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DEVELOPMENT OF KATAAR GAME FOR MOBILE

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By

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Abstract

The Kataar game is a board game played by two players and popular among a variety of people in various places in Afghanistan. People play it on ground or on a wood board or paper. The goal is to develop *Kataar* game for mobile devices with a touchscreen. We will make offline two player and online two players of this game, with help of social media (Facebook, twitter, Google plus…) player can login to game. In this thesis we only use Facebook API.

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Chapter 1

1 Introduction

In the game development industry, small game companies have a chance to be viable by distributing their games in the new digital distribution platforms, such as Appstore & Google Play Store. It is common for a game company to produce several games that fail in giving their return of investment. However, big hits can stand out and cover the costs of the failed games.

Games are entertainment and they should thrive to create fun and engagement. The game made in this thesis twists that fact, by bringing in a puzzle engaging game which is well known among many people in Afghanistan.

Game development utilizes a multitude of skills varying from 3d, animation, design, graphics, sound, storytelling, coding to producing. As our game were a 2d game apart from 3d and animation every other aspect were applied to the game.

1.1. Target Audience

The Kataar game's simplicity of roles and playing makes it fit for all age categories but it is mostly played by people above age of 10 years old. So in developing this game we assumed the audience for this game is above age of 10.

1.2. About Kataar Game

Kataar is a turn based board game played between two players. The game is well known in various places among people in Afghanistan. The name of the game is derived from the Dari word (Kataar) which means putting a set of pieces in a row along a straight line. People of different ages play it, mostly on ground or boards made of wood or paper and use small stones or other materials as pieces.

It's a very competitive and quite a tough game you will lose it very quickly if you don't be careful. It's a fabulous game with interesting strategy and very simple rules.

1.3. The board

Board of the game is made of three rectangles, each rectangle is connected to the inner/outer rectangle by four lines. Each rectangle has eight spots which are made of the four corners and four points where lines intersect with rectangles. Spots are where players put their pieces to make moves by turn.

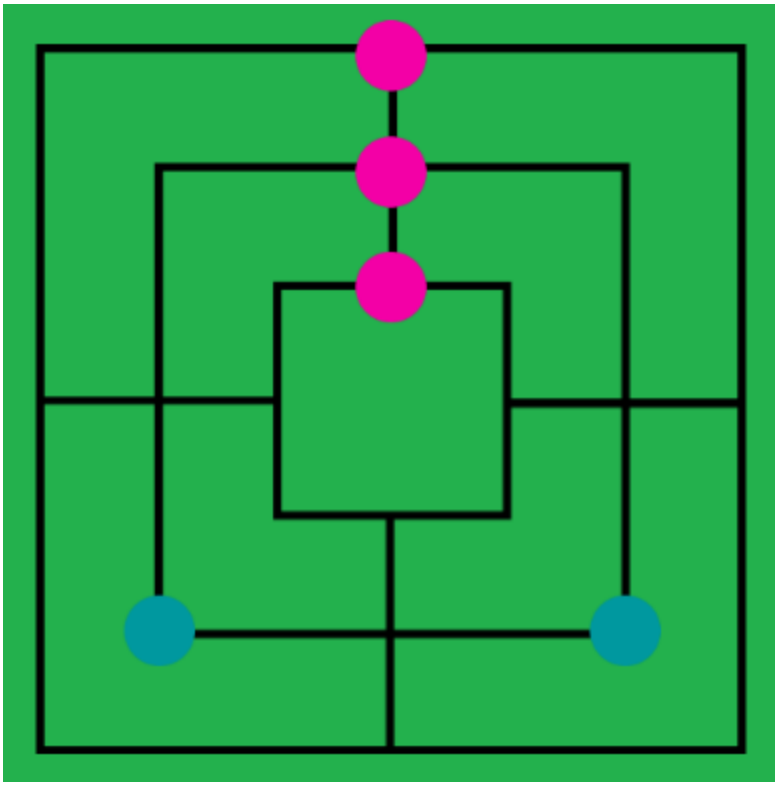

Figure 1: Game Board

1.4. Roles of the game

a) The game is played by two players. Each player has nine pieces. At the beginning of the game both players carefully places their pieces on the specific spots on the board one piece at a time taking turns.

b) After both players finished putting their respective pieces on the board, players move their pieces from one spot to another spot which is in neighborhood to this spot and also not filled with another piece at that time.

c) After the move if the moving side had made a Kataar (three pieces in a single vertical or horizontal row) she can pick off the board one of the opposition's pieces, she cannot pick any of the opponent's pieces that are in Kataar unless there are not any out of Kataar piece available.

