Bilkent University

Department of Computer Engineering

CS 319 Term Project

Section 2

Group 2G, Oldies but Goldies

Q-bitz

Analysis Report

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Contents

1. Introduction

We are going to implement a table game called "Q-bitz" as the group Oldies but Goldies. Q-bitz is a kind of game that helps its players to practice their symmetry, visual dexterity, quick thinking, and memory skills. [1] Q-bitz addresses not only children who are at their developmental age but also adults as well. We are going to implement this game as a desktop application which can be useful for all its players in terms of use.

After having some online research about Q-bitz, it is easy to say that the game is suitable for the object oriented design specifications and CS319 course concept. Many instances in the game such as cards, maps, and cubes can be implemented as objects.

Java platform will be used in order to implement Q-bitz. Moreover, since our goal is to convert a table game into a desktop application, we are planning to use JavaFX to make our job easier for the Graphical User Interface(GUI) part.

2. Overview

2.1 Game Play

Q-bitz is a single player game that the players are supposed to create the same geometric sequence that are differ from in each Q-bitz cards with identical cubes who have different shapes in their sides at a specific time interval. There are three different types of modes in Q-bitz (see 2.2 for more information) and each mode has three different difficulty level. Difficulty levels are different from each other in terms of the cube numbers. However, for each difficulty, cubes are still identical. For each mode and difficulty level, time interval will be decreased as the player starts a new card to play. When the game begins, there will be a score table that shows players score. For every right cube, player will score point and for every wrong cube player will lose point. The player has an opportunity to pause, reset or quit the game.

2.2 Modes

In game there are three different modes which are “Beat It”, “Rolling Stones” and “The Memory Remains”. All these modes have three difficulty levels which are “Easy”, “Medium” and “Hard”. In “Easy” level there are 16 cubes, in “Medium” level there are 25 cubes and in “Hard” level there are 36 cubes. All cubes are identical.

2.2.1 Beat It

In “Beat It” mode, the map is empty. User looks the design which is located on the opened card. With finding the correct side of the cube, user tries to fill the map and complete the design. If user puts the correct cube to correct square, score is going to be increased and if user puts the wrong cube to wrong square, score is going to be decreased. After completing the map with correct cubes, timer is going to stop and shows the elapsed time.

2.2.2 Rolling Stones

In “Rolling Stones” mode, the map is already filled with random cubes. If user rolls the cubes, the patterns of the cubes on the map changes randomly. User can fix the selected cube’s location or swap two cubes. With these actions, if one cube located correctly, score is going to be increased and if one cube located incorrectly, score is going to be decreased. After completing the map with correct cubes, timer is going to stop and shows the elapsed time.

2.2.3 The Memory Remains

In “The Memory Remains” mode, the map is empty. User looks the design for ten seconds which is located on the opened card. After that card is going to be closed. With finding the correct side of the cube, user tries to fill the map and complete the design. If user puts the correct

cube to correct square, score is going to be increased and if user puts the wrong cube to wrong square, score is going to be decreased. After completing the map with correct cubes, timer is going to stop and shows the elapsed time.

2.3 Maps

Maps are the places where players put cubes to complete the Q-bitz cards. According to the difficulty level that players selects, maps will be created. We mean that since we have different cube numbers for each difficulty levels, maps will be created according to those number of cubes. Easy level consists of 16 identical cubes, while medium level has 25 and hard level has 36 identical cubes. Moreover, for the "Beat It" and "The Memory Remains" modes, maps will be empty to be filled whereas "Rolling Stones" mode has a filled map with mixed cubes.

2.4 Cards

Cards, we also mention them as Q-bitz cards, have the geometric sequences that will be created by players into the map. Cards are changing according to difficulty levels because each level has different number of cubes. The sequences are fixed into a square and we will divide this square according to the selected difficulty level.

2.5 Options

In the game screen, players have different buttons in order to play the game. First of all, at the top, there will be a “Pause” button which will open the Pause screen and players can reset or quit the game from this screen. If they close this screen without resetting or quitting the game, they will continue to play. For the “Beat It” and “The Memory Remains” modes, there will be two buttons which are “Put” and “Change”. “Put” button provides player to put a cube into the map wherever they want while “Change” button provides them to change the surface of the cube that they want to place. For the “Rolling Stones” mode, players will have three options which are “Put”, “Roll” and “Swap”. In this mode, cubes will be already placed in the map but they will be mixed. Since they cannot change cubes surfaces, they need to roll the cubes by using “Roll” option until a surface which is necessary comes. “Swap” button will be used in order to swap two cubes. After doing this, players can use “Put” button to fix cubes which are in correct places in the map.

2.6 Settings

Players can reach this screen from Main Menu and they will be able to change the music and the background color from this screen.

3. Functional Requirements

3.1 Play Game

After entering the screen user can start the game by pressing Play Game button. As this game single player game. User should only select the mode and difficulty of the game. Basis of the game is same for every mode. Users will construct the the given picture by using cubes. System provides users a picture and cubes. Then system waits users to combine figures on the cubes to construct the picture. After user puts every cube at the map system checks if cubes place is right according to system. However, every mode has differences from each other. In the following there is explanations of every mode.

3.1.1 Beat It

Beat It is classical game where users can construct the given picture by combining the figures on the cubes. To find the necessary figure user can rotate the cube by pressing change button. On every side of the cubes there are different figures. So by rotating cubes, user can reach the necessary figure. When cube is placed on the map system will check if it has right place according to picture. For further explanation about system check 5.2.2 Activity Diagram.

3.1.2 Rolling Stones

In Rolling Stones different from Beat It, users are not able to rotate the cube. Instead they can roll the cubes to get the necessary figures. As users cannot rotate the cube, they will swap the cubes according to the figures on their sides. After putting cube and press put button system will check the figure's place. When user press roll button, system will roll unfixed cubes when roll button pressed and until they combine all of the cubes by swapping then user will continue rolling and combining.

3.1.3 The Memory Remains

The Memory Remains is same as Beat it only difference between them is, in Beat It players can visualize the picture, every time they want but in The Memory Remains players can visualize the picture for a specific time. While that specific time player should memorize the picture, because while they combining the cubes they will not able to visualize the picture. After they finish combining system will check if combination is right.

3.1.4 Difficulty

After mode selection, user will select the difficulty of the game. Difficulty of the game is based on the size on the map. Difficulty, divided into three as following:

Easy: Picture is divided into 4x4 square. So users will fill 16 squares using cubes.

Medium: Picture is divided into 5x5 square. So users will fill 25 squares using cubes.

Hard: Picture is divided into 6x6 square. So users will fill 36 squares using cubes.

3.2 How to Play

In every mode of the game, how to play varies. So how to play for every mode is in the following.

Beat it:

1. Press change button until you reach necessary side of the cube.
2. Then select the place on the map.
3. Then press the put button.

Rolling Stones:

1. Select two button.
2. Then press swap.
3. Then select the button that you think it has the right place.

4. Then press put.

The Memory Remains:

1. Press change button until you reach necessary side of the cube.

2. Then select the place on the map.

3. Then press the put button.

3.3 Settings

Players can access this from Settings button under the Play Game button. In this section user will be able to change sound settings and change background colors. System will provide user specific colors and user will select among them.

3.4 Credits

Users can access this screen from the Credits button from the menu. In this section users can see the names of developers of this game.

4. Nonfunctional Requirements

4.1 Game Performance

In order to increase game performance, different pictures will be used. Pictures with complicated figures will make the game more challenging. Also affects like sound or animations will increase the game performance.

4.2 User – Friendly Interface

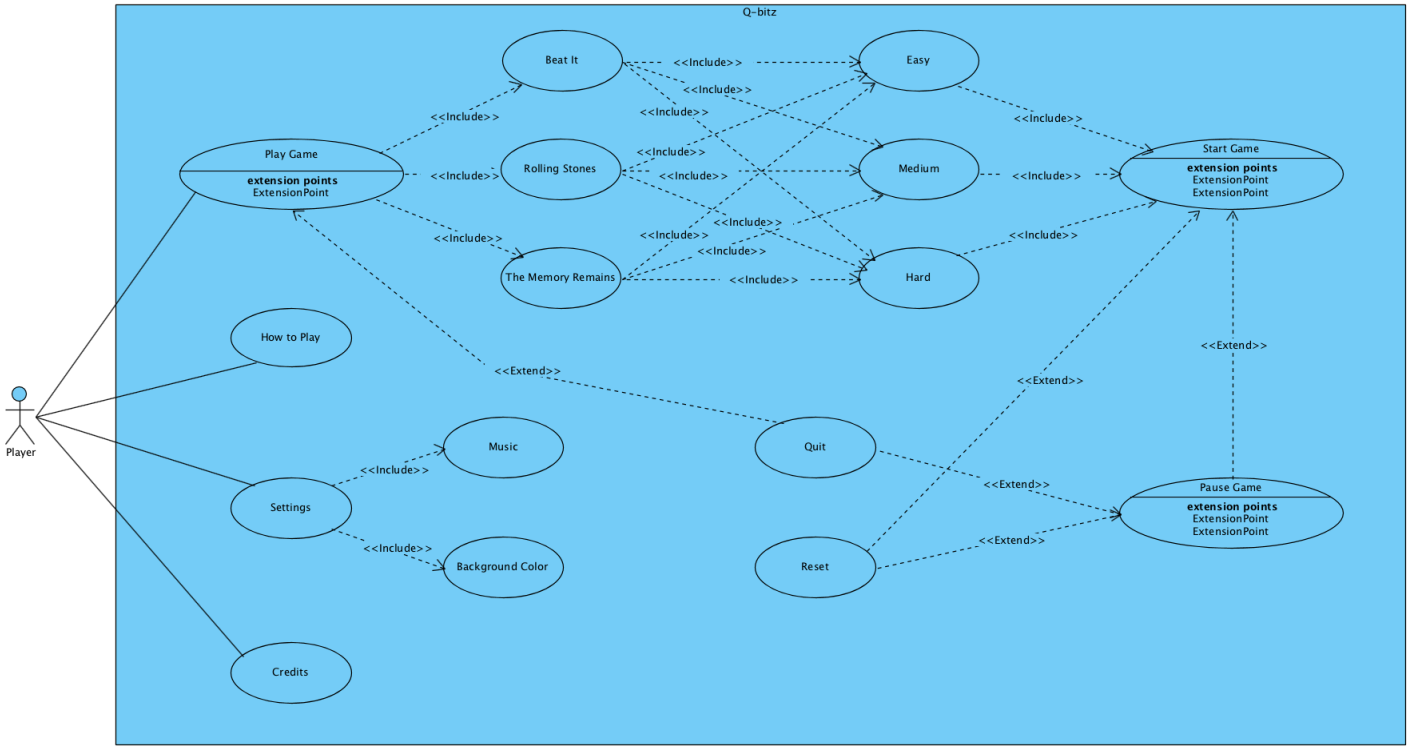
Game interface, designed to .be user friendly. There are no complicated buttons that distract the user. System always leads the user while starting to game and playing. Also, in the How To Play part, there is detailed description of the steps that user take.

