Bilkent University

Department of Computer Engineering

CS 319 - Object-Oriented Software Engineering

Analysis Report

Dirty Seven Card Game

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1 Introduction

Dirty Seven Card Game (Pis Yedili) is a well-known card game with different versions. However, in Google Play Store, there is not any likeable version of this game in terms of visually, usability and compensating different versions so it is decided that several version options will be included in this game with more user friendly features to reach more people and make them enjoy. Moreover, our application can be played in Turkish, English and Russian languages as well.

The game will be an Android based application which can be played by all devices having Android 4.0 version or newer.

2 Proposed System

2.1 Overview

Dirty Seven is a tactical card game with several different rules in various versions, in which commonly players' aims to vanish their cards in their hands and punish the others as much as possible. In our application, the user can play with 3 to 7 rival bots as her/his selection. In the game the user and bots have hands with several cards and table has 2 decks, one of which contains already played cards, the other contains cards will be played. The game also has 3 difficulty levels; easy, medium and hard, which is optional to the user as well as the configurations in Config Menu.

2.1.1 Gameplay

The application can be played by tapping related buttons, images etc. Initially, the user will need to select configurations for the game since it has several versions in distinct cultures. Once configurations are selected they are stored so there will be no need to select again and again. To play the game, the user tap the card in her/his hand, s/he wants to play.

2.1.2 Decks and Cards

The game begins with either 52 or 104 cards which means the game is played with one or two suits, upon the user's request. Those cards are founded at either decks on the table or players' hands. Those two decks are to contain already played cards or prospective playing cards.

2.1.3 Players and Difficulty

Number of players can change 4 to 8 as the user wish. In any game there is only one human and other players are bot. In addition, difficulty level is set according to user's wish. Bots play according to difficulty level of the game.

2.2 Functional Requirements

2.2.1 Create New Game

This option can be found in the main screen where human user run the program and first screen that will be encountered. This is one of many options in the main menu that human user can choose from main menu. When human user chooses this option, he will be redirected to selection screen to choose configurations and start the game. (Once configurations are selected, game starts immediately.)

2.2.2 Configuration Menu

When human user click create new game he will encounter this window. Human user will make set of choices to make game as suitable as possible for user wished configuration.

2.2.3 Selection of Number of Players

As soon as configuration menu comes human user will face different configurations to choose. One of them is selection of the number of players. First of all, human user will choose number of players which shows also number of computer bots that he wants play against. Software's option is 4 to 8 players to play the game which means 3 to 70 bots.

Afterwards, human will decide on difficulty level of computer player to play. There will be three options for that: Easy, Medium, and Hard. These levels will be based on ability level of the computer players and hints given to player. To begin with, in Easy mode game will be relatively easy such that human player will see number of cards opponents have, also, computer will place the cards without any algorithm they will play game randomly. So that, game will be relatively easy to win with no strategy. Secondly, in medium game mode human user will face only one difference, which is number of cards will not be shown to any type of user. However, still human player will counter random cards from computer player. Lastly, in hard mode computer bots will be upgraded with some algorithms.

2.2.4 Selection of Deck

Furthermore, human player would select number of cards in the deck he wants. Since, different people like to play this game with different options there will be 2 options here as 52 cards and 104 cards in game.

2.2.5 Selection of Gameplay Options

Game will offer 2 victory options for a game. According to choice game will determine the winner. Either human user may choose the single round or multiple rounds. In sub choice of multiple rounds he must choose one of two options either minimum point the player need in order to win such as 100, 200, 300, 400, 500 or the number of games such as 3, 5, 7, and 9. Scores will be calculated according to score norms of game (see Appendix A: Rules and laws, Scores). Until the last player passes the limit point game will continue and winner will be the one with least number of points. In the round choice winner will be also determined by having least number of points until the end.

2.2.6 Selection of Rounds or End Score

If human user selects the Single Game option than number of rounds will be 1. However, if Scored Game option is selected by the user, number of rounds can be selected as 3, 5, 7 or 9. If the user who selected Scored Game wants to finish the game according to the points, then s/he can choose end points as 100, 200, 300, 400 or 500.

2.2.7 Selection of Game Speed

Speed of game could be adjusted with configuration menu. There will 2 options for that: normal and fast. When human chooses fast option he will end up game 1.5 times faster than he plays average of times.

2.2.8 Start Game Option

When human player makes proper selections in configuration menu and press Start Game he will be directed to gameplay and enjoy the game according to its rules!

2.2.9 End Game Option

When human player want to exit he could press X in the right corner of screen to exit. That will close the game completely and whenever player wishes to come back, he will start new game again.

2.2.10 Menu Option

Human user could choose this one during game and pop up window will appear. He will have several options. To begin with, human player could turn on and of sound, read help about the gameplay and go back to main menu.

2.2.11 Help Option

In the main menu, after pressing help in the main menu you will be directed text with images describing person how to play Dirty Seven and tricky points in the game. This option will be very detailed description about gameplay of game. Moreover, help section is also available on the gameplay screen while game is continues.

2.2.12 Credits Option

From main menu, this option will provide names of developers. Additionally, this page will provide little specific information about Dirty Seven Development Team.

2.2.13 Comments and Suggestions Option

From main menu, this option will provide names of developers. Additionally, this page will provide little specific information about Dirty Seven Development Team.