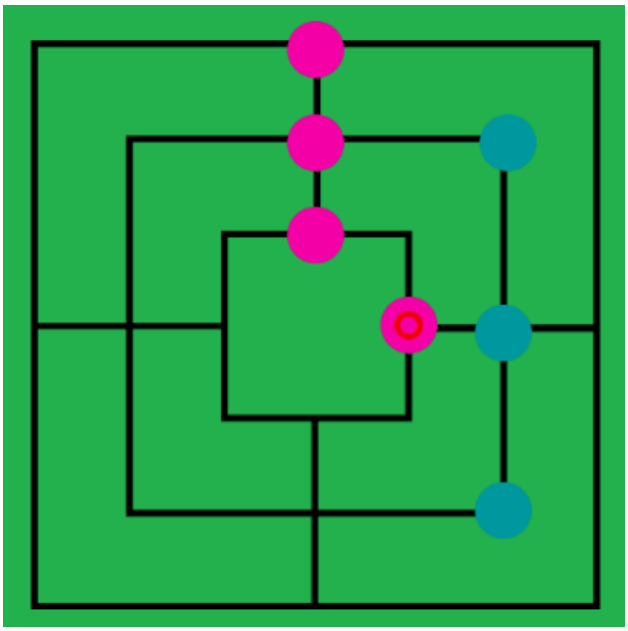

Figure 2: Pickup when out of Kataar piece is available

In the figure 2 the player with blue pieces has made Kataar and can only pick up the opposition player's piece which is not in Kataar but in figure 3 player with blue pieces has made Kataar and because there is not any of his opponent's pieces out of Kataar he can pick up any of his opponents pieces he wants.

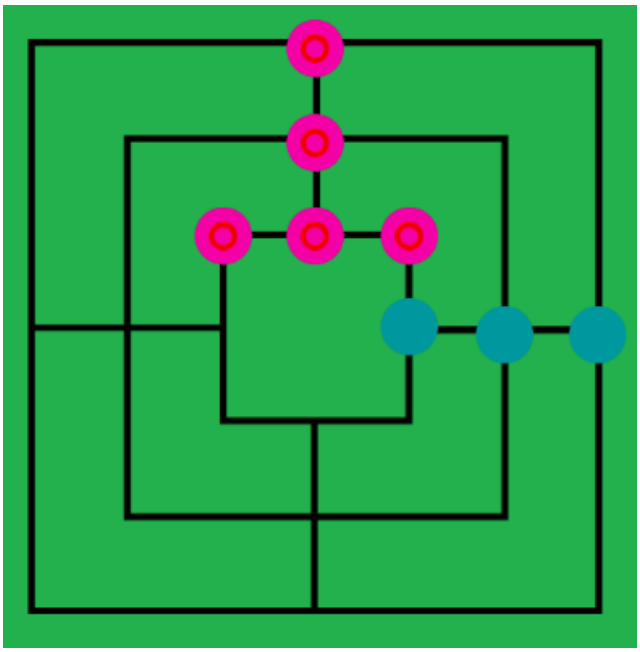

Figure 3: Pick up if no seed out of Kataar is available

The player whose remaining pieces are less than three loses the game and the other one wins the game.

Chapter 2

2 Background Information

A game is structured form of play, usually undertaken for enjoyment and sometimes used as an educational tool. (Merriam Webster, 2016). Games are distinct from work, which is usually carried out for remuneration, and from art, which is more often an expression of aesthetic or ideological elements. However, the distinction is not clear-cut, and many games are also considered to be work (such as professional players of spectator sports or games) or art (such as jigsaw puzzles or games involving an artistic layout such as Mahjong, solitaire, or some video games).

Key components of games are goals, rules, challenge, and interaction. Games generally involve mental or physical stimulation, and often both. Many games help develop practical skills, serve as a form of exercise, or otherwise perform an educational, simulational, or psychological role.

2.1. Gameplay elements and classification

Games can be characterized by "what the player does." (Crawford, 2003) This is often referred to as gameplay. Major Key elements identified in this context are tools and rules that define the overall context of game.

2.1.1. Tools

Games are often classified by the components required to play them (e.g. miniatures, a ball, cards, a board and pieces, or a computer). In places where the use of leather is well established, the ball has been a popular game piece throughout recorded history, resulting in a worldwide popularity of ball games such as rugby, basketball, football, cricket, tennis, and volleyball. Other tools are more idiosyncratic to a certain region. Many countries in Europe, for instance, have unique standard decks of playing cards. Other games such as chess may be traced primarily through the development and evolution of its game pieces.

Many game tools are tokens, meant to represent other things. A token may be a pawn on a board, play money, or an intangible item such as a point scored.

Games such as hide-and-seek or tag do not utilize any obvious tool; rather, their interactivity is defined by the environment. Games with the same or similar rules may have different gameplay if the

environment is altered. For example, hide-and-seek in a school building differs from the same game in a park; an auto race can be radically different depending on the track or street course, even with the same cars.

2.1.2. Rules

Whereas games are often characterized by their tools, they are often defined by their rules. While rules are subject to variations and changes, enough change in the rules usually results in a "new" game. For instance, baseball can be played with "real" baseballs or with wiffleballs. However, if the players decide to play with only three bases, they are arguably playing a different game. There are exceptions to this in that some games deliberately involve the changing of their own rules, but even then there are often immutable meta-rules.