4.3 Compatible User Interface with Real World

This game is for kids. From bigger picture aim of this game to develop analytic thinking of kids. As they try to construct a bigger picture using small pieces they will learn to organize. Also another point is they will learn to memorize and use their brains more effectively. This game kindly prepares players for real world. In the real world when they come across with a problem they will learn to divide it into pieces and solve. Also developing their memory is very useful for their life.

5. System Models

5.1 Use – Case Model



Use Case #1

Use Case: Play Game

Primary Actor: Player

Stakeholders and Interests:

- Player who wants to play the game
- System chooses random puzzle and starts the game.

Pre-conditions:

- Player must be in the main menu.

Post-conditions:

- No post conditions.

Entry-conditions:

- Player chooses “Play Game” button in the main menu.
- Player must choose the game mode (Beat it, Rolling Stones, The Memory Remains)
- Player must choose the difficulty (easy, medium, hard)

Exit conditions:

- Player pauses the game and click “Exit” button.
- Time limit is up and player can no longer continue playing that current puzzle.

Success Scenario Event Flow:

1. Player chooses “Play Game” button from main menu.

2. Player chooses mod which are “Beat it”, “Rolling Stones” and “The Memory Remains”.

3. Player chooses level among easy, medium and hard.

4. Player is represented a puzzle and a cube.

5. Player presses “Change” button if he/she desires to change side of given cube.

6. Player presses “Put” button then click desired space to put the cube in any place on map.

7. Player can know he/she is successful if the cube remains in place.

8. Player solves the puzzle.

9. Player is presented with another puzzle.

10. Steps 4-9 until time limit is up.

11. Player sees his/her score on screen.

Alternative Event Flows:

i. If player cannot solve any puzzle in time limit

- Player sees his/her score on screen.

ii. If player wants to return to main menu

- Player pauses the game with "Pause" button.
- Player chooses option "Back to Main Menu."

iii. If player wants to restart the game

- Player pauses the game with "Pause" button.
- Player chooses "Reset."
- Steps 4-11 is repeated.

Use Case #2

Use Case: How to Play

Primary Actor: Player

Stakeholders and Interests:

- Player who wants to learn how game is played
- How to play screen is displayed by system.

Pre-conditions:

- Player must be in the main menu.

Post-conditions:

- No post conditions.

Entry-conditions:

- Player presses "How to Play" button in the main menu.

Exit conditions:

- Player chooses "Back to Main Menu" and returns to main menu.

Success Scenario Event Flow:

1. Player chooses "How to Play" button from the main menu.

2. Player reads the description of the game and familiarize himself/herself with the game.

3. Player chooses "Back to Main Menu" and returns to main menu ready to play the game.

Use Case #3

Use Case: Pause Game

Primary Actor: Player

Stakeholders and Interests:

- Player wants to pause the game.

- Pause screen is displayed by system.

Pre-conditions:

- Player must have started the game in order to pause.

Post-conditions:

- No post conditions.

Entry-conditions:

- Player presses “Pause” button in the game screen.

Exit conditions:

- Player clicks exit button in the top left corner of the pause menu and continue to play the game.

Success Scenario Event Flow:

1. Player starts the game choosing game mode and difficulty.

2. Player clicks “Pause” button which is next to score.

3. Player resume playing the game by clicking exit button in the top left corner of the pause menu and resume the game at any desired moment.

Alternative Event Flows:

i. If player desires to restart the game

- Player chooses “Reset” in pause menu.
- Player plays a new game with already defined mode and difficulty.

ii. If player wants to exit

- Player chooses “Quit” button from the pause menu.
- Player goes back to Main Menu of the game.

Use Case #4

Use Case: Settings

Primary Actor: Player

Stakeholders and Interests:

- Player who wants to change background color or music of the game
- System displays settings screen.

Pre-conditions:

- Player must be in the main menu.

Post-conditions:

- Player must be in the main menu.

Entry-conditions:

- Player presses "Settings" button in the main menu.

Exit conditions:

- Player chooses "Back to Main Menu" and returns to main menu.

Success Scenario Event Flow:

1. Player chooses "Settings" button from the main menu.
2. Player changes background color of the game.
3. Player changes music playing in the background of the game.
4. Player chooses "Back to Main Menu" and returns to main menu ready to play the game.

Use Case #5

Use Case: Credits

Primary Actor: Player

Stakeholders and Interests:

- Player who wants to see who make this game.
- System displays credits screen.

Pre-conditions:

- Player must be in the main menu.

Post-conditions:

- No post conditions.

Entry-conditions:

- Player presses "Credits" button in the main menu.

Exit conditions:

- Player chooses "Back to Main Menu" and returns to main menu.

Success Scenario Event Flow:

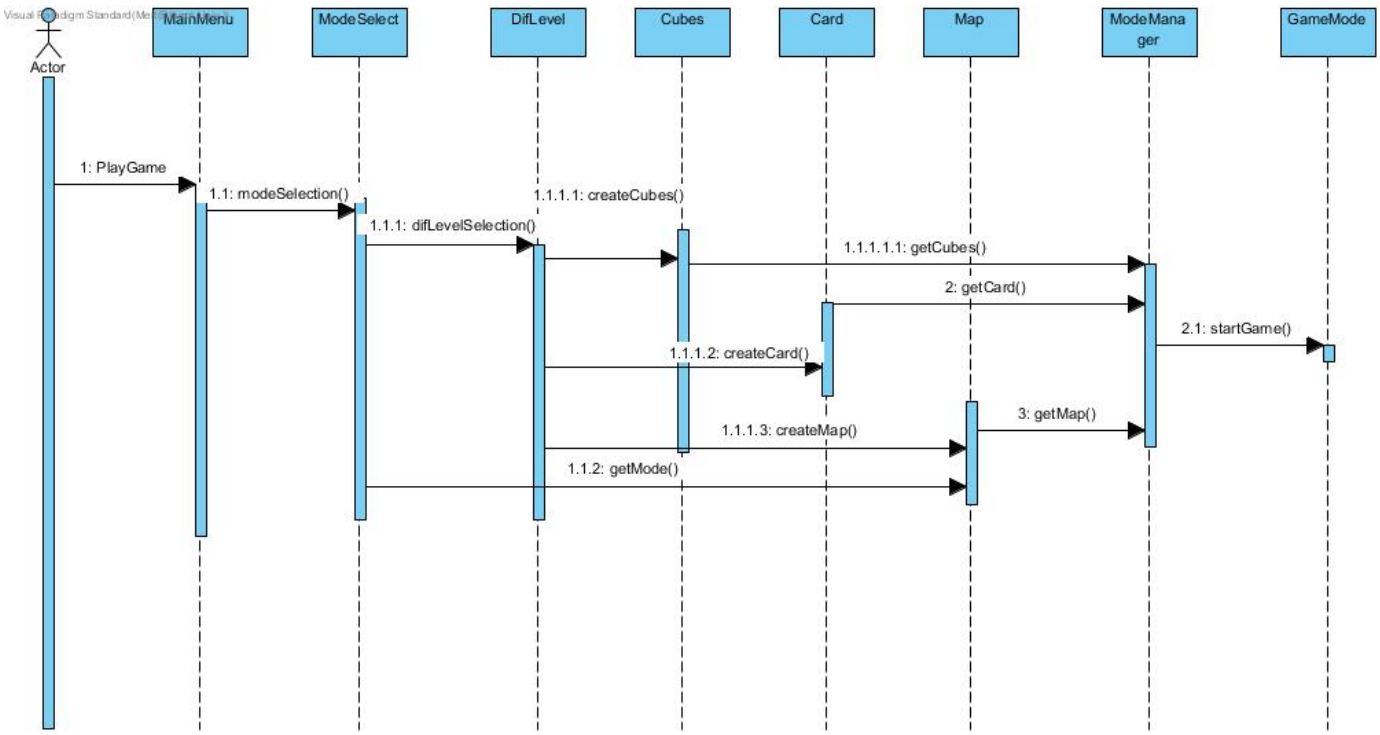
- Player who wants to see who make this game.
- System displays credits screen.