2.3 Non-functional Requirements

2.3.1 Usability

- The game should be accessible, that is it should be easy to use by as many people as possible. For this, the user interface will be made simple and consistent.
- The amount of user documentation provided in the help section which is accessible on main menu and gameplay screen should also be sufficient for anyone with minimal phone and Android experience to enjoy the game.
- For multilingual purposes, the game has Turkish, English and Russian language versions.

2.3.2 Reliability

- The inputs given to the game are almost always selected from a pre-determined menu, therefore unexpected cases are hard to occur.
- The game should always work smoothly independent of users' choices, however, if an event of failure occurs, the game can be manually shut down and restarted.
- This is not a level-based game; therefore no data is stored once the current game is over except configurations of the game the user selected. Once, the user select the configurations for the game, they will be stored so that the user can play new games without choosing that settings again. However, whenever the user wants to change the configurations for a new game, they can be changed. While playing a game, they cannot be changed though.
- To download and install the game do not request any private information about device and user.

2.3.3 Performance

- This game has basics graphics therefore; it should not create stressful conditions for the devices running this Android based game.
- The game should not take more than ten seconds to load. The users should be able to iterate through game creation smoothly and once the game starts it should never stall.
- While selecting options for the game and making a decision on how to move, the user can take as much time as they want, so there will be no time constraints for the user during the game creation and playing.
- The game supports only one player. Only one game can be played at a time.
- Passing time for moving a bot should not take more than 3 seconds.
- Different levels of the game will not make a differentiable difference related to performance of the game.

2.3.4 Supportability

- The game can be played on any device which has Android 4.0 Ice Cream Sandwich version or newer.
- An extension to the game can be making it a multiplayer game that people can play from different devices.
- The game can be written for iOS based devices as well.

2.4 Constraints

2.4.1 Implementation

- Dirty Seven Card Game will be programmed using Java Programming Language.

- Since it will be an Android game Android SDK will be used.
- Target for the game are devices having Android 4.0 or a newer version installed.

2.4.2 Packaging

The game will be available on Google Play Store, so only installation it requires is downloading from store and installing it on the device.

2.4.3 Legal

Dirty Seven Card Game will be an open-sourced application. Also the code of the application will be on GitHub and will be available for seeing. The tools and technologies which will be used to develop this application are either open-sourced or licensed; therefore it will need no license fee.

2.5 System Models

2.5.1 Scenarios

Scenario Name: mainScenario

Participating actors: Can (Player)

Flow of events:

1. Can clicks on the game icon from his android phone and opens the game.
2. He chooses Single Game (so number of rounds will be 1), sets the number of players to "4" (so there will be 3 bots in the game), and difficulty to hard.
3. He clicks the "Save" button and starts a new game.
4. He plays the game by its rules and a few minutes later he announces that he has only 1 card on his hand by clicking "Only 1 Card Left" button.

5. Then another player announces that he has only 1 card.

6. When he wants to finish the game by playing the last card of his. He sees that the top of the cards on the table is a Diamond 7 and the last card of his is not any kind of 7. So the game gives him 3 cards from the deck immediately.

7. Another player who announced that he had only 1 card plays the last card and win the game.

8. Calculations are made and he becomes 3rd.

9. Can closes the program, a confirmation pop-up box appears. He confirms and exits the game.

Scenario Name: Training Scenario

Participating actors: Cem (Player)

Flow of events:

1. Cem clicks on the game icon from his android phone and opens the game.

2. He doesn’t change the settings and begins the game because he is a new player.

3. He clicks to help icon to learn the rules of the game and how to play it.

4. He learns that first round he need to play a club card and the special cards are not important on this round.

5. He learns the special card and understands that he need to have a 7 in his hand in order not to get penalized.

6. He understands that he need to get rid of the 7s, Aces and Jacks before the game ends in order not to get more points which is not good.

7. He starts a new game learn other tricks of the game.

8. After some time he forgets to click 1 card left button and can't finish the game. Another player wins the game so he learns that it is important.