Rules generally determine turn order, the rights and responsibilities of the players, and each player's goals. Player rights may include when they may spend resources or move tokens. Common win conditions are being first to amass a certain quota of points or tokens (as in Settlers of Catan), having the greatest number of tokens at the end of the game (as in Monopoly), or some relationship of one's game tokens to those of one's opponent (as in chess's checkmate).

2.1.3. Skill, strategy, and chance

A game's tools and rules will result in its requiring skill, strategy, luck, or a combination thereof, and are classified accordingly.

Games of skill include games of physical skill, such as wrestling, tug of war, hopscotch, target shooting, and stake, and games of mental skill such as checkers and chess. Games of strategy include checkers, chess, go, arimaa, and tic-tac-toe, and often require special equipment to play them. Games of chance include gambling games (blackjack, mah-jongg, roulette, etc.), as well as snakes and ladders and rock, paper, scissors; most require equipment such as cards or dice. However, most games contain two or all three of these elements. For example, American football and baseball involve both physical skill and strategy while tiddlywinks, poker, and Monopoly combine strategy and chance. Many card and board games combine all three; most trick-taking games involve mental skill, strategy, and an element of chance, as do many strategic board games such as Risk, Settlers of Catan, and Carcassonne.

2.1.4. Single-player games

Most games require multiple players. However, single-player games are unique in respect to the type of challenges a player faces. Unlike a game with multiple players competing with or against each other to

reach the game's goal, a one-player game is a battle solely against an element of the environment (an artificial opponent), against one's own skills, against time, or against chance. Playing with a yo-yo or playing tennis against a wall is not generally recognized as playing a game due to the lack of any formidable opposition.

If the computer is merely record-keeping, then the game may be validly single-player.

Many games described as "single-player" may be termed actually puzzles or recreations.

Chapter 3

3 Technologies and Tools

As we told in earlier part of our thesis developing a game needs a variety of tools. The most important tool is of course the game engine although a game engine is not the only tool we used through development of this game. The following are the tools and technologies we used for developing the Kataar game.

3.1. Game Engine (Unity 3D)

Unity is a video game development environment used for developing games on multiple platforms. It is used to develop games for PC, Mac, Linux, current generation consoles and most popular mobile operating systems.

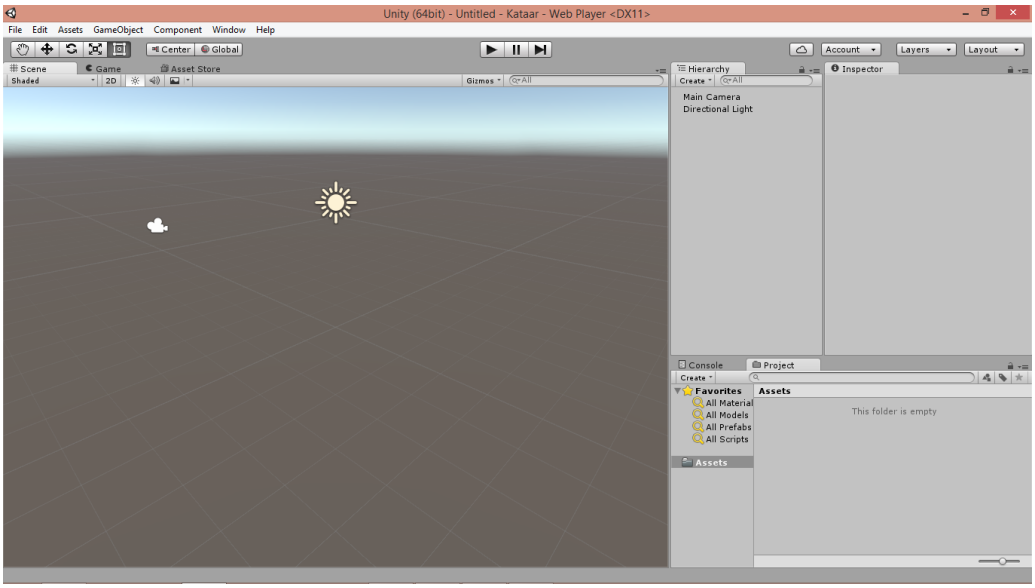

Figure 4: Unity environment

One of Unity's beauties lies in the possibility in cross-platform deployment without the need to rewrite your code base. A handful of system specific tweaks are enough. Unity comes in two versions for PC, free and pro version. The choice for this study was the free version of Unity since purchasing the pro version for a non-commercial project would have been rather costly for a student project and no

problems were seen in realizing the study without Unity's pro features. The free version of Unity does not come with some of the excellent features of Unity Pro, but still manages to offer a very good choice for many amateur projects and even some cases professional. However, Unity Pro would be the definite choice for most serious projects with the arsenal of important features it provides. Some of these features include optimization and profiling tools, state of the art graphic options and support for external version control to mention a few.

3.2. Why Unity

Unity 3D game engine is a powerful and cross platform game engine that can be used to make 2D and 3D games with less coding and concentrating more on graphics.