5.2 Dynamic Models

5.2.1 Sequence Diagrams

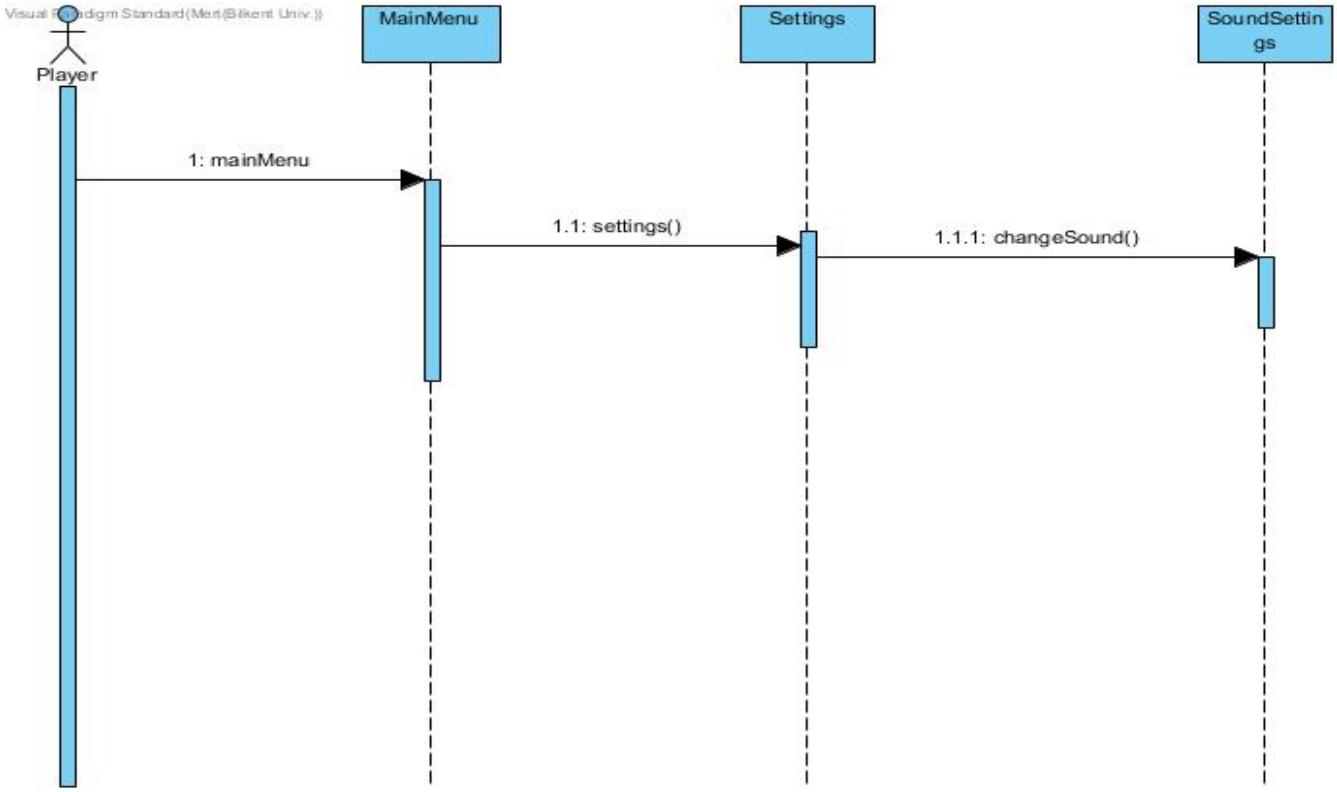
1. User starts the game.

When player enters the game, chooses Play Game option from the Main Menu. Then, chooses one of the game mode, which are Beat It, Rolling Stones and the Memory Remains, identified in ModeSelection. After the mode selection, player specifies the difficulty level of the game; easy, medium or hard. Cubes, map and card are created before the game starts in Cube, Card and Map classes, according to selected difficulty level and selected game mode. Then, these Cubes, card and map arranged in ModeManager, and buttons for specific commands are created in this ModeManager class. After that class, game starts in Beat It, Rolling Stones or the Memory remains class, depends on player's game mode selection.



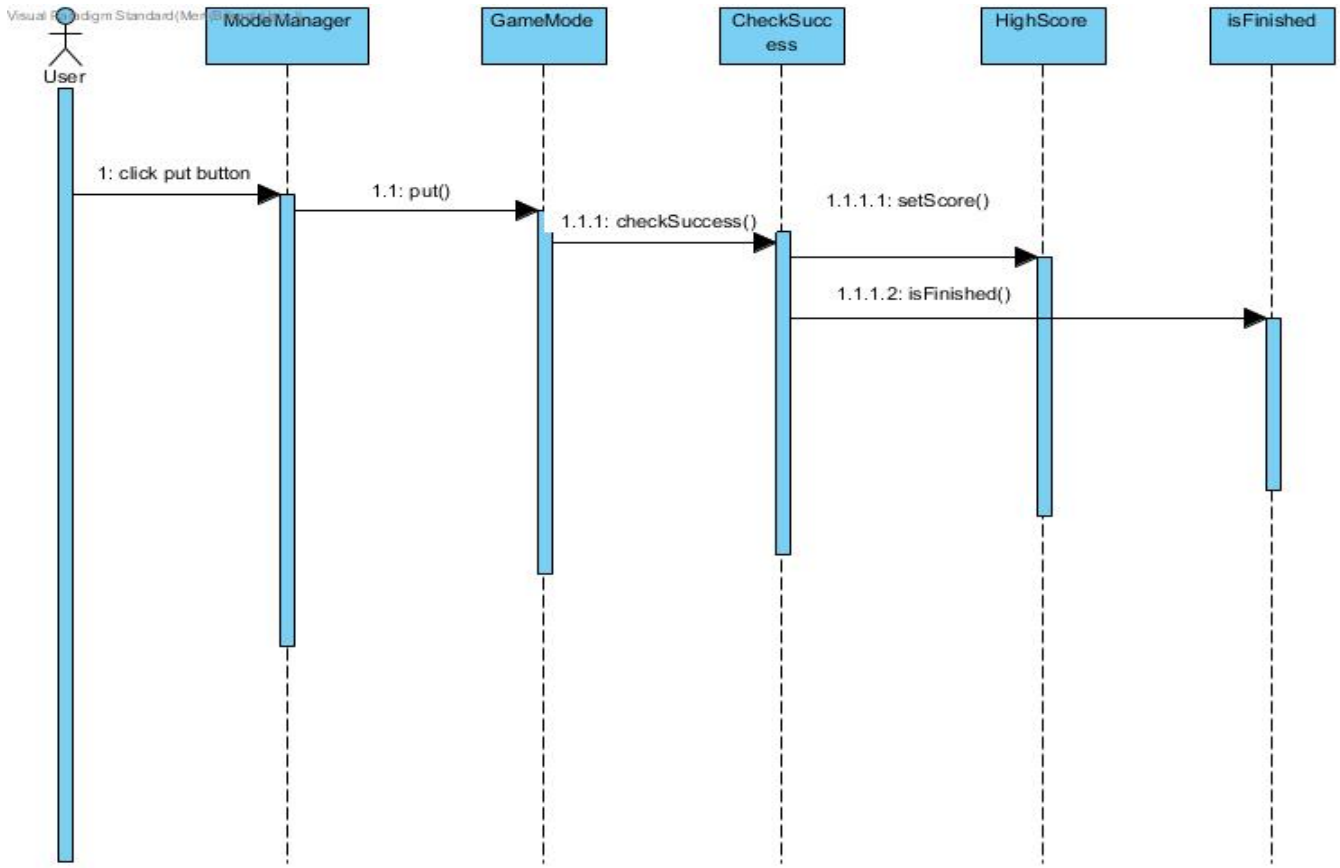
2. User enters Settings.

When user enters the game, chooses Settings option from the Main Menu. Settings class is the user interface menu which has two specifications. First one is changing background color of the game, other one is changing the sound of the game. User can back to main menu from Back to Main Menu button.



3. User wants to put the cube into the map.

While player is playing the game, he/she clicks the put button to put the cube to specified area on the map. This command goes to Mode Manager class to execute this action. Then game checks if player put the cube to the accurate area or not in the CheckSuccess class, increases or decreases the score in the Highscore class and checks whether the game is finished or not if the player's selection is accurate.