9. Cem closes the program, a confirmation pop-up box appears. He confirms and exits the game.

2.5.2 Use Case Model

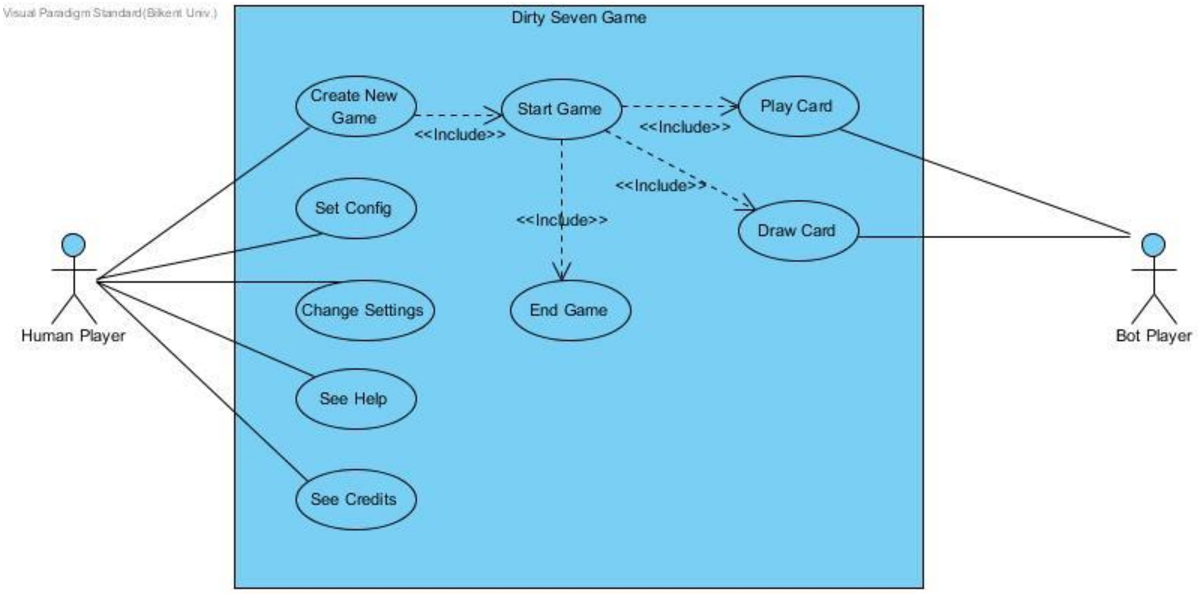


Figure 1: Use Case Model

In Figure 1 use case diagram of the game can be seen. Player can create a game from the main screen and enter the options he/she would like to and start the game. During the game, the player can draw and play card. After starting the game, he/she can end the game any time. Also from the main screen, player can see help, see credits and change settings of the game. Detailed explanations of the use cases are given in the next section.

2.5.2.1 Use Case Definitions

Use Case Name: Create New Game

Participating Actors: Player

Flow of events:

1. Player selects New Game from the main screen.
2. Application redirects user to configuration screen for the game with values that are saved on the last time loaded. If it’s the first time, default values are loaded.
3. Player chooses the number of players and the difficulty of the game. Number of players vary from 4 to 8. Provided difficulties for the bots are easy, medium and hard.
4. Player chooses the number of decks which will be used in the game.
5. Player chooses the number of rounds.
6. Player chooses the game ending type.
7. Player chooses the game speed.
8. Player selects the Start Game option and application loads the game with given configuration.

Entry Condition: Player has started the application and selected the New Game option.

Exit Condition: Game is loaded with the configuration player provided.

Use Case Name: Play Card

Participating Actor: Player

Flow of events:

1. Player finishes the Create New Game process.
2. Game deals the cards to player and bots.
3. Player chooses a card to play. Game checks whether the card can be played or not at that moment;
    1. If the card can be played, Player plays the card.

2. If the card cannot be played, Game prompts player to play another card or draw a card.

Entry Condition: Player has started the application and finished the Create New Game process.

Exit Condition: Player played a card and his/her turn ended.

Use Case Name: Set Config

Participating Actor: Player

Flow of events:

1. Player selects Set Config option from the main screen.
2. Application opens the configuration screen which includes following sections to specify: number of players, difficulty, number of decks, number of rounds, game ending type, game speed.
3. Player determines the configuration settings according to his/her wishes.
4. Player clicks the Save Config button and application saves the provided config.
5. Player closes the Set Config screen and returns to main screen.

Entry Condition: Player has started the application and selected the Set Config option.

Exit Condition: Configuration is saved and will be used as default for the future games.

Use Case Name: See Help

Participating Actor: Player

Flow of events:

1. Player selects See Help option from the main screen.
2. Application creates the help screen with the documentation for the game.

3. Player sees and reads the given documentation and after that clicks the close button and closes the See Help screen and application loads the main screen.

Entry Condition: Player has started the application and selected the See Help option from the main screen.

Exit Condition: User documentation is shown to the player.

Use Case Name: See Credits

Participating Actor: Player

Flow of events:

1. Player selects See Credits option from the main screen.
2. Application creates the Credits page and opens it.
3. Player looks credits and then he/she clicks the close button and closes the Credits screen.

Entry Condition: Player has started the application and selected the See Credits option from the main screen.

Exit Condition: Player is provided with the credits of the game.

Use Case Name: Change Settings

Participating Actor: Player

Flow of events:

1. Player selects Change Settings option from the main screen.
2. Application loads the Settings page and shows it to the player with two options which are sound and volume.

3. Player specifies the options by setting the sound value on or off, and by adjusting the volume. After that he/she clicks to save button or clicks to close and returns to main screen.
4. Application saves the settings if player chooses saving. Then main screen is loaded.

Entry Condition: Player has started the application and selected the Change Settings option from the main screen.

Exit Condition: Settings are changed according to Player's preferences. Player has returned to main screen.

2.5.3 Object Model

2.5.3.1 Data Dictionary

Game: This class is the main class of the game. A game has 1 player and 1 to 3 bots. Also a game has 1 or 2 decks, settings and configuration. Game object's basic functionalities are starting and ending the game and loading existing configuration. There are to child classes for Game object according to type: Single Game and Scored Game.

Single Game: Single Game is a class extended from Game class. Dirty Seven Game has two types of game play options for players; one of them is Single Game. This type is for playing only one round.

Scored Game: Another extended class from Game class. This type of game contains more than 1 round (3, 5, 7, and 9) and winner is determined by total score.

Player: This class represents the players who play the game. Player has name and score attributes. Additionally, a player has a hand consisting of cards. In the game Player can play and draw card.