We could native Android app development tools for developing this game, but using Unity has some advantages:

- It takes less effort and coding in unity than native tools
- You can take benefit of Unity's powerful graphic rendering features
- Its cross platform, the game that is built with unity can be exported to various platforms with a little configuration change

3.3. Programming Language (C#)

Unity supports two scripting languages: Javascript and C# (Unity3d, 2016). There is little performance difference between the two so the choice was left open. It is also possible to use a mix of the two languages in a single project but separate scripts, since they share the same API. The language of choice for this project is C# in the planning phase.

3.4. Server (PhotonEngine)

Photon is an online multiplayer game API which enables game developers to easily enable multiplayer feature to their games.

Some of PhotonEngine features:

- Good integration with unity
- Distributed servers
- Free for starter package
- Easy to learn
- Good documentation

- Robust and Powerful

3.5. Facebook API for Android

Facebook API for Android enables application and game developers to enable their users to login to their app by their facebook account.

3.6. Android SDK

The game made with unity can be exported to different platforms without any change in code of the game. For exporting it to Android you need to have Android SDK installed in your computer.

3.7. Image Processing (Adobe Photoshop)

Designing a good game which users likes needs to have good graphical user interface and for that you need a good graphic edit program. Photoshop is one of the most used image editing and graphic designing programs right now.

Chapter 4

4 System Implementation

In the implementation phase of the project requirements are gathered and models of the system are designed.

The user requirements for a system should describe the functional and nonfunctional requirements so that they are understandable by system users who don't have detailed technical knowledge. Ideally, they should specify only the external behavior of the system. The requirements document should not include details of the system architecture or design. Consequently, if you are writing user requirements, you should not use software jargon, structured notations, or formal notations. You should write user requirements in natural language, with simple tables, forms, and intuitive diagrams.

System requirements are expanded versions of the user requirements that are used by software engineers as the starting point for the system design. They add detail and explain how the user requirements should be provided by the system. They may be used as part of the contract for the implementation of the system and should therefore be a complete and detailed specification of the whole system.

4.1. Functional Requirements:

- Every player has nine pieces
- At beginning of the game both player put their pieces on the board turn by turn.
- If a player managed to make a Kataar (3 pieces in a horizontal or vertical row) he picks up one of the opponent's pieces off the board, that piece would be out for the rest of the game.
- After both players finished putting their pieces on the board both players make moves on turn.
- Each player can only move one step.
- Moves can only took place at empty spots, if your neighbor spot is captured with another piece then that spot is bounded.
- The player with less than 3 piece is the loser of the game.
- Every player must have an ID to login in to game
- IDs are three type :
    - Guest ID: This ID is generated by server

- Facebook ID: player can login with their facebook account.

4.2. Non-functional Requirements:

- Players can send sticker to each other
- Good and intuitive design of Assets (like Images, buttons, etc.)
- Player can change their profile photos
- Player can send request to play with each other

4.3. SWOT Analysis

A SWOT analysis contributes to the strategic planning process by identifying technical, human, and financial resources. It answers the following questions:

- What are our major strengths, and how can we maximize them in the future?
- What are our major weaknesses, and how can we overcome them?
- What are our major opportunities, and how can we take full advantage of them?
- What major threats do we face, and what can we do about them?

Strengths:

- Having good tools for game development
- Good resources for gaining help
- Our target is smartphones and tablets only, we can concentrate on mobile device only
- Not restricted to any specific age range.
- Innovative game idea

Weaknesses:

- Lack of good graphic and sound designers in team
- Lack of experience in game development
- No obvious leadership

Opportunities:

- Good demand for the game in the market
- People love to play old games (market demand is high)
- Online version of this game is not developed yet, we are the first who develop the online version of this game

Threats:

- Transition to new technology
- Time and resource constraints

4.4. Modeling the system behavior

Before starting to implement our game we designed our game models to help us in the development of our game and also will be vital for future evaluations. We designed the models in UML short for Unified Modeling Language which is universally accepted as the standard approach for developing models of software systems which is a set 13 diagram types.

4.4.1. Modeling the interaction between the system and users:

In the figure 5 you can see the UML Use Case Diagram for playing online which shows the interaction between the system and the users. The server enables users to login, signup, reset password and play game with another player online. For playing online against another player, the players should be logged in.