5.2.2 Activity Diagrams

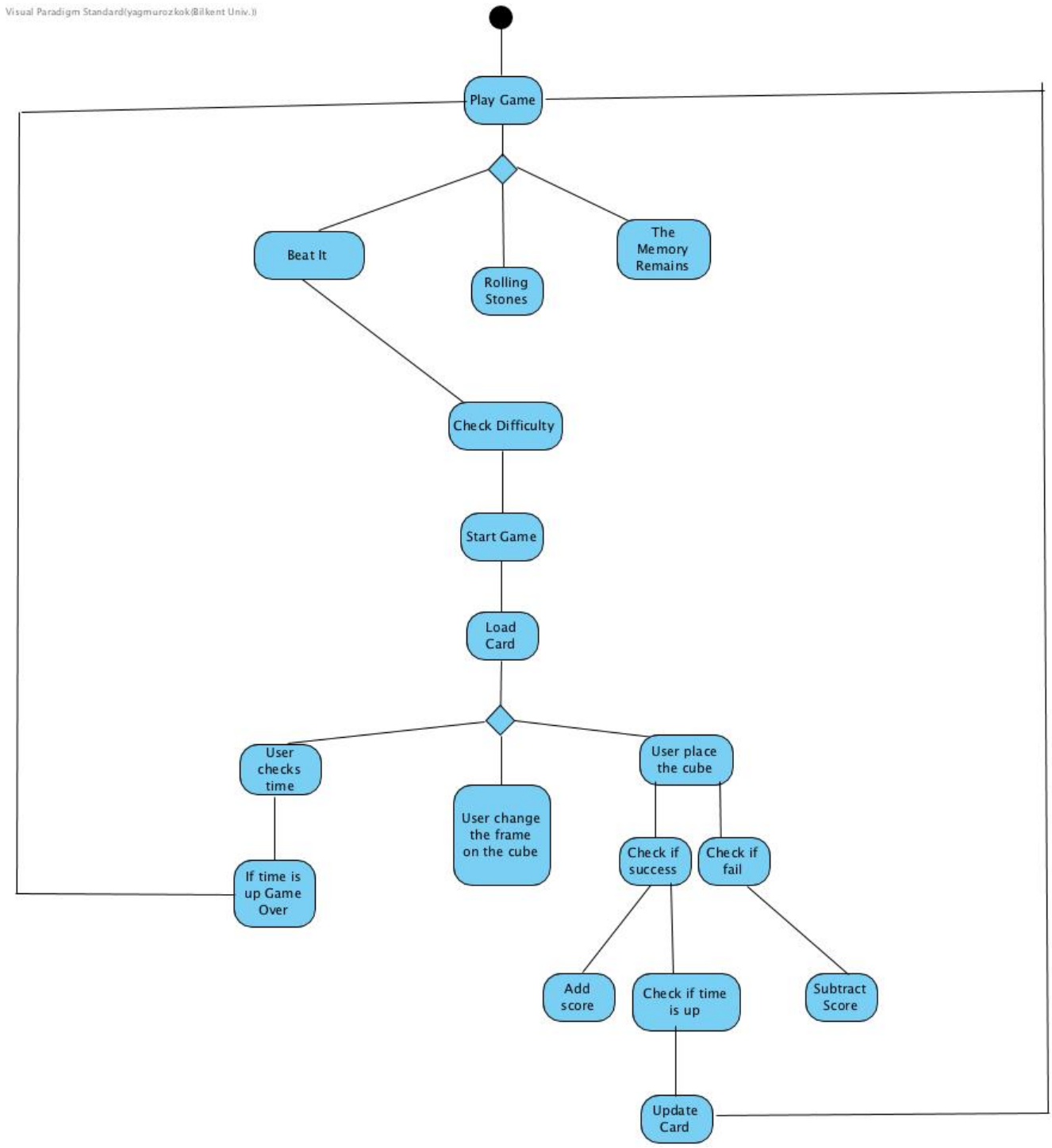


Figure 1

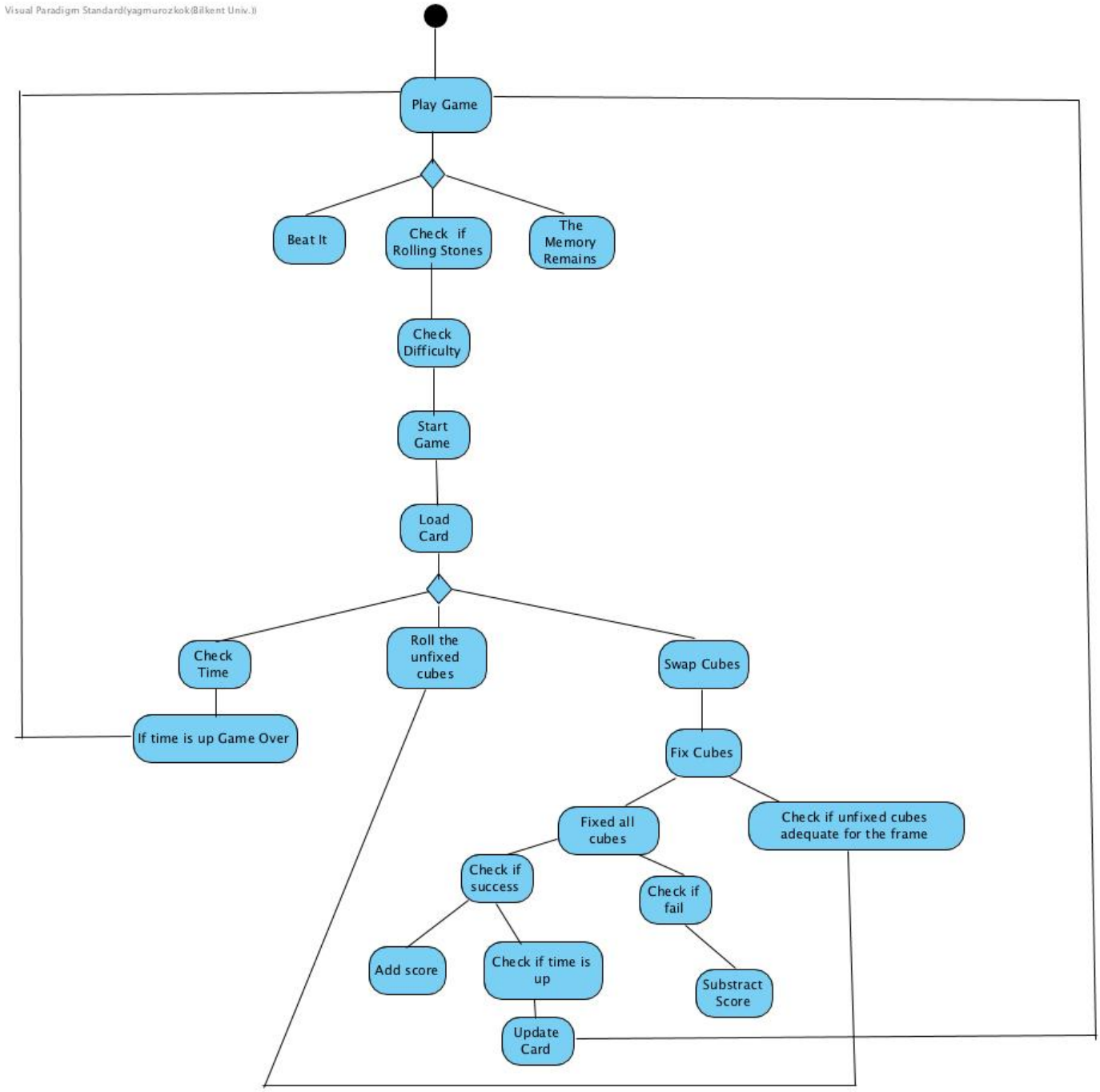

Visual Paradigm Standard(yagmurozkok(Bilkent Univ.))
Play Game
Beat It
Check if Rolling Stones
The Memory Remains
Check Difficulty
Start Game
Load Card
Check Time
Roll the unfixed cubes
Swap Cubes
If time is up Game Over
Fix Cubes
Fixed all cubes
Check if unfixed cubes adequate for the frame
Check if success
Check if fail
Add score
Check if time is up
Substract Score
Update Card

