of Technology. Stockholm, Sweden.
- [10] Mobile Games Generated Over 25% More Direct Spending Than PC Games, and More Than Twice as Much as Home Consoles Games Last Year, According to New IDC and APP Annie Report. Press Report. Available in <u>http://www.idc.com/getdoc.jsp?containerId=prUS42328217</u>. Accessed in July 1st, 2018.
- [11] Pong, Atari, 1972. Electronic game.
- [12] Ready Steady Bang, Noodlecake Studios, September 15, 2011. APP. Available for iOS and Android.
- [13] A. K. O. Sato, "Game Design e Prototipagem: Conceitos e Aplicações ao Longo do Processo Projetual," Proc. Simpósio Brasileiro de Jogos (SBGAMES 2010), SBC, 2010.
- [14] Slip-Screen Multiplayer. Available in https://www.giantbomb.com/split-screen-multiplayer/3015-322/. Accessed in April 12, 2017.
- [15] Spaceteam, Sleeping Beast Games, December 1st, 2012. APP. Available for iOS and Android.
- [16] Sprite Kit, Apple. Available in https://developer.apple.com/spritekit/. Accessed in April 13, 2017.