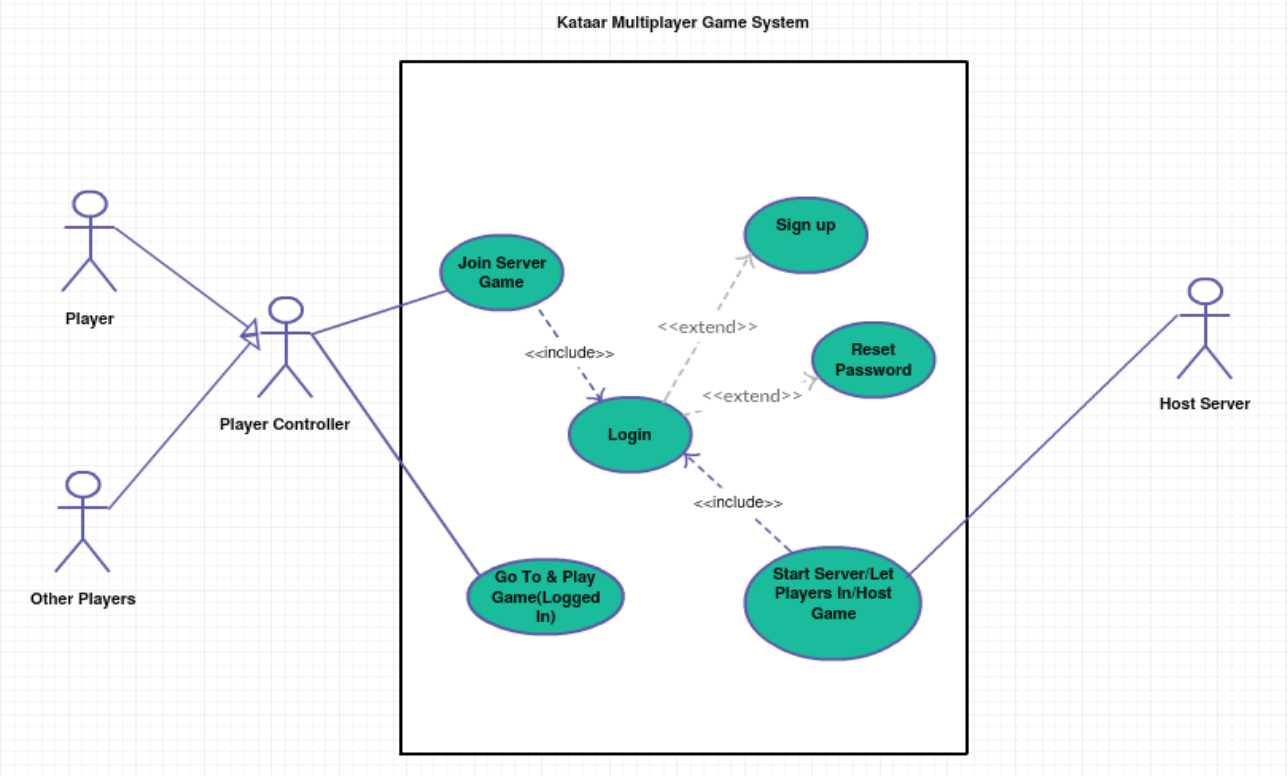

Figure 5: Use case diagram for playing online

4.4.2. Modeling the interactions between players and the game

The diagram in figure 6 shows the interaction between the players and the game using Sequence diagram.

1. Players triggers the play online method by clicking/touching the play online button in home screen
2. The method checks if player is logged in through the GameController
3. Player starts a game and wait for another player to join
4. Another player joins the game
5. Players start playing the game

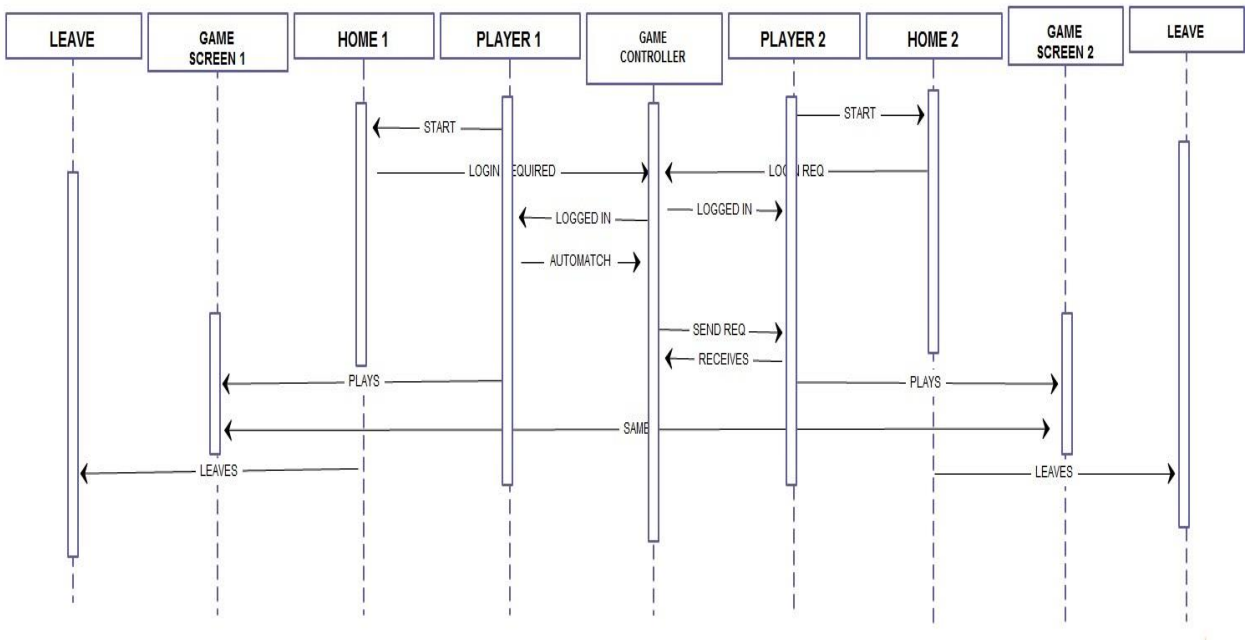

Figure 6: Sequence diagram for playing online

4.4.3. Modeling the flow of the activities

Figure 7 demonstrates the flow of control between the activities in UML Activity diagram.