Human: Human a sub-class of Player class and has ability to create a new game, open settings, set configuration, see help and see credits from the main menu.

Bot: Bot object is also sub-class of Player class. It doesn't have all the functionalities of Human class. Bot object has a hand and it only has capability to play and draw a card. It represents players controlled by computer.

Deck: Deck class serves as the card container in the game. In a Game, 1 or 2 decks can be used and this is represented as an attribute in the Deck object. Also a deck can be shuffled and needs to be updated during a game; hence Deck object has these operations.

Card: This object is a simple object but it is used in most of other classes. Card object has only two properties which are kind and value.

Hand: Hand object is composed of single or multiple Card objects. Hand object has update method for updating itself when a card is played. All players have their own hand.

Config: Config class involves the setup options for the game. The attributes of the Config object are number of bots, difficulty of the game, number of rounds and game speed. These values are stored according to Player's input.

Settings: Settings object includes main selections about the game. The options in Settings object are sound and volume.

2.5.3.2 Class Diagram

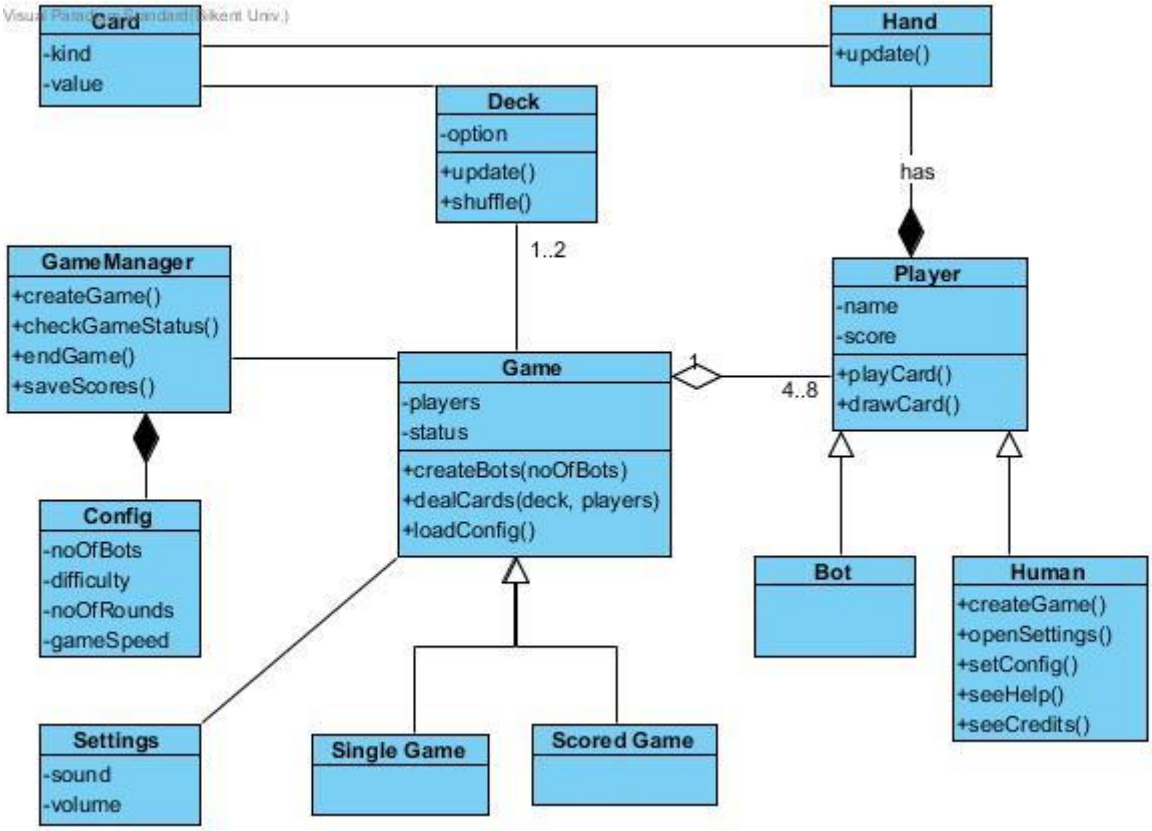


Figure 2: Class Diagram

2.5.4 Dynamic Models

2.5.4.1 *Activity Diagram*

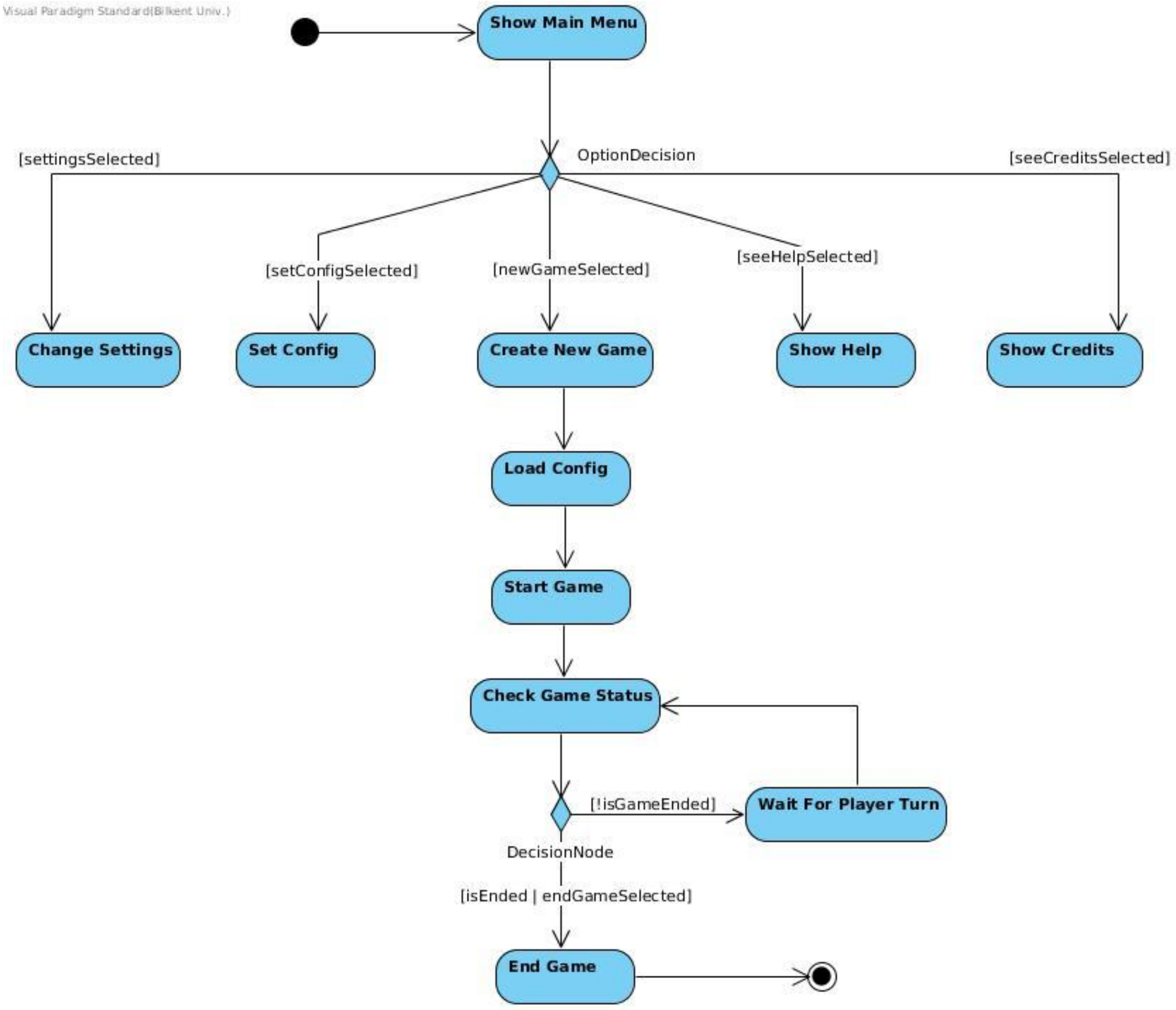


Figure 3: Activity Diagram

This diagram shows the main workflow of the system. First of all, system starts with showing main screen. Then, according to user selection, a decision has to be made to start perform next activity. If the user selects Settings, preferred settings are changed; if the user selects Config, he/she configures the main options of the game as he/she desires and those are set and saved; if the user wishes to see help or credits, in accordance with her/his request. If the user wants to create a new game, the system first loads the configuration of the game. After that, it starts the game and during the game it periodically checks the game status. If user ends the game by selecting End Game option or game reaches the end by either Human or one of the Bots winning, end game activity is performed. Otherwise game waits for one turn then checks the game status again.

