PROJECT REPORT ON

“Android Chess Game”

SUBMITTED BY

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Third Year Bachelor of Science

(COMPUTERSCIENCE)

Under The Guidance Of

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&

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DEPARTMENT OF COMPUTER SCIENCE

CERTIFICATE

This is to certify that the project entitled

Android Chess Game

Is completed by **Mr. Mohd. Hussain Niyamatali Ansari**

Roll No : **21TCS03**

Under the guidance of

Mrs. Sybal Dias

&

Mrs. Snehalata Agarwal

In partial fulfillment for the Degree of Bachelor of Science

(Computer Science) of University of Mumbai

Prof. In charge	**Head**	**External Examiner**

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Acknowledgement

The project of "Android Chess Game" has been unique experience for me. I am very thankful to the **Department of Computer Science of Government of Maharashtra's Ismail Yusuf College**, who gave me the opportunity to take thisproject.

I express my gratitude to our Head of Department **Prof. Amol Sonawane** and my project guide **Mrs. Sybal Dias** for her invaluable support and guidance during the project.

I am also very much thankful to the "UNIVERSITY OF MUMBAI" for including the project work as part of the syllabus, without which I would not have gained the experience of developing software as this.

Last but not the least, I would like to express my gratitude to my Friends for their support and guidance throughout this venture.

Thanking You

Mohd. Hussain Ansari

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Introduction/Preliminary Investigation

- Organizational overview

  - Chess is a game played between two opponents on opposite sides of a board containing 64 squares of alternating colors.
  - Each player has 16 pieces: 1 king, 1 queen, 2 rooks, 2 bishops, 2 knights, and 8 pawns.
  - The goal of the game is to checkmate the other king.
  - Checkmate happens when the king can be captured (in check) and cannot escape from capture.
  - Chess is one of many great alternatives to video games.
  - Chess teaches strategy and this creates thinking about two or three moves in advance instead of focusing only on what the next move of your chess piece will be. This changes the usual concentration of only thinking about what is going to happen in the next five seconds. This instructs children to look beyond the first move and the immediate future. This is an enhancement to their planning skills.

  - Chess teaches patience. After a few games, the child learns that making moves without thoroughly looking at the whole board and noticing where important pieces are vulnerable will end up with her losing these important pieces. They will learn that the lack of patience will most likely cause them to end up in checkmate.

  - Chess will improve executive functioning. According to National Center for Learning Disabilities, “Executive fun download fees of mental processes that helps connect experience with present action. People use it to perform activities such as planning, organizing, strategizing, paying attention to and remembering details, and managing time and space.” Chess allows children to practice all the facets of executive functioning and provides a motivation (winning) to engage in all these facets. Therefore, kids who have difficulty with exec existing functioning will increase these skills.

  - Chess is a great board game for parents to play with their children. The nuances of the game will improve your connection with your child as you teach him, or he teaches you how to play effectively. This is a game when you can share and teach strategies, learn from mistakes and be with each other in a quiet, thoughtful way.

DESCRIPTION OF THE EXISTING SYSTEM

Existing System:

- ✓ People need to play the game manually.
- ✓ Where two people play the chess game on the normal chess board
- ✓ There are only the players who have to take care of the wrong movements.
- ✓ And to live telecast the games played they need to record the game.

Limitations:

- ✓ Because of this traditional way of playing chess in manual, there is no automatic correct move detection can be done.
- ✓ Moves can't be recorded for future reference.
- ✓ It can't be communicated through Internet.

DESCRIPTION OF THE PROPOSED SYSTEM

- Chess is a 2-Dimensional game.
- The program will naturally plot the graphical portrayal of the genuine chess board, for all intents and purposes.
- The software will check all the movements done by the player on game & also suggest valid/best moves for good understanding about game.
- Moves is recorded for future reference.
- One player can play with a computer also.
- All players can see the last piece moved.
- A player can add a timer in the game also.
- There are also undo redo features in the game
- There is total four kinds of draw in the game.
    1. Stalemate.
    2. Repeated move.
    3. Insufficient materials.
    4. fifty moves draw
- Game will end in the following ways.
    1. When one of the players will win the match by checkmate.
    2. When one of the players will lose the match by out of time due to timer.
    3. Draw between the players.
    4. When one of the players will resign and wins go the other player.
- Game will save automatically when player by mistake close the game.
- Player can also save the game whenever he/she wants until minimum 3 move played in the game.
- A player can play with another player online as well as offline.

Proposed System:

- ✓ Show available move of a piece for a newbie.
- ✓ Showing Last piece move of the piece.
- ✓ Undo redo features.
- ✓ Timer in the game.
- ✓ Play with computer option.
- ✓ Saved state of the game.
- ✓ Different kinds of end game condition.
- ✓ Play with another player online as well as offline

Advantages:

- ✓ Very optimized.
- ✓ 99 % Bug and glitch free(since nothing is 100%).
- ✓ Easy to play.
- ✓ Any aged person can play this game.

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Feasibility Study

Depending on the result of the initial investigation the survey was expanded to a more detailed feasibility study.

Feasibility is the process of defining exactly what is and what strategic issues needs to be considered to access its feasibility, or likelihood of succeeding. Feasibility studies are useful both when starting a new business and identifying a new opportunity for an example for an existing business.

Feasibility study is a test of a system proposal according to its workability and impact on the organization, ability to meet user needs and effective use of resources.

Technical Feasibility:

We can strongly say that it is technically feasible, since there will not be much difficulty in getting required for the development and maintaining the system as well. All the resources needed for development of software as well as the maintenance of the same is available in the organization here we are utilizing the resources which are available already.

Economical Feasibility:

Development of this application is highly economically feasible. The organization needed not spend much money for the development of the system already available. The only thing is to be done making an environment for the development with is to be done is making an environment for the development with an effective supervision. If we are doing, we can attain the maximum usability of the corresponding resources even after the development the organization will not be in a condition to invest more in the organization, therefore, the system is economically feasible.

System Requirements

Software Requirements:

- **Programming language:** Java
- **JDK VERSION**: 11.0.11
- **IDE**: Android Studio Bumblebee | 2021.1.1

Hardware requirement(Min):

For Developers:

- **Hard disk**: 40GB
- **RAM**: 8GB
- **Processor Speed**:3.00GHz
- **Processor**: Pentium IV Processor and above.

For Players:

- **Hard disk:** 1GB
- **RAM**: 1GB
- **Processor Speed**:2.3 GHz
- **Processor**: Any kind of processor who satisfies above speed.

Back-End Tool:

Back-end: SQLite and Firebase Real-time Database.

Operating system compatibility:

For Developers:

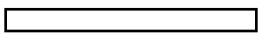
- **MS Windows**: Windows 10 and above.