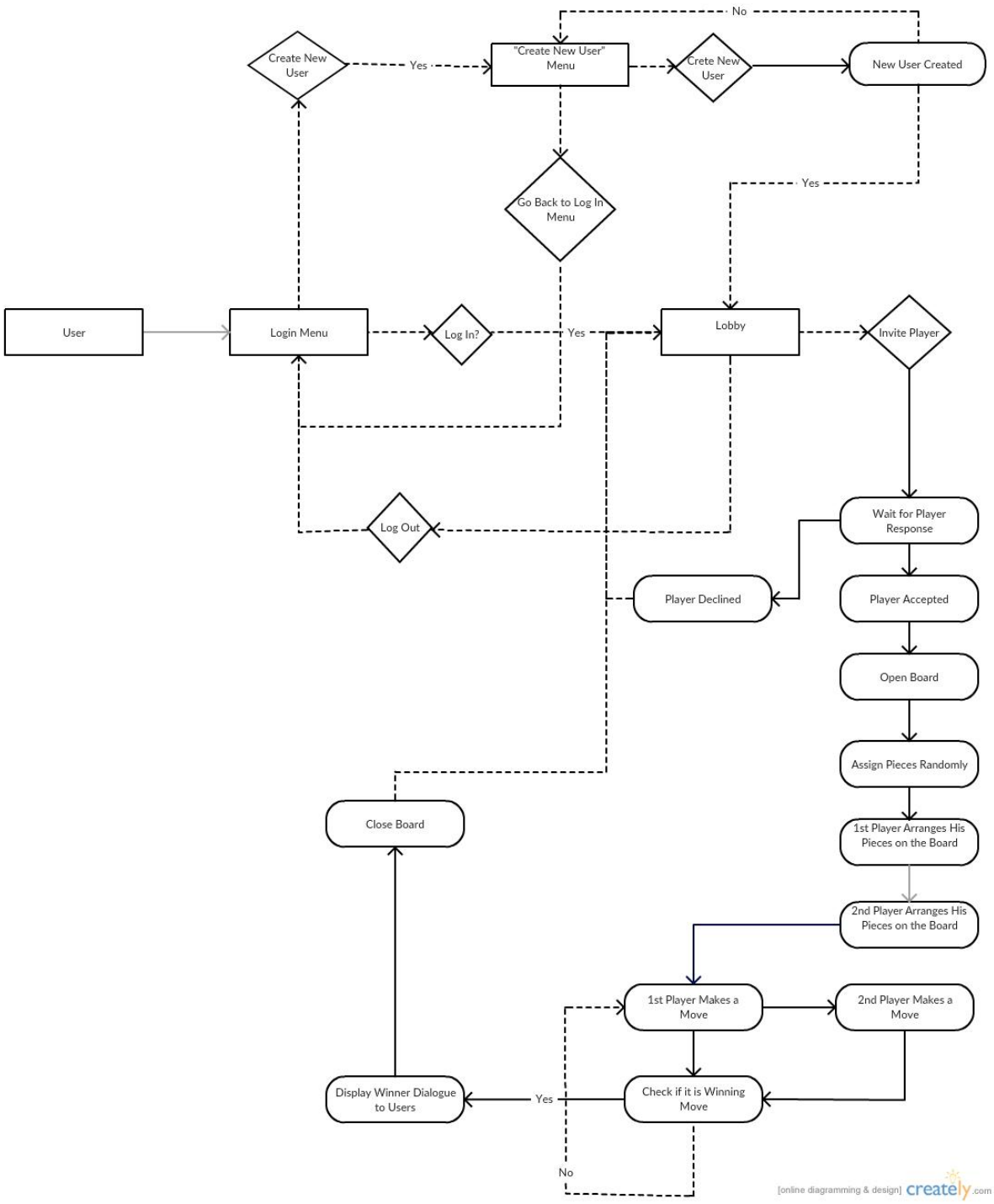

Figure 7: Activity diagram demonstrating the flow of the game

Chapter 5

5 Game Demo

In the development phase of our project we used the models that were developed during the Design and Analysis phase to actually bring our game to real world.

5.1. Main Menu

Main menu consists of three buttons which is Play Offline, Play Online, Settings and About.