2.5.4.2 Sequence Diagram

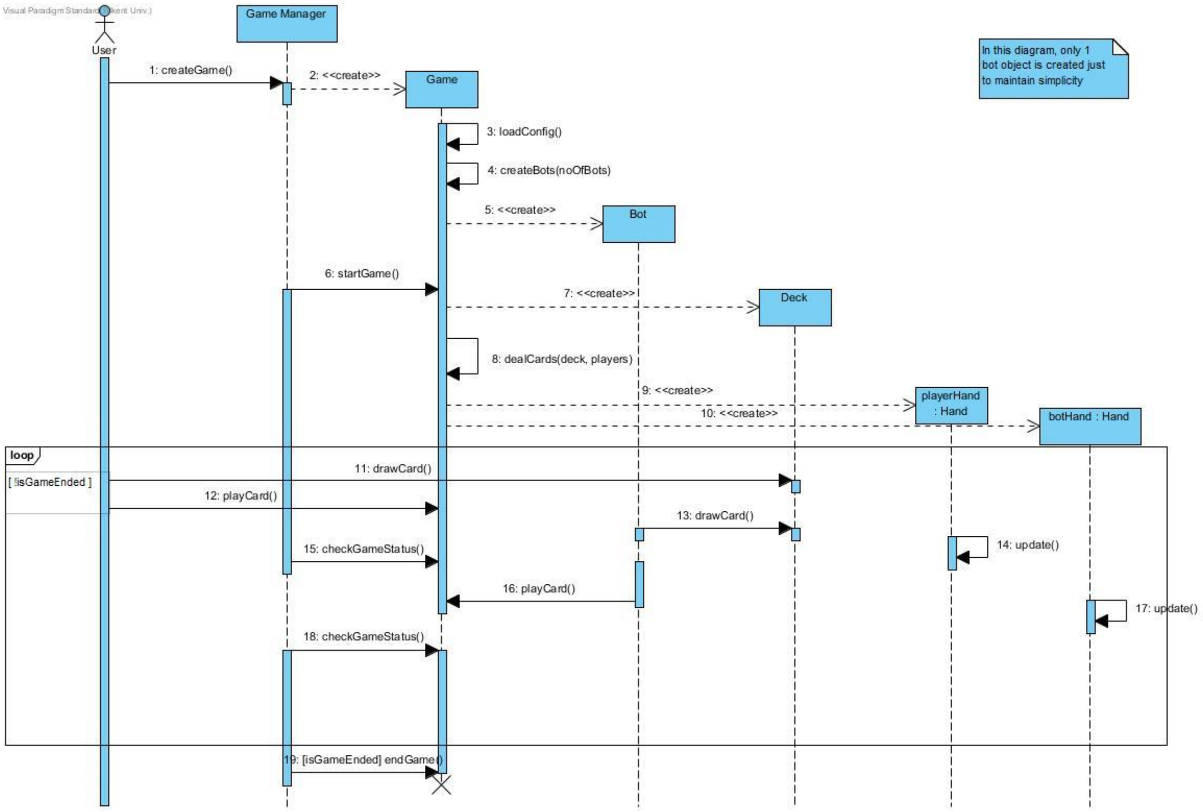


Figure 4: Sequence Diagram

This diagram shows the main workflow of the system. First of all, system starts with showing main screen. Then, according to user selection, a decision has to be made to start perform next activity. If the user selects Settings, preferred settings are changed; if the user selects Config, he/she configures the main options of the game as he/she desires and those are set and saved; if the user wishes to see help or credits, in accordance with her/his request. If the user wants to create a new game, the system first loads the configuration of the game. After that, it starts the game and during the game it periodically checks the game status. If the user ends the game by selecting End Game option or game reaches the end by either Human or one of the Bots winning, end game activity is performed. Otherwise game waits for one turn then checks the game status again.

2.5.5 User Interface

In this section illustrations of main screens of Dirty Seven Card Game can be found.

2.5.5.1 Main Menu Screen

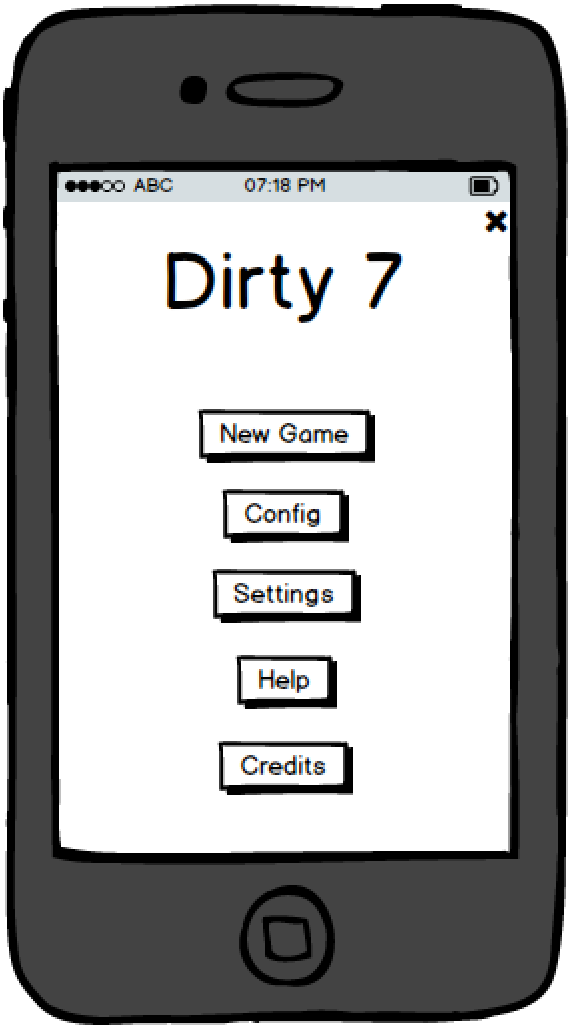
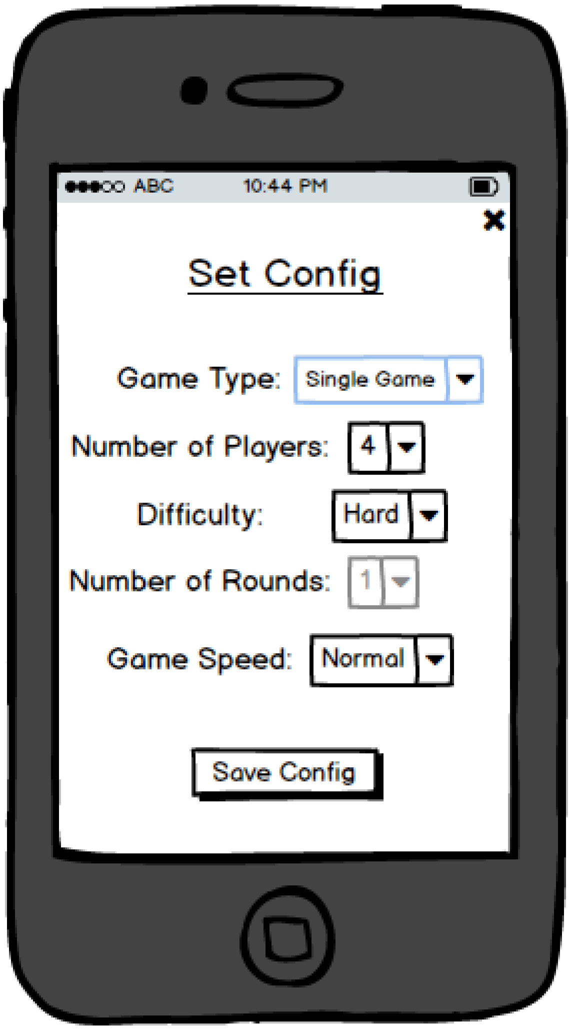