For Players:

- **Android**: Android 9 and above

Gantt Chart

Project Phase	December	January	February	March
Planning				
Analysis				
Design				
Coding				
Testing & Implementation				
Documentation				



Purposed Duration

Actual Duration

System Design Details

FACT FINDING TECHNIQUES

What is Fact Finding?
Fact Finding is the formal process of using research, interviews, questionnaires, and other techniques to collect information about systems, requirements, and preferences. It is also called information gathering or data collection.

Who does it?
The System Analyst. The Analyst especially needs to develop a detective mentality to be able to discern relevant facts.

What is its Significance in SDLC?
Tools, such as data and process models, document facts, and conclusions are drawn from facts. If facts are not collected, tool scant be used effectively and efficiently.

When is it done?
System Development Life Cycle.

- System Analysis Phase
  - Study Phase
  - Definition Phase
  - Selection Phase
- Design
- Post Implementation Review

What are the facts to be collected?

Any information System can be examined in terms of four building blocks:

- Data: The raw material used to create useful info.
- Processes: The activities that carry out the mission.
- Interfaces: How the system interacts with people.
- Geography: Where data is stored, processes & interfaces happen
-

Fact Finding Techniques
There are seven fact-finding techniques:
1. Study & sampling of existing documentation, forms and databases.
2. Research and Site visits.
3. Observation of the work environment.
4. Questionnaires
5. Interviews
6. Joint Application Development (JAD)

7. Rapid Application Development (RAD) an Analyst usually applies several of these techniques during a single systems project.

The Analyst selects the most suitable technique, depending on the advantages and disadvantages.

1. **Studying & Sampling of Existing Documentation, Forms and Files**

A good Analyst always gets facts from existing documentation rather than from people.

Documents to Study

- Organizational Chart
- Evolution or History of the project.
- Documents that describe the problem:
    - Studies and reports that document the problem area.
    - Suggestion box notes
    - customer complaints
    - Information systems project requests -past and present.
- Documents that describe the business function being designed:
    - Company's mission, objectives and strategic plan.
    - Policy manuals, SOPs
    - Samples of manual and computerized databases.
    - Samples of manual and computerized screens and reports.
    - Documentation of previous system studies and designs.

2. **Research & Site Visits**

A second Fact Finding Technique is to thoroughly research the application and problem.

- Read Computer Journals, Reference books
- Internet
- White Papers
- Case-Studies the Analyst can visit other companies or departments which have addressed similar problems.

3. **Observation of the Work Environment**

A technique where the System Analyst either participates in or watches a person perform activities to learn about the system.

- Used to validate the data collected from other methods.
- Used when the complexity of the system prevents a clear explanation by the End-users.

Do's

- Obtain permission from appropriate supervisors or managers.
- Prepare special forms to record data.
- Determine the who, what, where, when why and how of the observation.
- Take notes during or immediately following the observation.
- Review the observation notes with appropriate individuals.
- Also observe during low, normal, and peak periods of operations.

Don'ts

- Don't interrupt the individuals at work.
- Don't focus on trivial activities.
- Don't make assumptions.

Advantages

- Reliable data.
- Relatively inexpensive.
- Allows work measurement.
- Practical Experience

Disadvantages

- The act of observation alters the behaviour.
- The observation made may not involve the difficulty and volume normally experienced during that time period.
- Some tasks may not always be performed in the manner in which they are observed.
- People may let you see what you want to see.

4. **Questionnaires**

Special purpose documents that allow the analyst to collect information and opinions from respondents.

Types of Questionnaires:

1. Free Format
   What benefits do you think the system might bring?
2. Fixed format: Multiple Choice, Rating, Ranking.

Developing a good Questionnaire

- Determine what facts and opinions must be collected & from whom.
- Examine and edit the questions for construction errors & possible misinterpretations.
- The questions should not offer personal bias or opinions.

Advantages

- Can be answered quickly.
- Relatively inexpensive.
- Maintains anonymity and provides real facts.
- Responses can be tabulated and analysed quickly.

Disadvantages

- No. of respondents is low.
- Respondents may not answer all questions. Inflexible and hence cannot be reframed.
- Cannot quickly clarify a vague or incomplete answer.
- Cannot observe and analyse the respondent's body language.

5. **Interviews**

The most important and most often used fact-finding technique where the analyst collects information from individuals face to face.

Goals of an interview

- Find facts, verify facts, Clarify facts.
- Generate enthusiasm.
- Get the end-user involved.
- Identify requirements and
- Solicit ideas and opinions.

Steps Involved

- Select the interviewee.
- Prepare for the interview.
- Conduct the interview.
- Follow up.
-

Ask Questions tactfully

Consider the following two approaches:

First Scenario:

Analyst: Do you have a budget in mind?
Client: I'd rather not give you a budget. You can submit the quote, and I'll tell you if it's doable or not.
Analyst: OK, no problem.

Contrast this with the Second Scenario:

Analyst: When I've looked at implementing similar solutions like this for companies like Toyota in the past, they costed between 3.5 to 4 lakhs.
Does that sound like the kind of ballpark you had in mind for this project?
Client: Oh...no, it really isn't. I'm afraid the maximum we can afford to part with is 2 lakhs.

Note that you haven't asked what the budget is. Rather, you have suggested that:

- You have worked on similar projects in the past.
- You have worked with companies like Toyota in the past.
- These companies have invested anywhere between 3.5to 4 lakhs.

The emphasis on the positives means that the negative thoughts associated with determining the budget will not kick in directly.

Research suggests that a meeting in which parties have used positive words and body gestures leaves a far better impression than one littered with "NO's" and shakes of the head.

Interview Question Guidelines

- Listen, Listen, and Listen.
- Use Clear and Concise language.
- Don't include your opinion as part of a question.
- Avoid long or complex questions.

Advantages

- Can motivate the interviewee to respond freely.
- More feedback can be probed.
- Can adapt or reword questions for each individual.
- Extra info from body movement and facial expressions.

Disadvantages

- Time consuming.
- Requires good human relations skills.
- Requires good interviewing skills.
- May be impractical due to location constraints.
- The interviewee may not answer/give appointment.

6. **Joint** A**pplication Development (**J**AD)**

Also called as **Group Work Sessions.**
Group work sessions are highly structured group meetings that get the end-users, Managers, & Analysts together.
Separate interviews often lead to conflicting facts, opinions, and priorities. The result is numerous follow up interviews.

Group Sessions overcome this flaw and decrease the time required to obtain concrete facts.
The goals are same as in an interview, except that a no. of analysts are required for:

- discussion leader or moderator
- recording facts

- recording items that require further action or individual interviews.