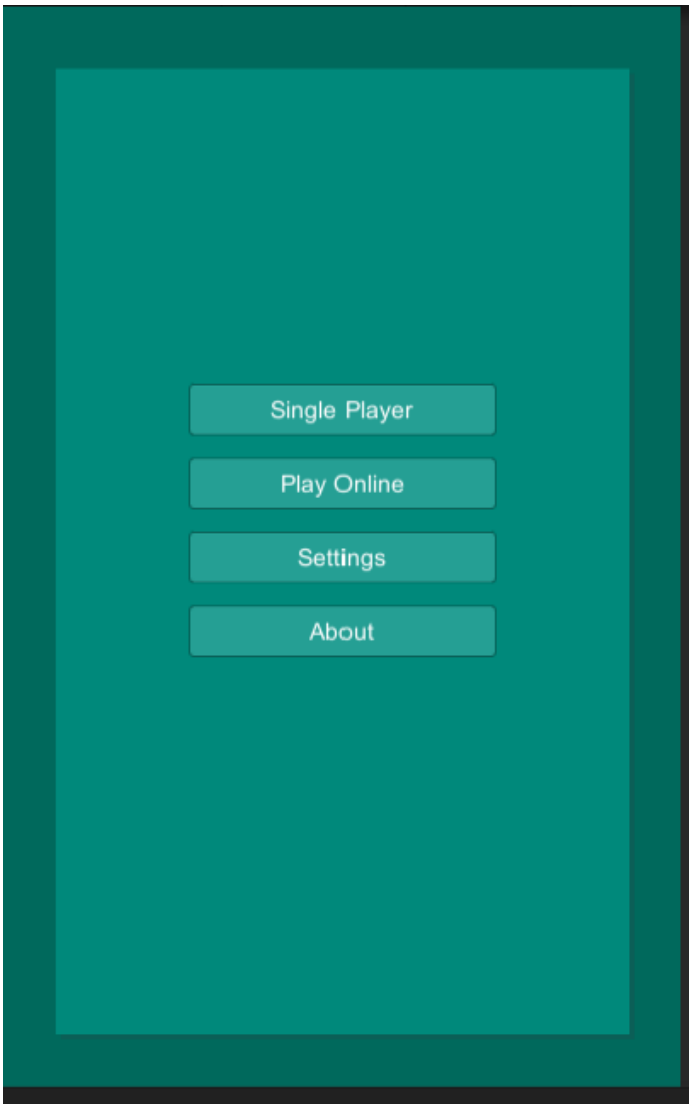

Figure 8: Main Menu

5.2. Play Screen

A good user interface is one of the most important things in a game. That in mind we made our best to make Play Screen as simple and clean as possible.

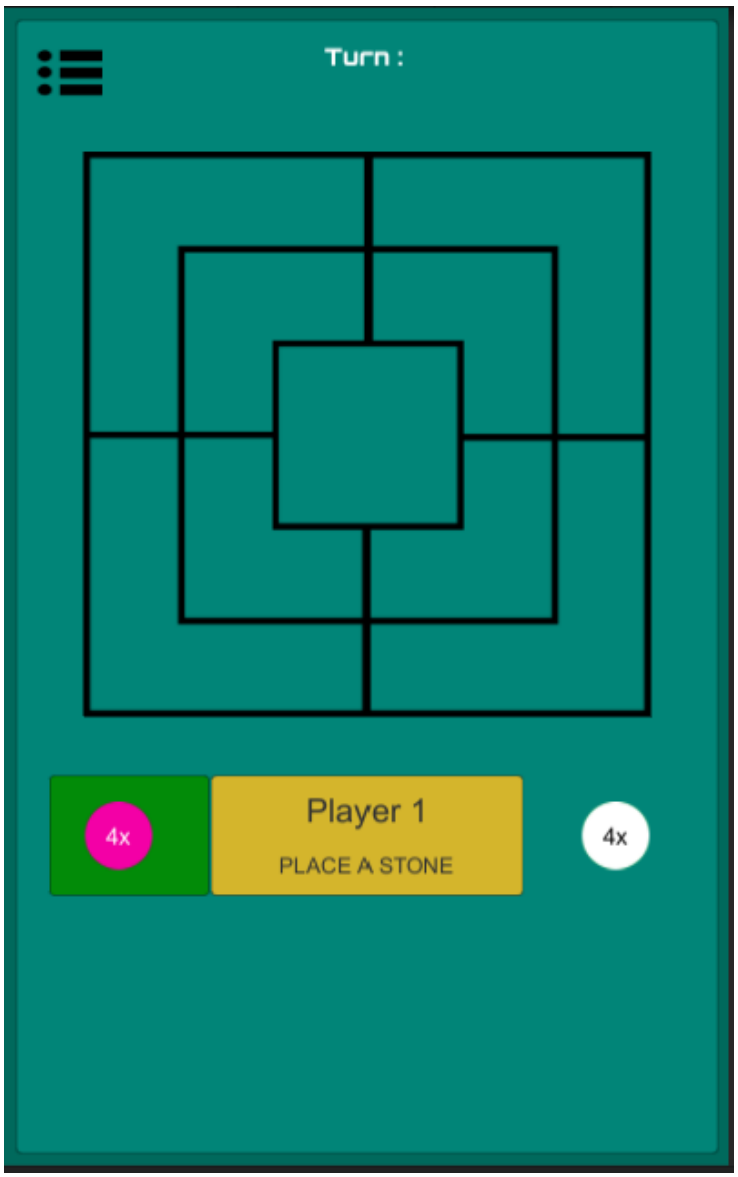

Figure 9: Play Screen

5.3. Settings Screen

In the settings screen there are two items. The first item enables user to choose the type of board, at this point there are two type of boards available which may increase in later versions of the game. The second item is a check box which enables the user to make moves by drag and dropping a piece if checked.