Figure 5: Main Menu Screen

This is the main menu of Dirty Seven Card Game. Player can create a new game, set configuration, change settings, see help and see credits from this screen.

2.5.5.2 Set Config Screen



Game Type: Single Game

Number of Players: 4

Difficulty: Hard

Number of Rounds: 1

Game Speed: Normal

Figure 6: Set Config Screen

This screen is an example of the application’s configuration options. The Player is able to select Game Type, Number of Players, Difficulty, Number of Rounds and Game Speed from this menu and save it. In this very example, number of rounds selection is disabled because Player selected single game option. If the user selected otherwise, it would be enabled.

2.5.5.3 Settings Screen

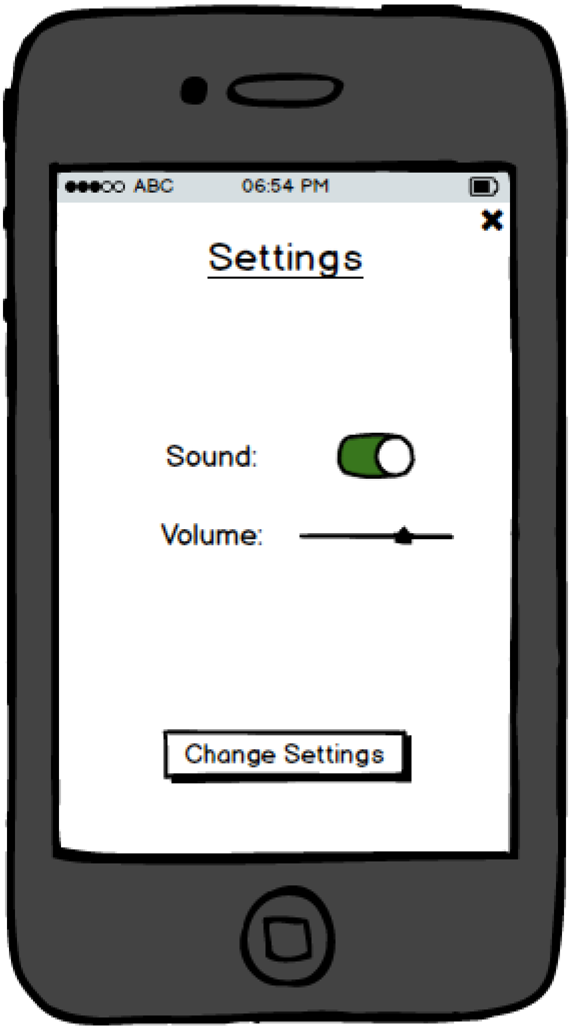


Figure 7: Settings Screen

This is an illustration of the settings screen of the application. The user can turn on or off the sound and designate the volume from this screen as it can be seen.