Figure 2

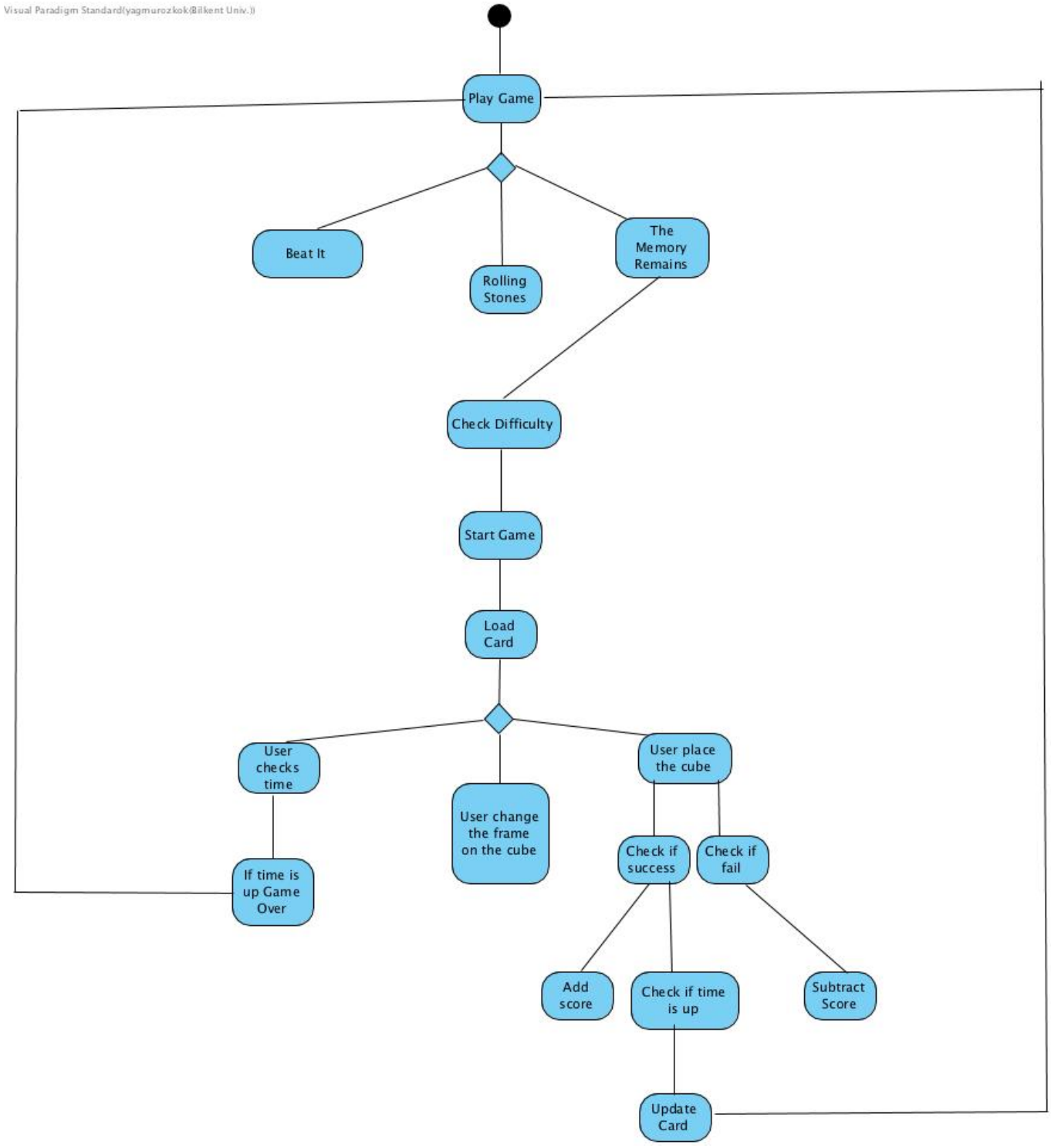

Visual Paradigm Standard(yagmurozkok(Bilkent Univ.))
Play Game
Beat It
Rolling Stones
The Memory Remains
Check Difficulty
Start Game
Load Card
User checks time
User change the frame on the cube
User place the cube
If time is up Game Over
Check if success
Check if fail
Add score
Check if time is up
Subtract Score
Update Card

Figure 3

The activity diagrams above, shows how the system runs while playing. Activity diagram explains three paths after starting game:

First of there is three paths because game consists of three different modes;

Before starting playing, user selects the mode of the game. If players select Beat It as shown in the Figure 1, system leads users to a section where they can select the difficulty of the game. Difficulty of the game based on the number of cubes. After selecting the difficulty, user starts the game. After selection of the difficulty, a picture will load for the players to construct the figure by using cubes. Then users will start to play the game. While playing the game, user may have three different interactions with the game.

First interaction: Users can check time while playing. Aim of the game is to reach high score in a specific time. So visualizing the time amount is important. Also when game is over, system will lead users to main game menu where they can start to play game.

Second interaction: To win, users should combine the figures on the sides of cubes and get the picture on the card. So as an interaction, after pressing change button users will be able to rotate the cube to get the necessary figure to construct the picture.

Third interaction: While playing the game, players interact with the system by placing the cube. After they place cube, user press the put button. Then system checks if the figure is in the right place. If it is in the right place

system, add points to their score. When all of the placing is done if they have time, a new picture loads. Otherwise system subtracts points from their score and they try to fix their cubes.

Activity diagram of Rolling Stones (Figure 2) resembles mode1 only two interactions of the system is different from Beat It. After users select the second mode, system leads players to the same procedure as above. They can select the difficulty of the game. They start to game and system provides them a picture. After they start game they have three interactions with game.

First interaction is the same with the Beat it, system provides user the remaining time and when time is over system leads user to main menu where they can select modes.

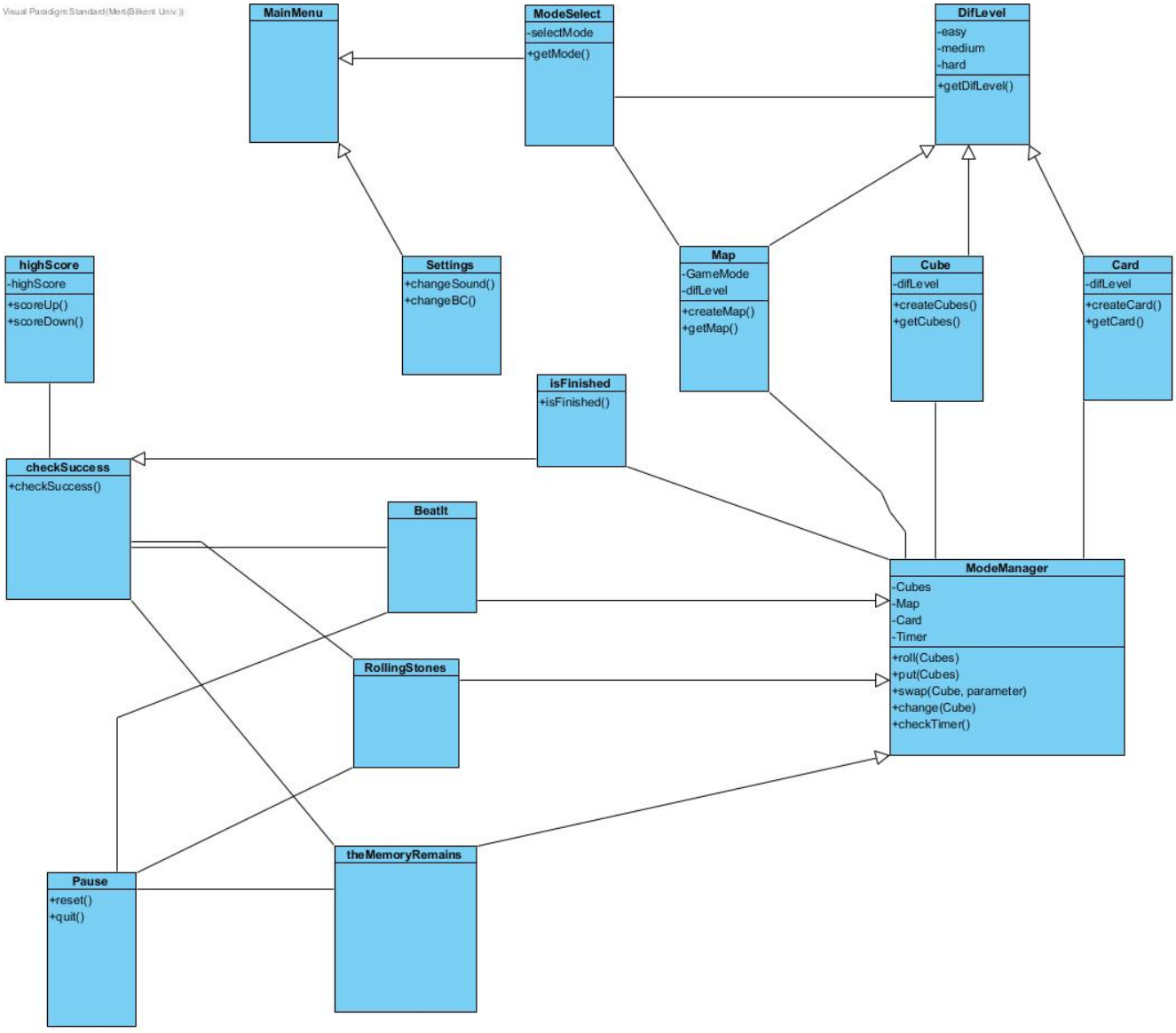
Second interaction: This modes difference from Beat It is, user will roll the cubes but cannot change their sides. So to get ideal sides user should roll the cubes instead of rotating cubes. So as an interaction there is roll button which rolls the unfixed cubes.

Third interaction: After first rolling user will fix the cubes by pressing put button. If the place of the figure is right than system will add points to users' score. Then users will decide if the figures on the cubes are enough to construct the picture. If it is not after putting some cubes, user will press roll button and system will lead user to the second interaction. If there is remaining time, then system will load new picture. If the place of the cubes is not right than system will subtract point from the users' score than player will continue to combine

the cubes to construct last picture.

In the The Memory Remains, system procedure is same with the Figure 3. Difference of this mode from Beat It is visualization of the picture is limited. Player must memorize the picture than after a specific time, player could not see the picture and combine the cubes according to users' memory. So the interactions are same with the Beat It.

5.3 Object and Class Model



The class diagram of Q-bitz as shown in the figure. We have 14 classes in the current situation. When user enters the game, there is main menu class, which user can choose four options. Play game, How to Play, Settings and Credits. Settings have 2 specifications which user can change sound and change the background color. If user chooses Play Game, there is ModeSelect class, which user can choose one of the three modes, and DifLevel class that user can choose difficulty level of the selected mode, which are easy, medium and hard. After the difficulty level selection, there are four classes before the game starts.

Map Class: Basically, map is the area that player arrange cubes. In this class, map is created according to selected mode, and selected difficulty level. Except Rolling Stones, map is created empty, but in Rolling Stones, map is created with cubes with random faces. Also, amount of the area is specified with the difficulty level.

Card Class: In this class, card is created when game starts and every successful finish of the previous card. It is created according to random order of cubes faces.

Cube class: In this class, cubes are created according to specific amount of selected difficulty level. Each cube has different image in their surfaces, but all cubes are identical.

Mode Manager class: Mode manager class is the essential class of the all modes. In this class, the design of the map, card and cubes will be generated according to selected modes. Put, roll, swap, change commands will be implented. Also, checkTimer is a common specification for all modes, which will be also implented in this class.

1. Put is the command that put cube to the selected area of the map, after player decided the face of the cube.

2. Roll and swap are the commands for Rolling Stones Mode. In roll command, after map is fullfilled with cubes random faces, player rolls all cubes except placed ones. In swap command, player swaps two cubes in the map.

3. Change command is the command for Beat It and the Memory Remains Modes. In this command, player changes the face of the specific cube.

4. checkTimer checks the time whether it is greater than zero or not. If it is less than zero, time is up and game is over.

Beat It, the Rolling Stones and the Memory Remains: These are different modes of our game. Each mode will be implemented in its own class, using the commands that implemented in Mode Manager class. Player plays the game in these classes.