7. Rapid Action Development (RAD)

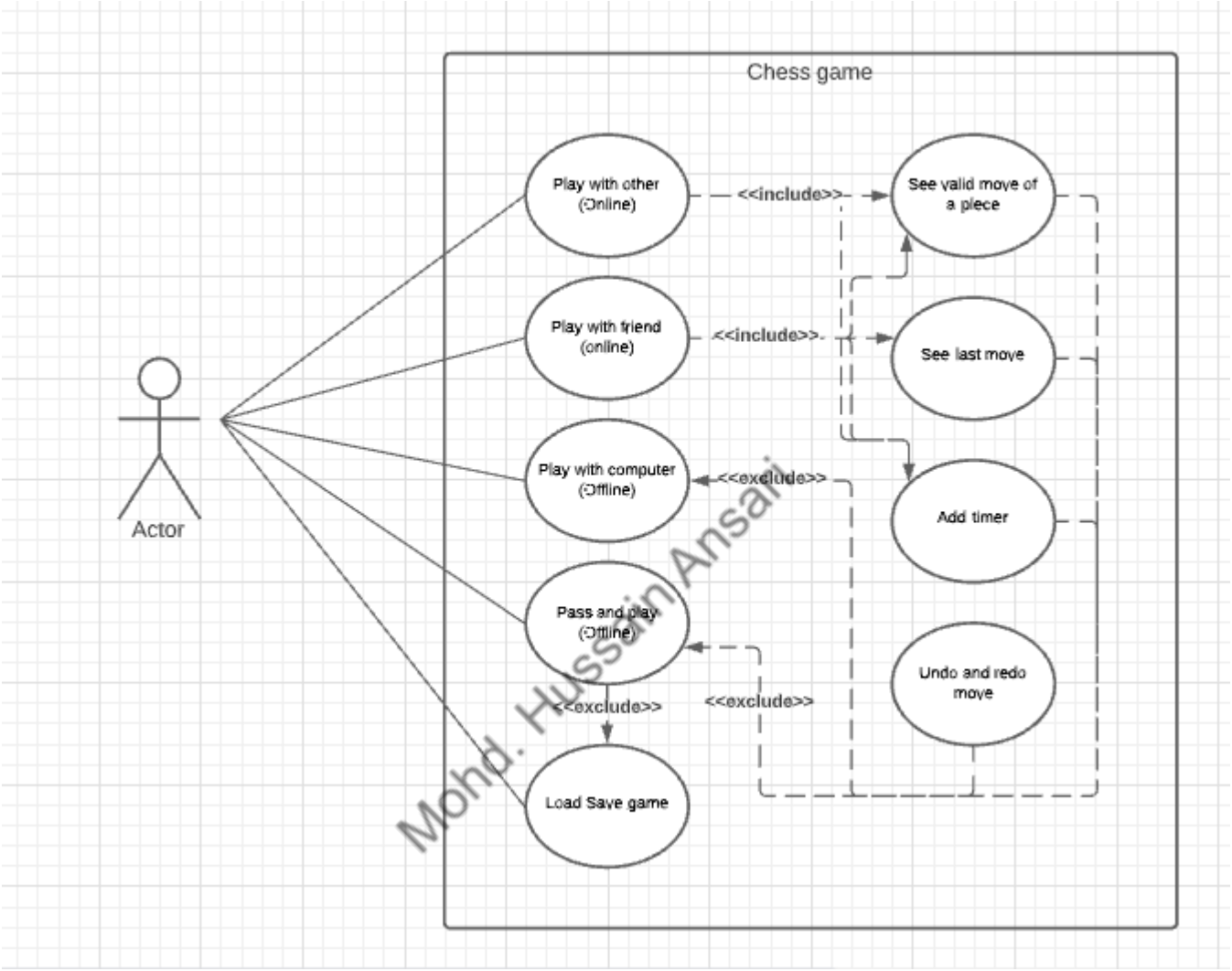
This technique allows analysts to quickly create mock forms and tables to simulate the implemented system and users suggests the changes to the prototype.
Once the prototype is completed, the basis for a user's manual, a requirements Specification, and a template for a test plan is ready.

In this User-cantered approach the emphasis is primarily on the user's requirements. This can reduce the risk of discovering requirements errors later in the life cycle.

Fact Finding Strategy

- Study in the existing documents, forms, reports, and files.
- If appropriate, observe the system in action.
- Given all the facts that are already collected, design and distribute questionnaires to clear doubts.
- Conduct interviews or JAD.
- Verify and clarify the most difficult issues and problems.
- Follow up.