2.5.5.4 Gameplay Screen

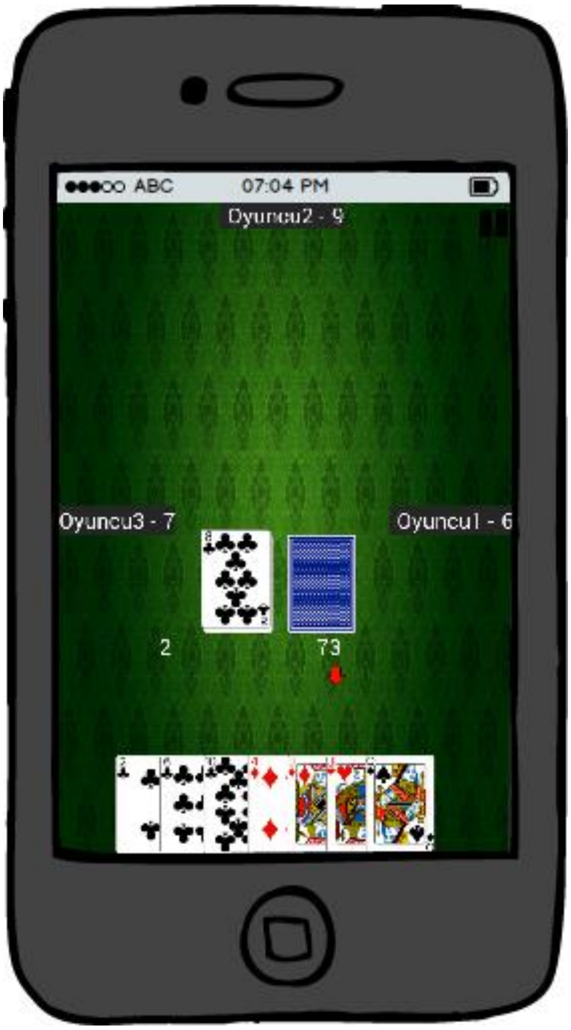
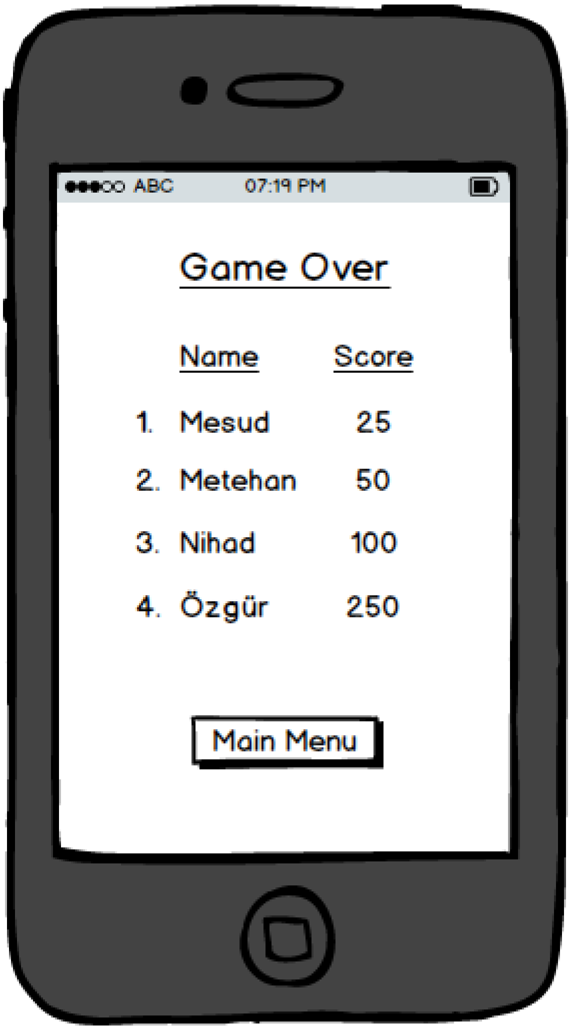


Figure 8: Gameplay Screen

Since the application is not completed, this is an example screen for Dirty Seven Card Game. Our main gameplay screen will be similar to this instance.

2.5.5.5 Results Screen



Game Over

	Name	Score
1.	Mesud	25
2.	Metehan	50
3.	Nihad	100
4.	Özgür	250

Figure 9: Results Screen

This screen is shown to the user when game comes to an end. Results screen involves a list of players including bots in order with respect to their scores in the game. Because of the game rules players are listed in ascending order according to their scores. The user can navigate to main menu from this screen.

Appendix A: Game Rules and Laws

Dirty Sevens card game is very old solitare game that can be played with as many players as possible if you have required amount of card decks. Game is very interesting one of card games. Rules and laws of game is very simple and similar to popular game “UNO”.

Starting game: First of all, winning rule of game emptying your hand first among the players. Starting the game has different scenario. When you start the game you have to place any of clubs if you do not have clubs just have get from deck and you cannot skip your turn in the first step. Also, in first stage your special cards (see Special Cards) are played as normal cards that has no advantage on others.

Rules and Laws during game: When 1st hand finishes you can place the different number from the same group or the same number from different card group to the card that is on the top of placed cards deck. When its some turn of the player that has none of them or she do not want to place card because of any tactic, she could get a card from deck and pass turn. Also, she could get until the end of deck. Then she passes or plays and turn goes to other player. When a player who has 2 cards plays her card and has a card, she has to say “ONE”, if not she has to get a card from deck and say “ONE” and turn goes to next player in the row.

Special Cards:

- **7:** If a player places 7 on the table next playing player has to get 3 cards from deck as a penalty. However, if next player also has 7 and she decides to place her card, the next player will get 6 cards. Indeed, if other players also have 7 game goes as the last one with no 7 will get *number of 7 * 3* number of cards from deck.

- **10:** When player places 10 on the top of cards, she could place as many 10 as she wants, also, in the end she must place a card from the same type (rather than 10) as last 10 to the top. If she cannot place a card, she has to say “NONE”.

- **JOKER:** Player who places joker could change the type of card in the game to whatever player decides at the time of placing card. Player could play Joker whenever she wants with one exception, in the top of played cards has to be no Joker.

- **8:** When player places 8 direction of game changes to reverse of current direction. If other player also has a ace or 8 she could also reverse the direction of game.

- **ACE:** Ace playing player could penalize everyone except herself. She could make everyone draw card from deck

Rules and Laws due to No of Players: If game played between two, when one of the players plays Ace the other will draw a card from deck. If her hand does not contain Ace or the card from the same type as placed Ace player will draw another card and say “PASS”

On the other hand, when game played between 3-10 player. Ace playing could only penalize other player with only drawing a card from deck.

Point System: Point system of this game is different than the other games, such as player with least amount of point wins the game. When one of the players empties her hand firstly, other players will get points from cards in their hand. First they draw 3 cards for each 7 left on their hands and if they draw 7 they draw 3 cards for each of them again. Players will get 21 points from Ace, 25 point from Jack, 10 from King and Queen and 2-10 from numbers as its number equivalent.