Pause Class: Pause is the user interface menu when player wants to pause the game. It has two specifications, first one is reset the game and the other one is quit the game and returns to the main menu.

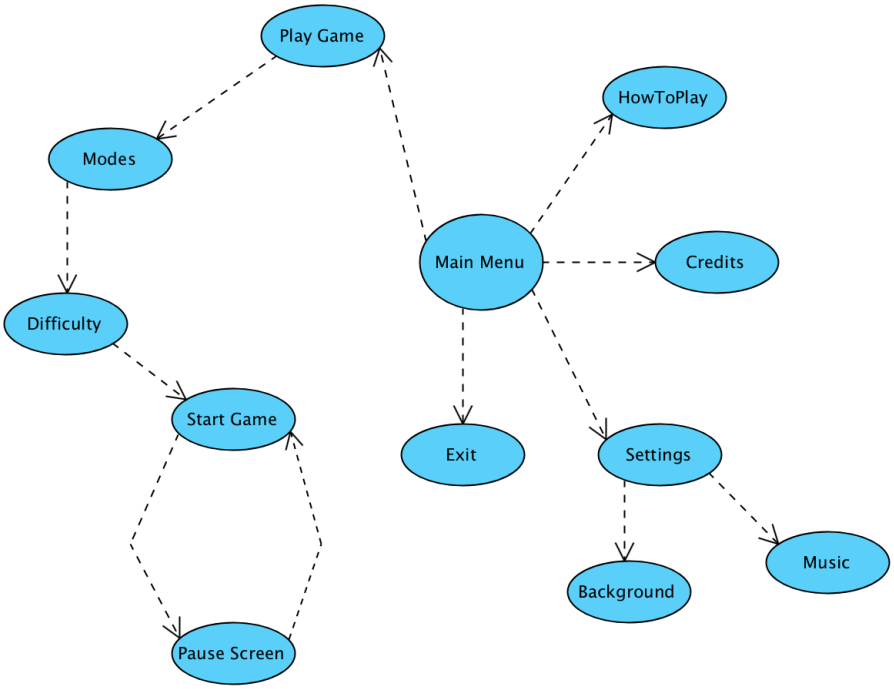
Check Success: After player puts the cube to specific area of the map, this class checks if player put the cube to the accurate area of the map or not.

High Score Class: If player successfully put the cube, players score will be up. If not, players score will be down. Also, high score is kept in this class.

isFinished class: After player successfully put the cube, this class checks whether all cubes arranged successfully or not. If all cubes are arranged successfully, score will be up according to the remaining time and it goes to the ModeManager class and get new card and continue the game.

5.4 User Interface - Navigational path & Screen Mock-ups

5.4.1 Navigational Path



5.4.2 Screen Mock-ups

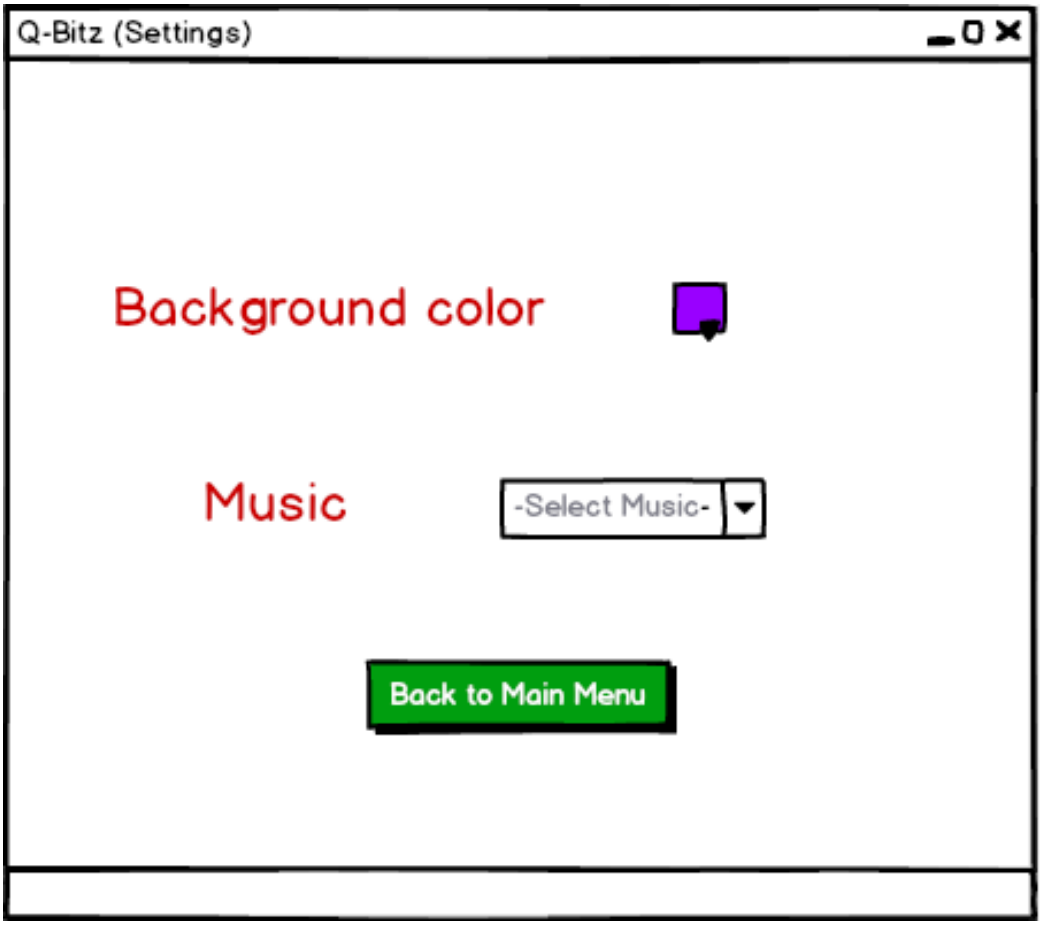
5.4.2.1 Main Menu

In the main menu screen there are 4 buttons and 1 high score counter. First button is “Play Game” button which redirects the user to the "mode selection" screen. Other buttons are “How to Play”, “Settings” and “Credit”. High score counter shows the highest score that user made before. In the lower right corner, user can see which version of the game that he/she is using.

5.4.2.2 How to Play

"How to Play" screen gives the user some information about the game. In addition to that, there are some pictures about game. In "How to Play" screen user can learn about game modes and functions of buttons. There is "Next Page" button in this page which allows the user to move to the other page. "Back to Main Menu" button helps user to move back to "Main Menu" screen.

5.4.2.3 Settings



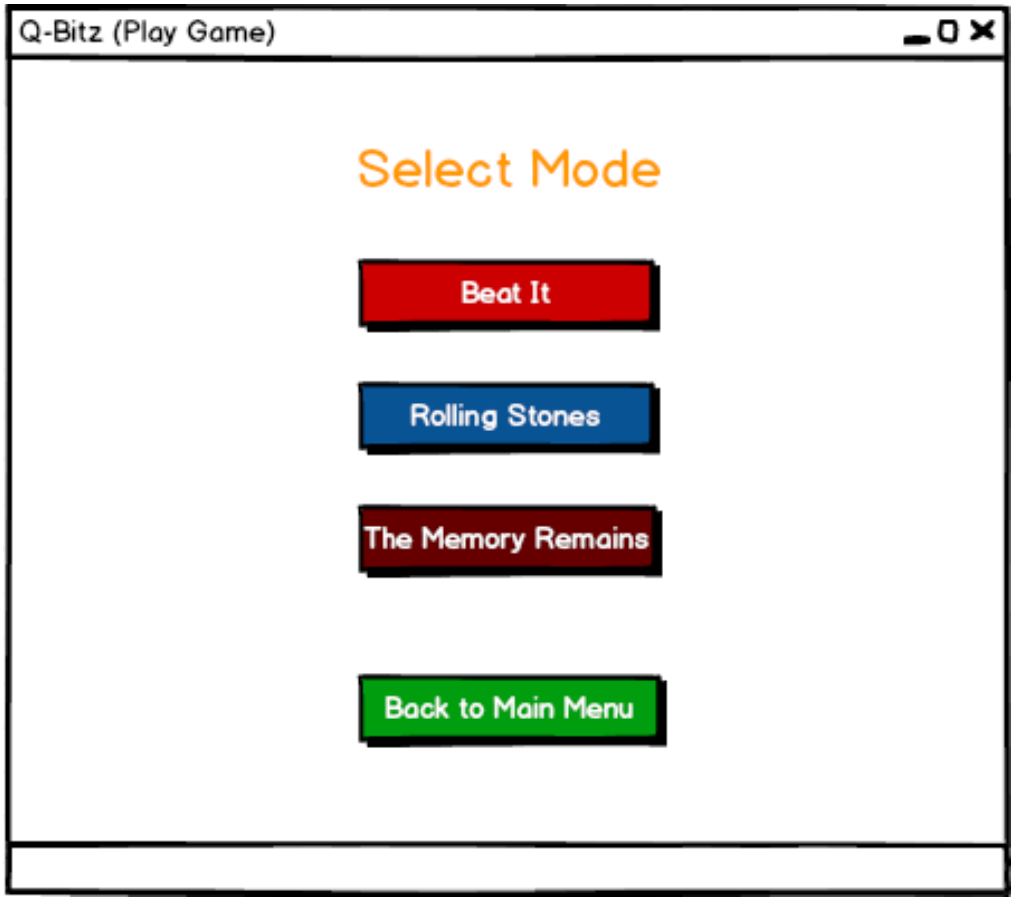
"Settings" screen helps the user to change the background color of the game. With using "Settings" screen user can change the game music. "Back to Main Menu" button helps user to move back to "Main Menu" screen.