Use case diagram

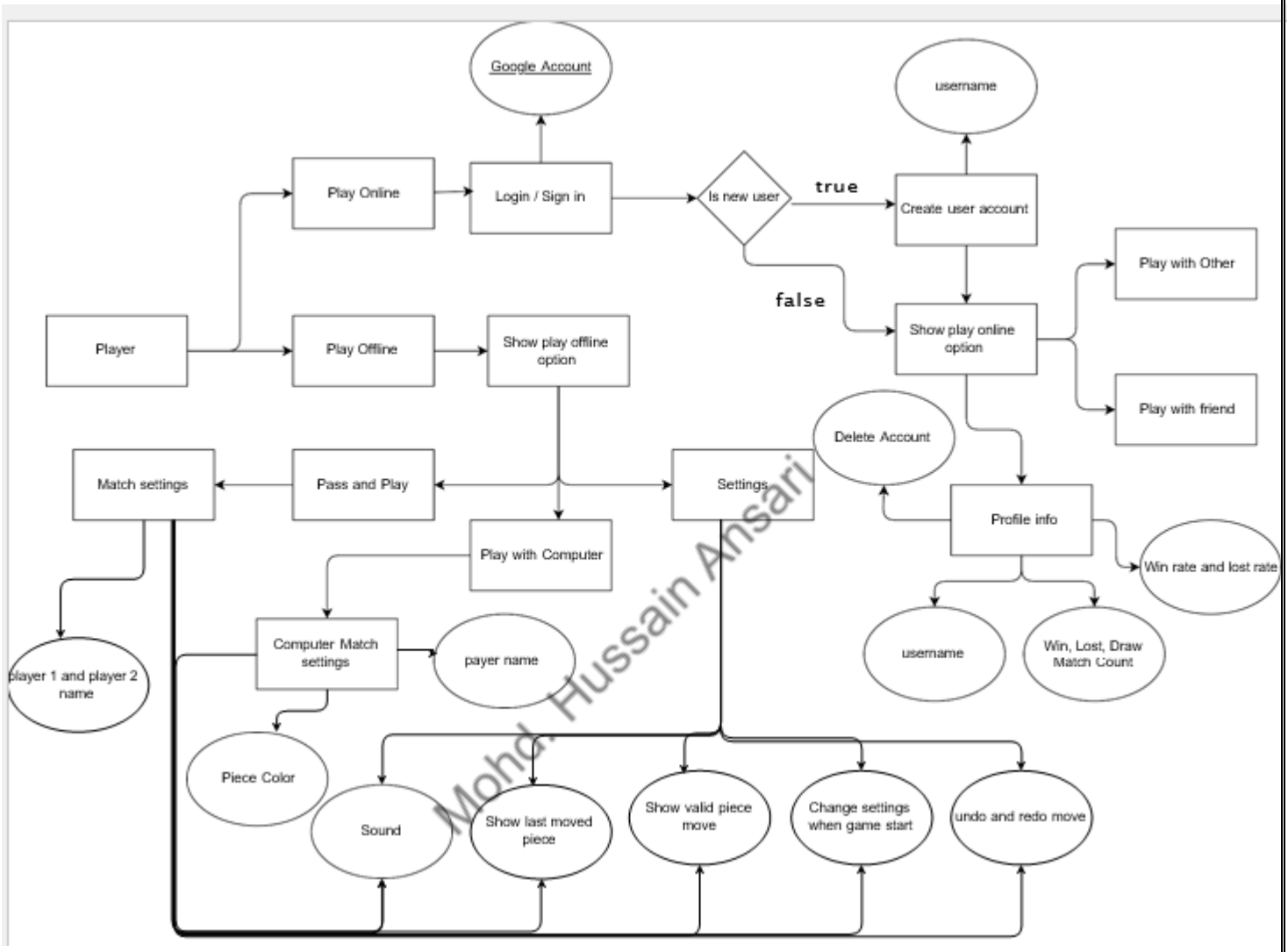


Description of use case diagram

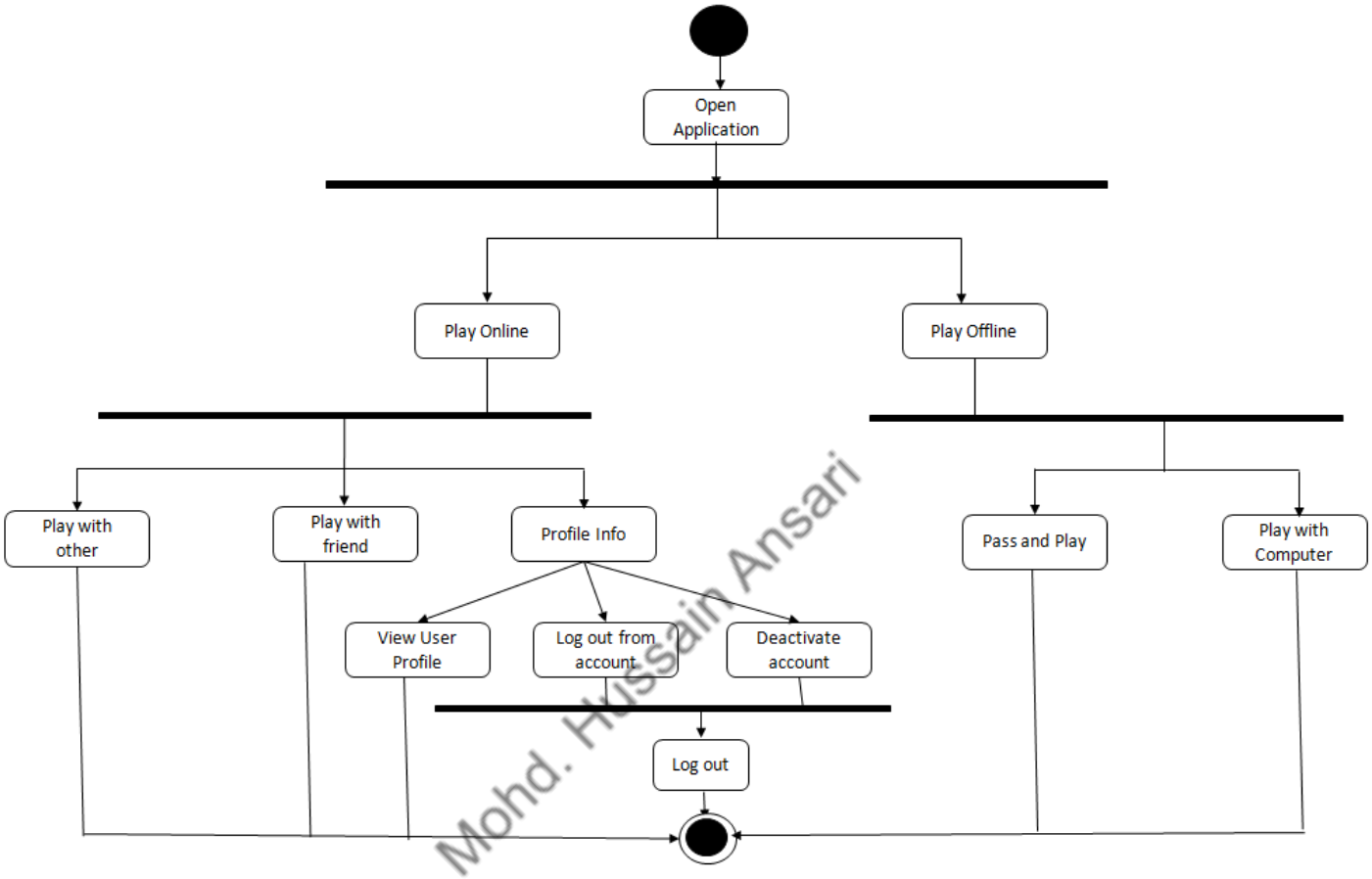
its indicates that player can

- Play with another player (Online & Offline)
- Play with computer player
- See valid move of his/her piece.
- See last move played in the game.
- Add timer in the game.
- Undo and redo move.
- Save offline game.