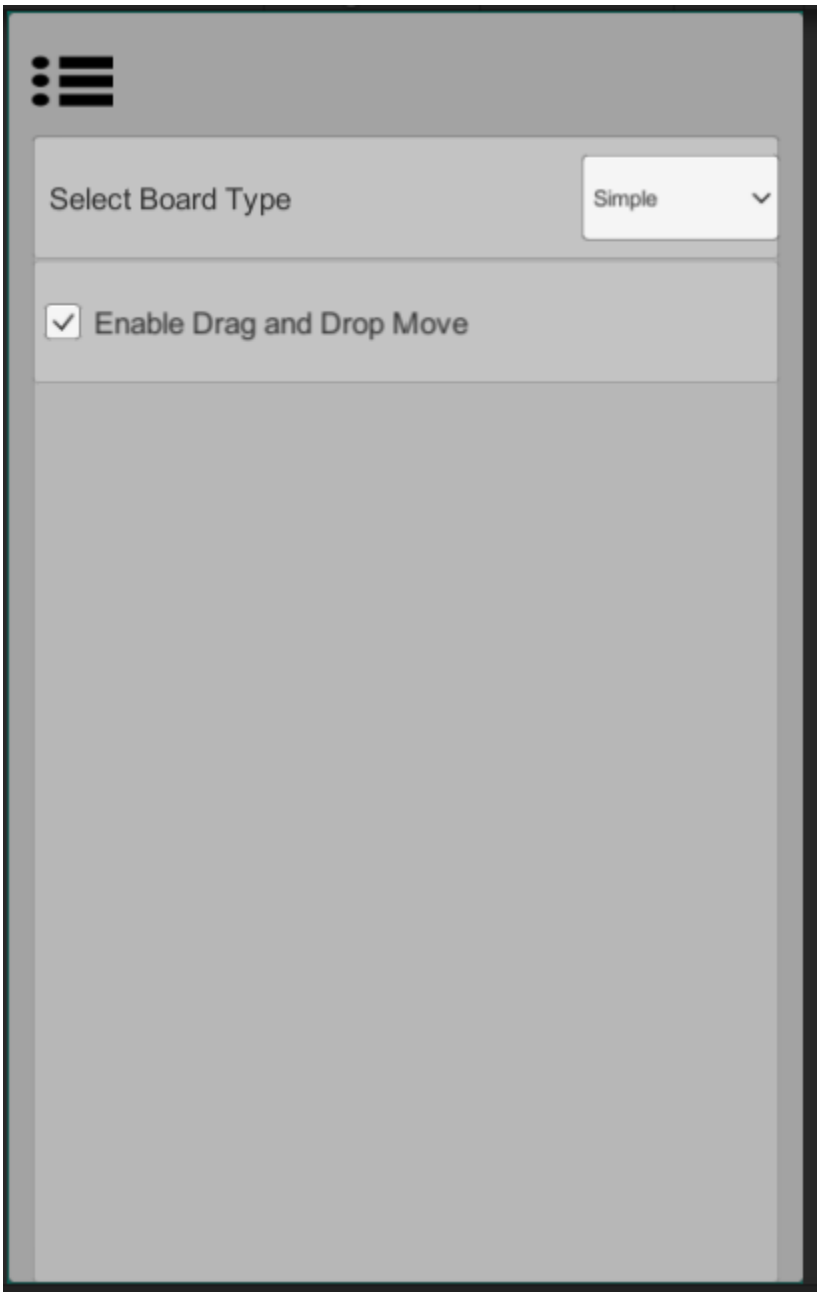

Figure 10: Settings screen

5.4. About Screen

The about screen give information about the version and developers to user.

Figure 11: About screen

References

Crawford, C. (2003). *Chris Crawford on Game Design.* New Riders.

(2016). Retrieved from Unity3d: http://www.unity3d.com

(2016, 6 11). Retrieved from Merriam Webster: http://www.merriam-webster.com/dictionary/game

Adams, E. (2010). *Foundamentals of Game Design, Second edition.* New Riders.

Andrews, J. (2007). Retrieved 2016, from http://blog.zco.com/unity-3d-game-development-proves-effective/

Gamasutra. (2012). Retrieved 2016, from http://www.gamasutra.com

Gamasutra. (2016). Retrieved 02 12, 2016, from Gamasutra: http://www.gamasutra.com/view/feature/132554/making_better_games_through_.php?print=1

Schell, J. (2009). *The Art of Game Design, A book of lenses.* Morgan Kaufman.