5.4.2.4 Credits

In "Credits" screen, user can see the names of the developers of the game.

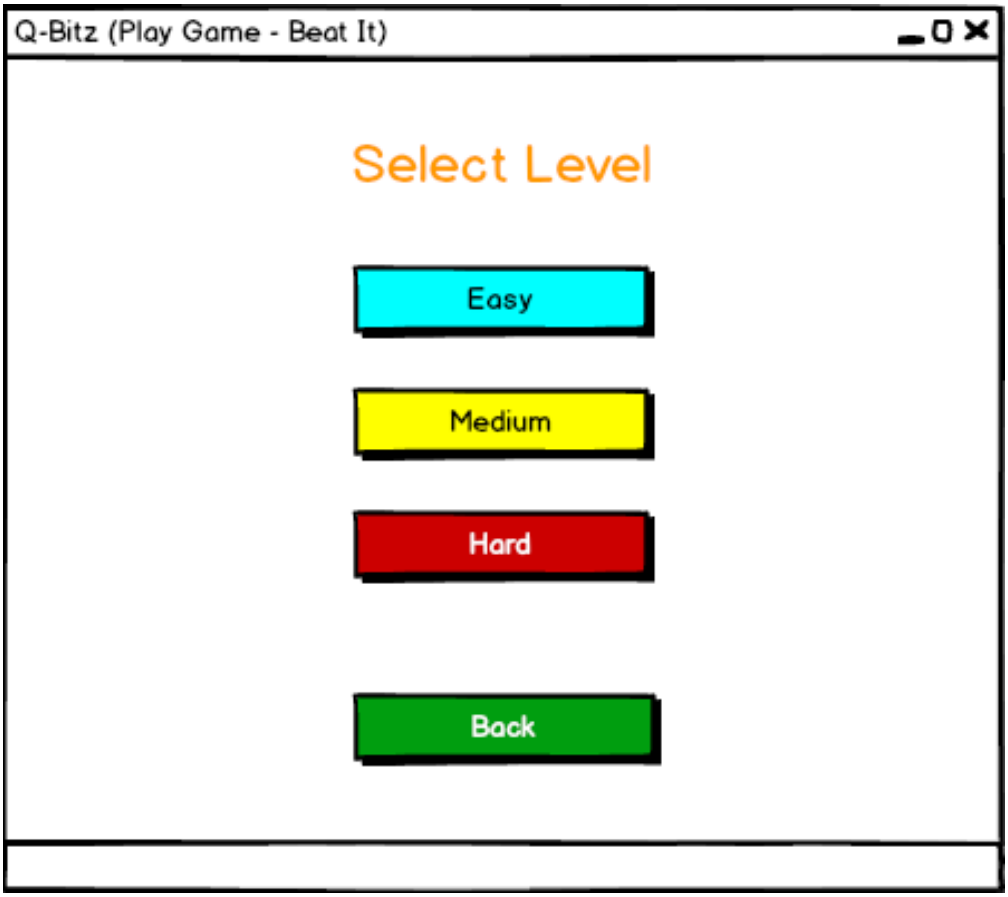
"Back to Main Menu" button helps user to move back to "Main Menu" screen.

5.4.2.5 Play Game – Select Mode



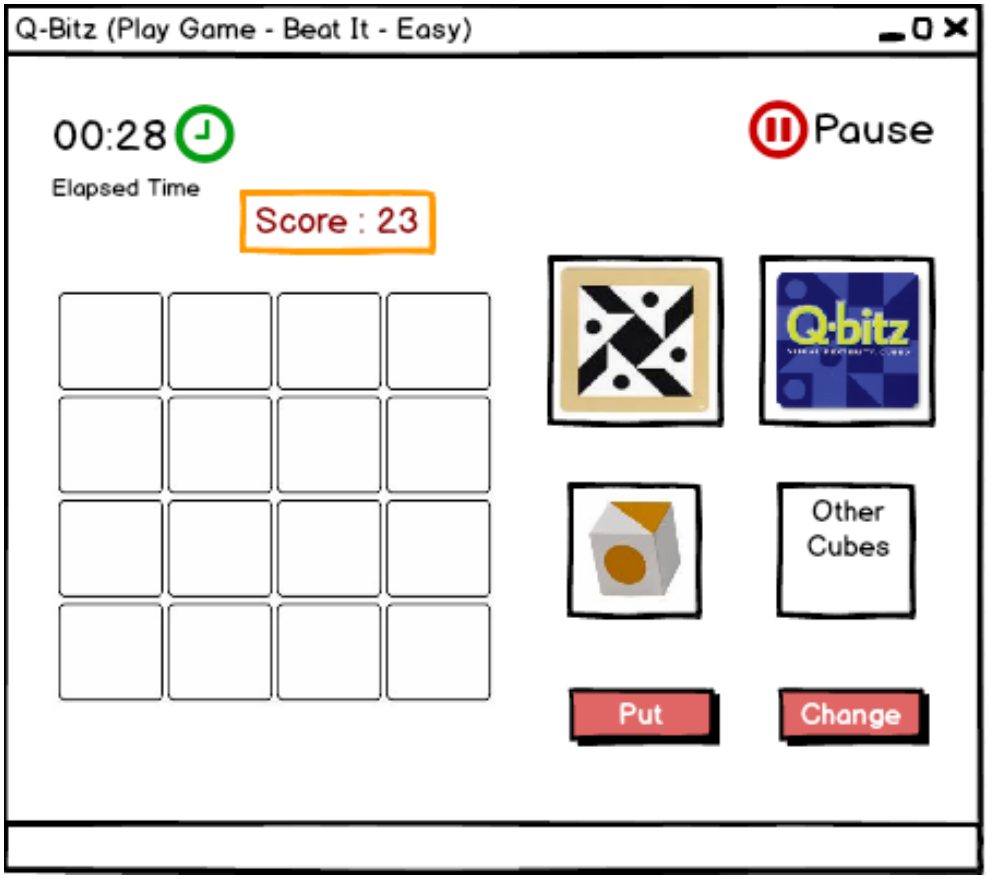
If user presses the button "Play Game" in "Main Menu" screen, the "Select Mode" screen will be opened. In "Select Mode" screen, there are 4 buttons which are "Beat It", "Rolling Stones", "The Memory Remains" and "Back to Main Menu". "Beat It", "Rolling Stones", "The Memory Remains" are the names of game modes. If user selects one of them, "Select Level" screen will be opened. "Back to Main Menu" button helps user to move back to "Main Menu" screen.

5.4.2.6 Play Game – Select Mode – Select Level



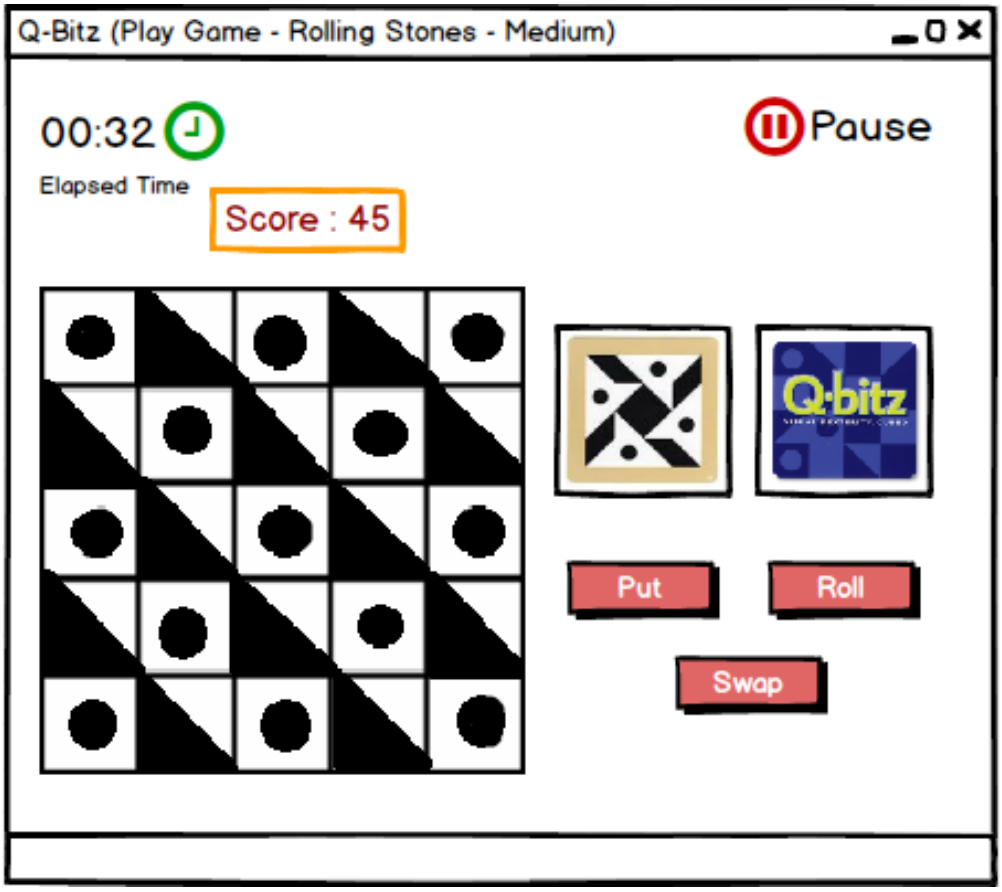
After user selected the game mode, "Select Level" screen will be opened. In this screen there are 3 level (difficulty) choices. In "Easy" level there are 16 cubes, in "Medium" level there are 25 cubes and in "Hard" level there are 36 cubes. All cubes are identical. "Back " button helps user to move back to "Select Mode" screen.