ERD diagram

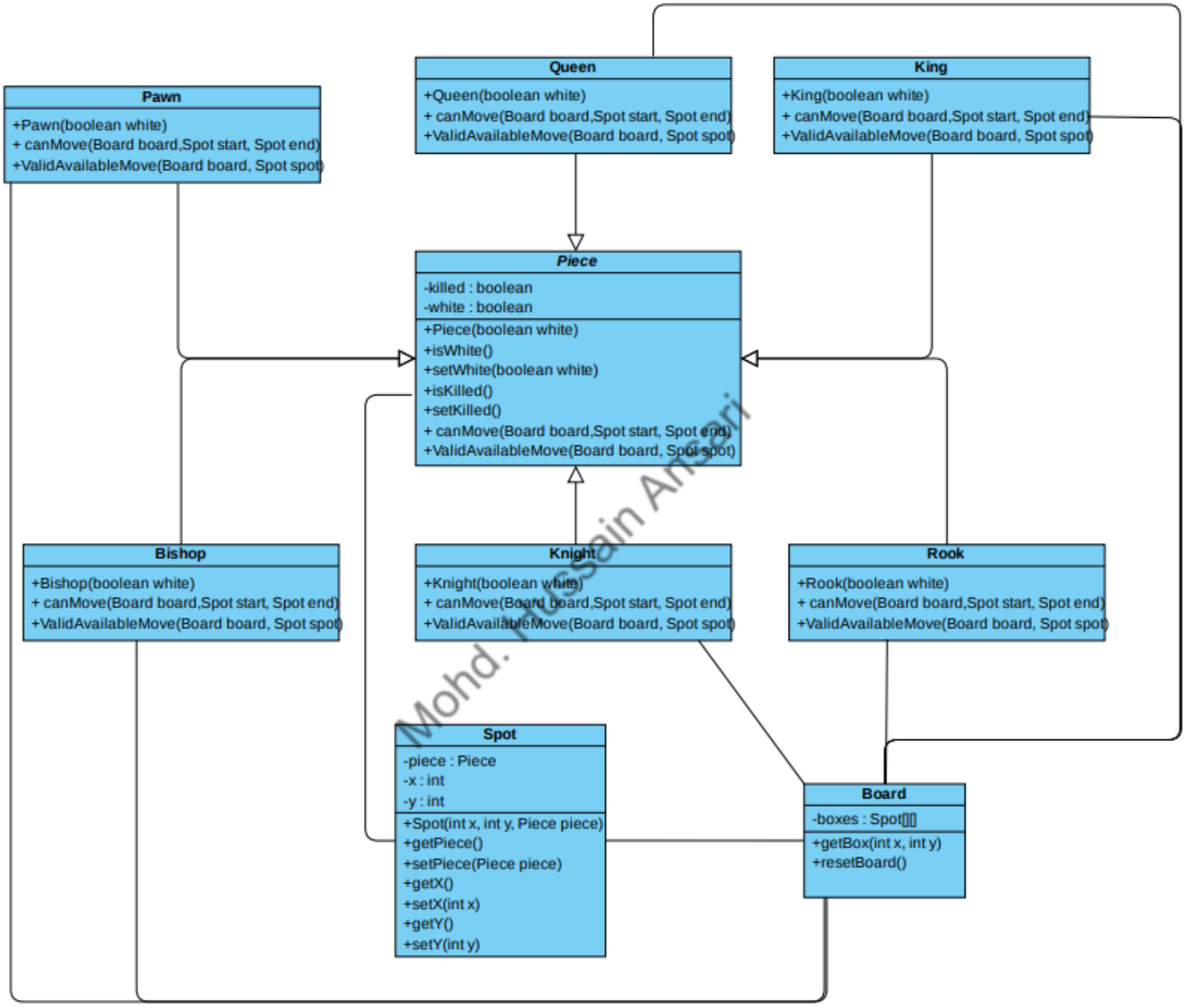

Google Account
username
Play Online
Login / Sign in
Is new user
true
Create user account
Play with Other
false
Player
Play Offline
Show play offline option
Show play online option
Play with friend
Delete Account
Match settings
Pass and Play
Settings
Profile info
Play with Computer
Win rate and lost rate
player 1 and player 2 name
Computer Match settings
payer name
username
Win, Lost, Draw Match Count
Piece Color
Sound
Show last moved piece
Show valid piece move
Change settings when game start
undo and redo move
Mohd. Hussain Ansari