5.4.2.7 Beat It



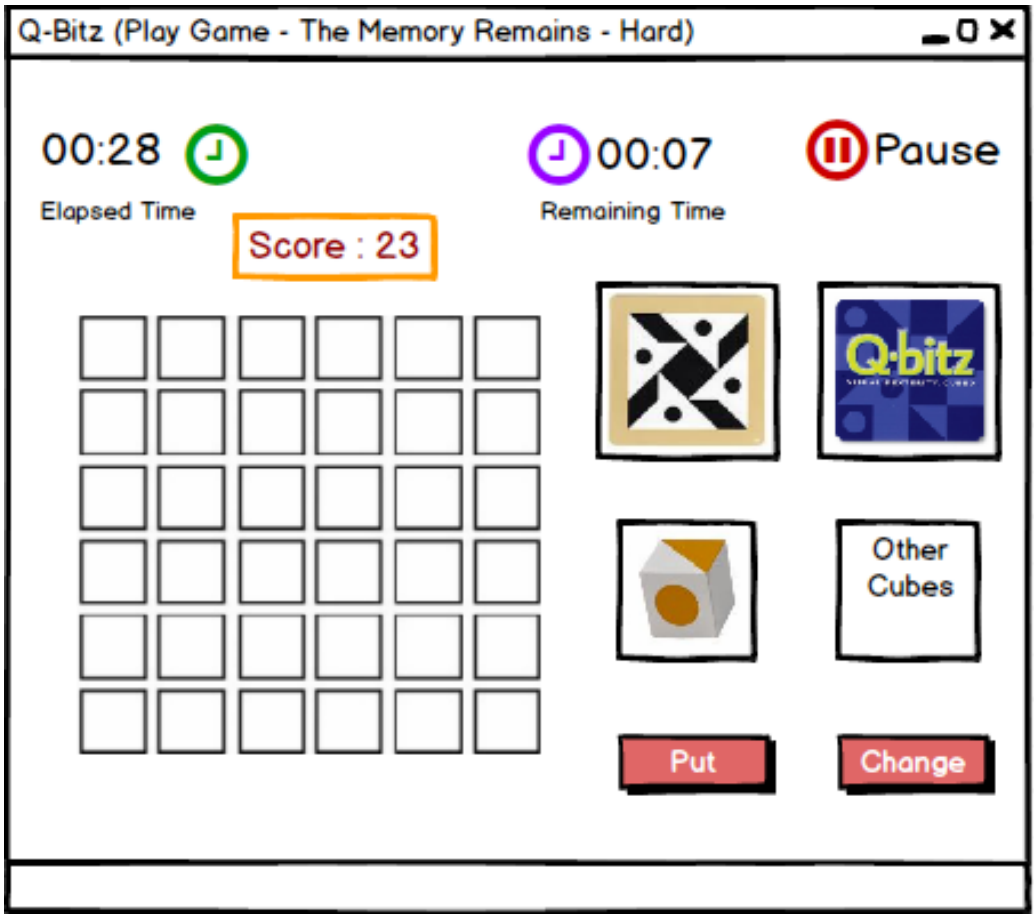
If user selects "Beat It" mode and "Easy" level, this game screen opens. In the top left corner, there is a counter that calculates the elapsed time. In the top right corner, there is a "Pause" button in order to stop the game. In the top there is a scoreboard that counts the user's points. If user puts the correct cube to correct square, score is going to be increased and if user puts the wrong cube to wrong square, score is going to be decreased. In the left there are 16 squares which are waiting to get filled with correct cubes. We call these 4x4 area as a "Map". In the right there are many cards, one of them is opened and others are closed. User looks opened card and tries to fill the "Map" like the opened card. Below the cards, there are cubes that user uses to fill the "Map". If user presses the "Change" button, side of cube will change and if user presses the "Put" button and clicks the one of the squares, the selected cube is going to placed there.

5.4.2.8 Rolling Stones



If user selects "Rolling Stones" mode and "Medium" level, this game screen opens. In the top left corner, there is a counter that calculates the elapsed time. In the top right corner, there is a "Pause" button in order to stop the game. In the top there is a scoreboard that counts the user's points. In the left there are 25 squares which are already filled with random cubes. In the right there are many cards, one of them is opened and others are closed. If user presses the "Roll" button, the patterns of the cubes on the map changes randomly. If user presses the "Put" button and clicks one of the cubes on the map, this cube will be fixed on that location. If user presses "swap" and clicks two cubes, cubes swap. After those actions, if one cube located correctly, score is going to be increased and if one cube located incorrectly, score is going to be decreased.

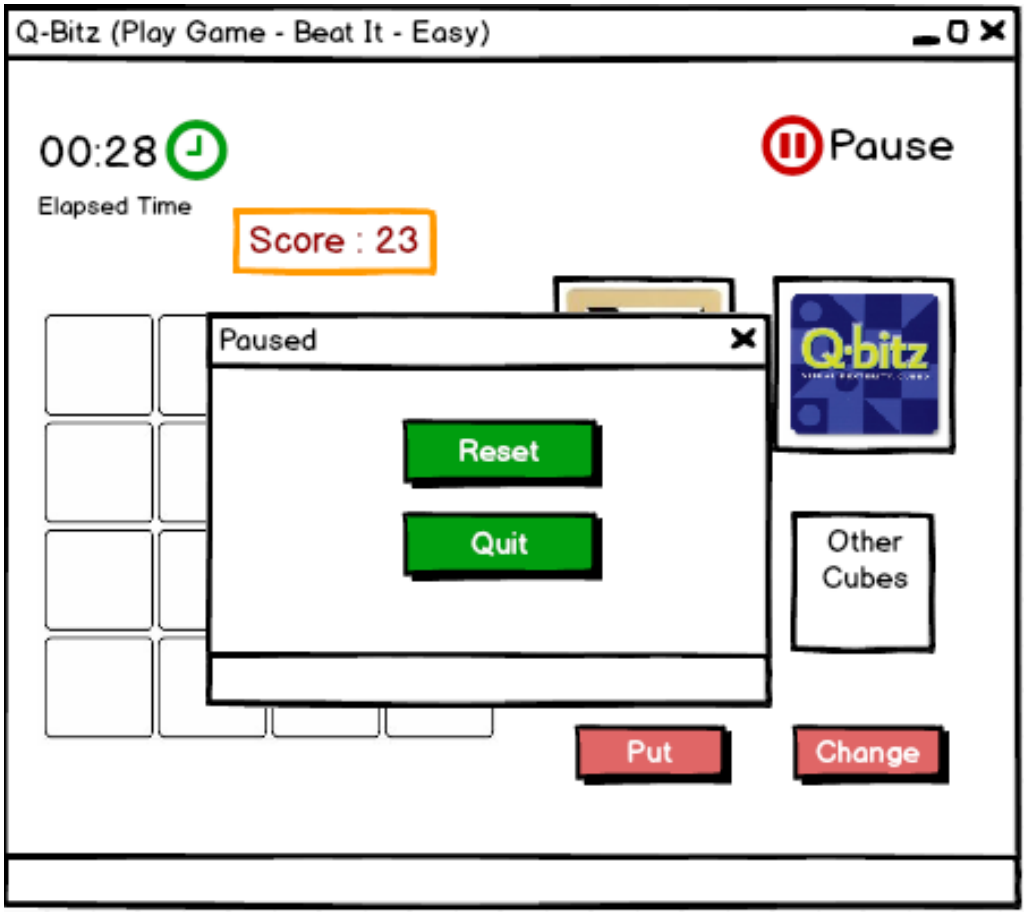
5.4.2.9 The Memory Remains



If user selects "The Memory Remains" mode and "Hard" level, this game screen opens. In the top left corner, there is a counter that calculates the elapsed time. In the top right corner, there is a "Pause" button in order to stop the game. In the top there is a scoreboard that counts the user's points. In the left there are 36 squares which are waiting to get filled with correct cubes. In the top, there is a timer that counts backwards from 10 seconds. User can only look opened card for 10 seconds then card will be closed again. If user puts the correct cube to correct square, score is going to be increased and if user puts the wrong cube to wrong square, score is going to be decreased. If user presses the "Change" button, side of cube will change and if user presses the

"Put" button and clicks the one of the squares, the selected cube is going to placed there.

5.4.2.10 Pause Menu



While playing the game, if user presses the "Pause" button which is on the top right corner, "Pause Menu" opens. In "Pause Menu" there are two buttons which are "Reset" and "Quit". If user presses "Reset" button, elapsed time, score, opened card and selected cube is going to be reset. If user presses "Quit" button, "Main Menu" screen opens. If user presses the "cross" at the top right corner, the game resumes.

6. Conclusion

To sum up what is stated above, our project will basically be a desktop application of the table game "Q-bitz." Before starting implementing the actual game or writing this analysis report, as a group we meet and discuss several issues regarding our version of the game. First, we agree upon some additions to the game hoping it will make the game more desirable. Then we decide to use Java platform during implementation and research about libraries that can be beneficial to us. Finally, we think of ways to manage our classes and objects so that not only our implementation process will be easier but also our program will be more efficient.

In the end, we come up with this analysis report hoping it will be helpful to us during future reports and actually implementing the game.

7. Glossary & References

[1] https://www.amazon.com/MindWare-44002-Mindware-Q-bitz/dp/B0031P91LK

[2] https://www.mindware.orientaltrading.com/q-bitz-a2-44002.fltr