Activity diagram

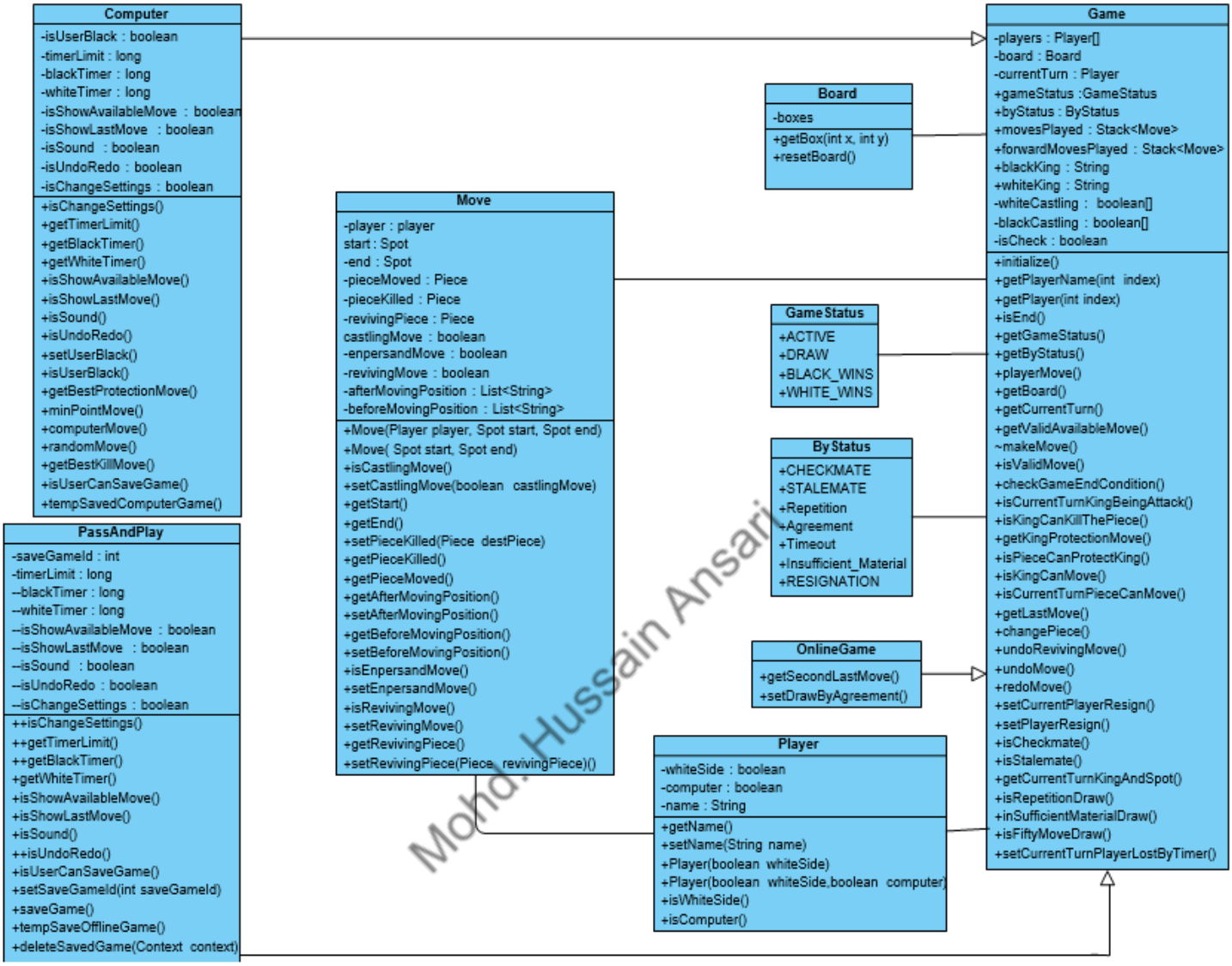


Class Diagram

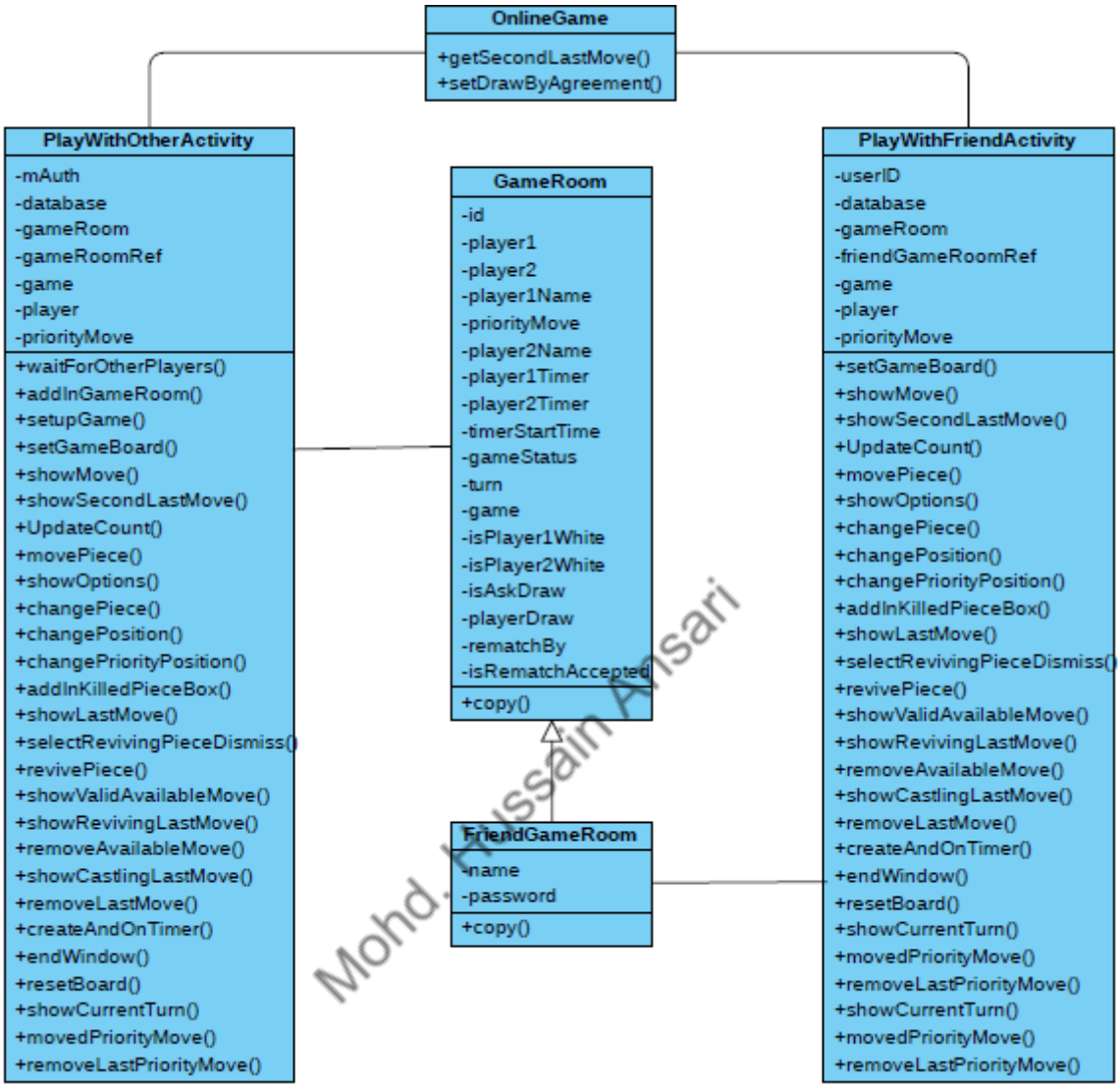
Class diagram for game board and piece: -



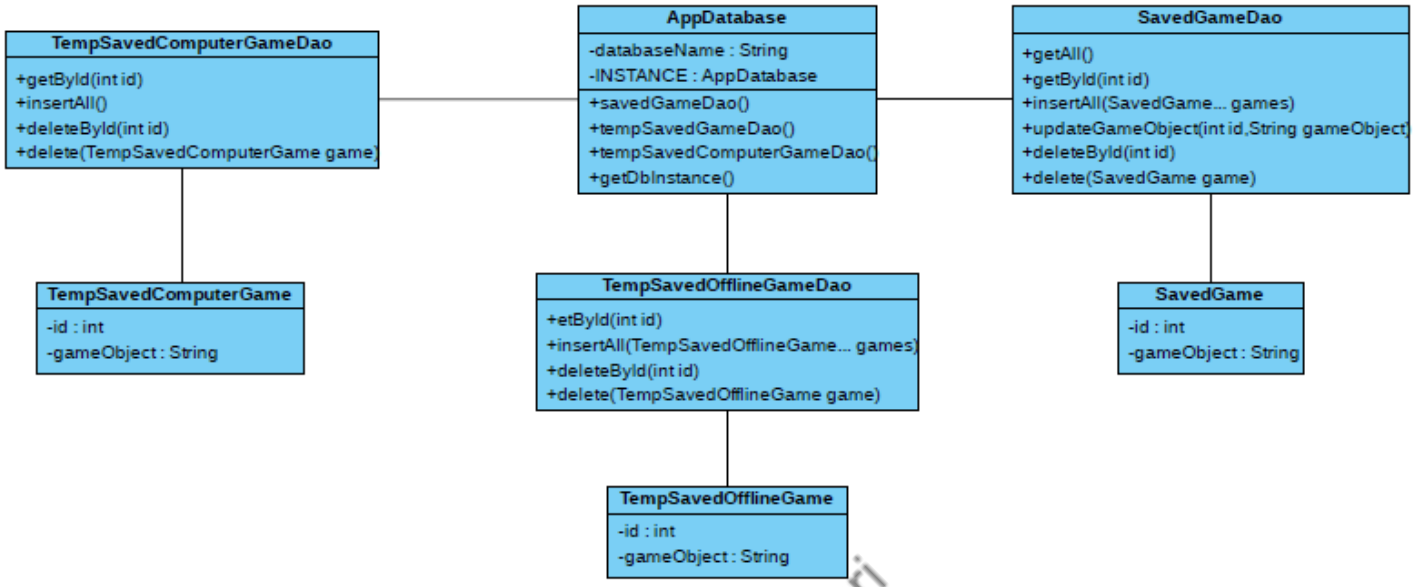
Class diagram for game connection:



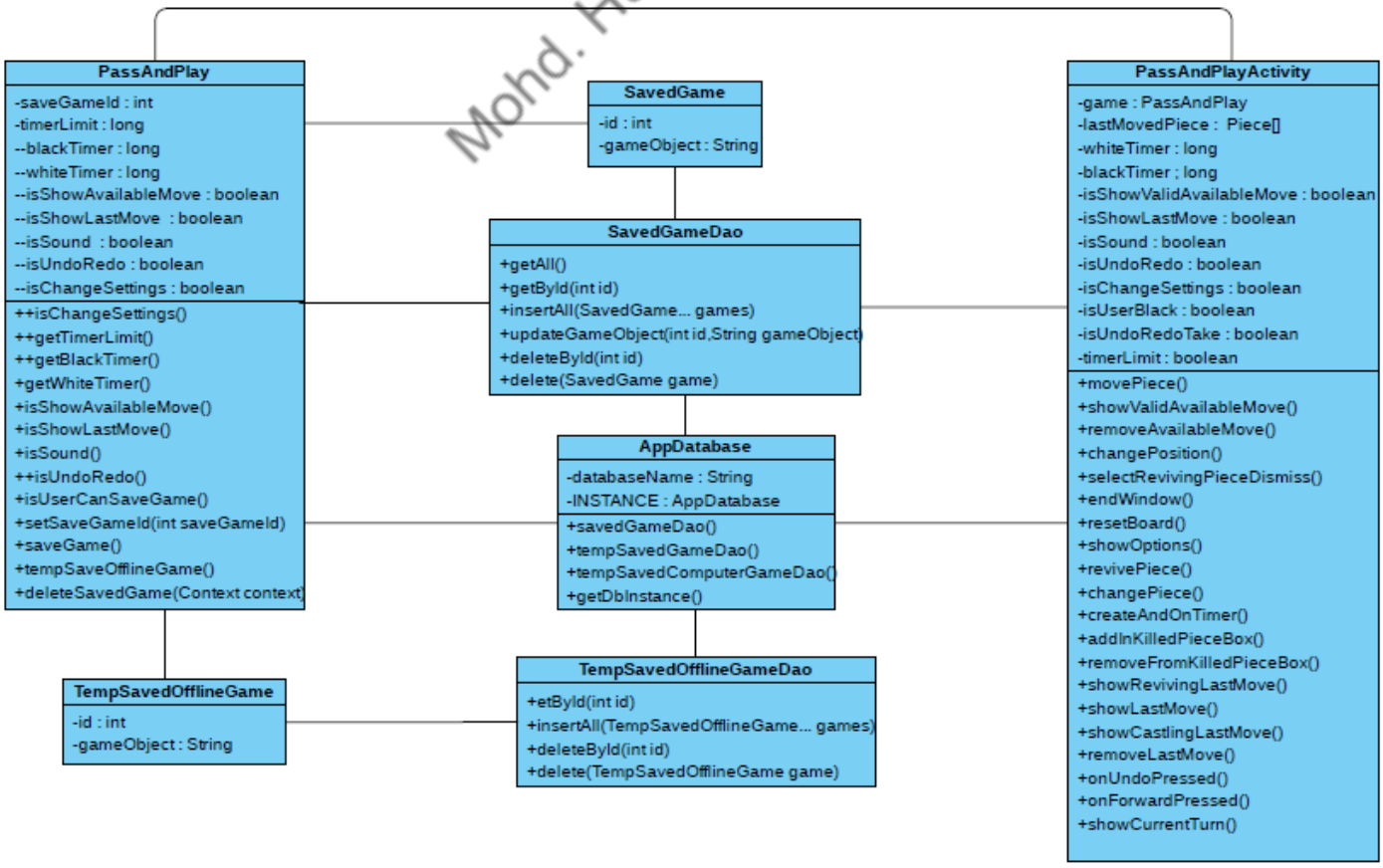
Class diagram for online mode: -



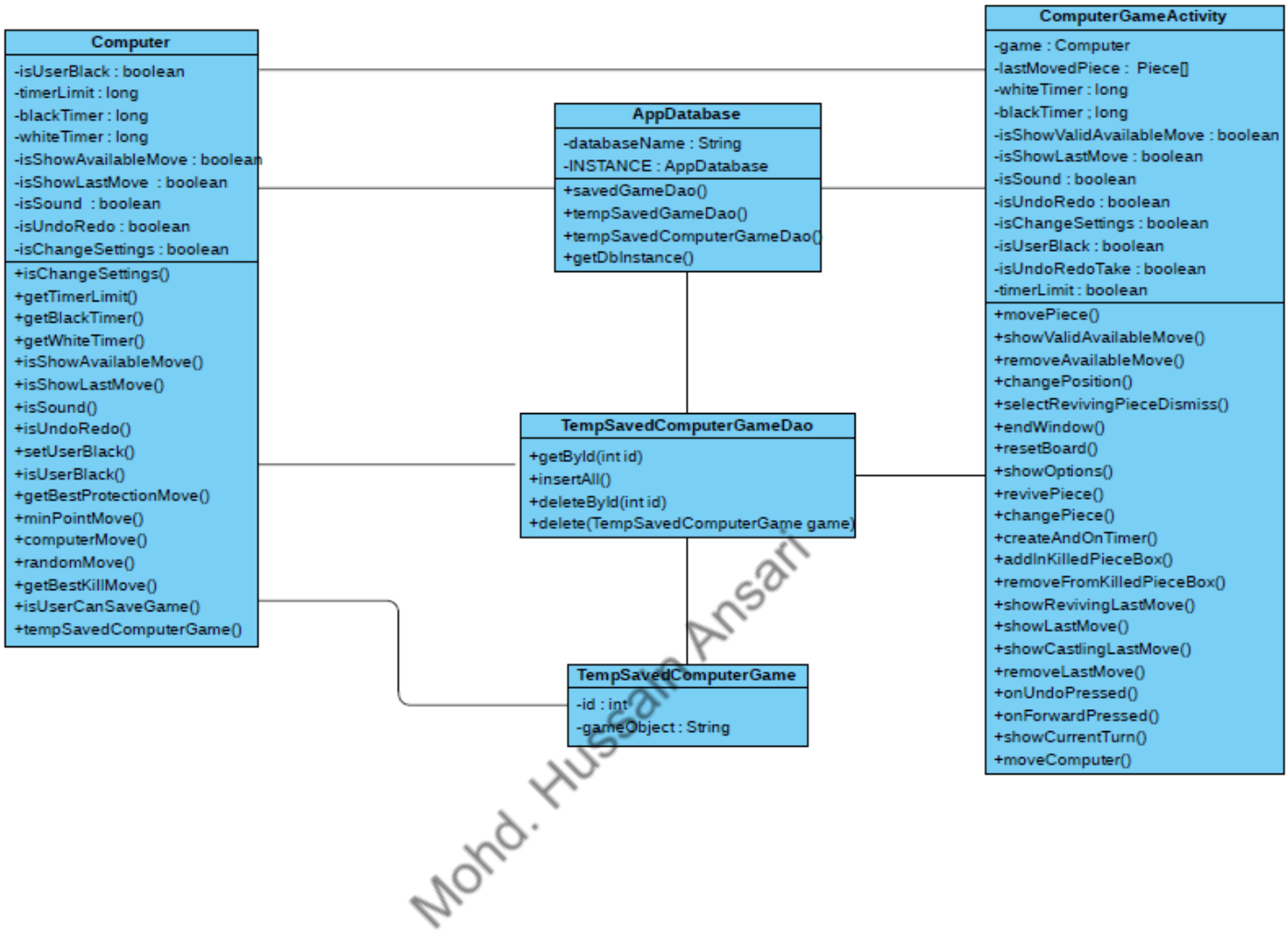
Class diagram for offline mode database connection: -



Class diagram for pass and play: -

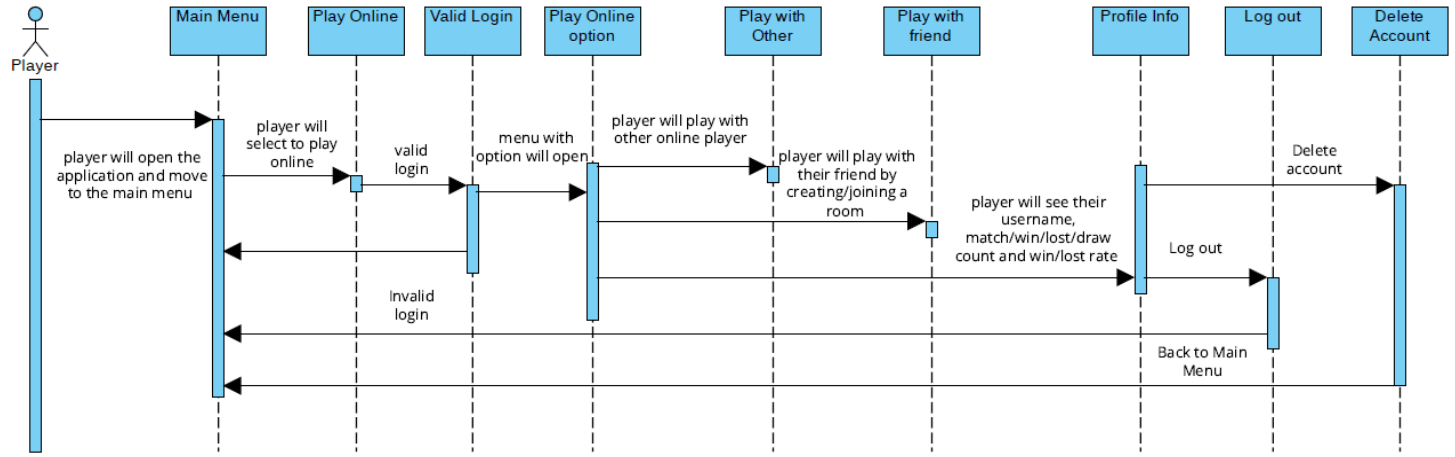


Class diagram for play with computer: -

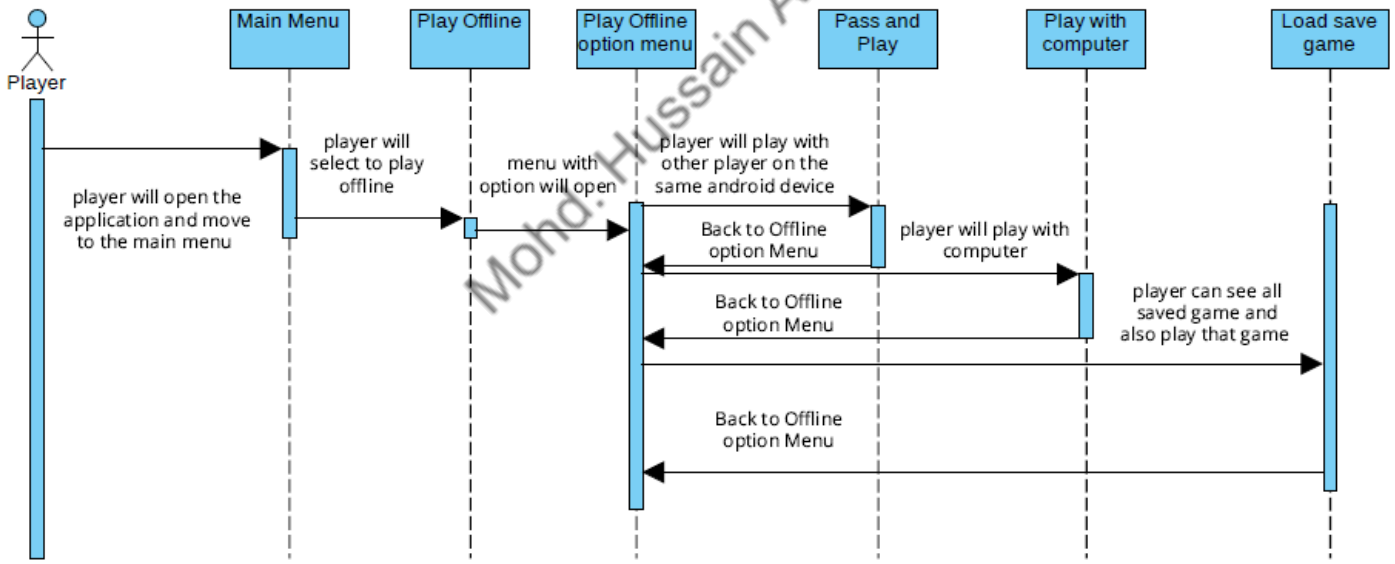


Sequence Diagram

Play Online: -

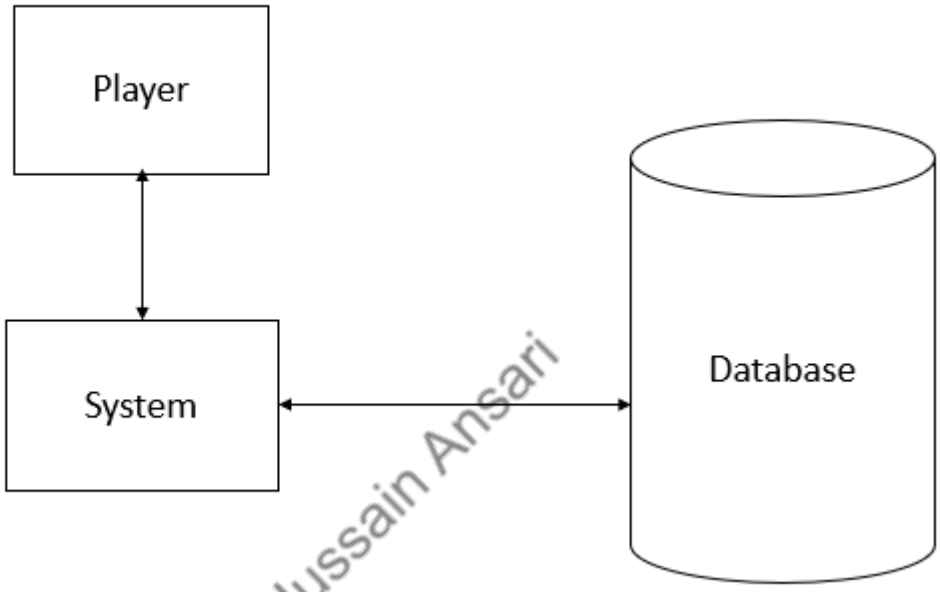


Play Offline: -

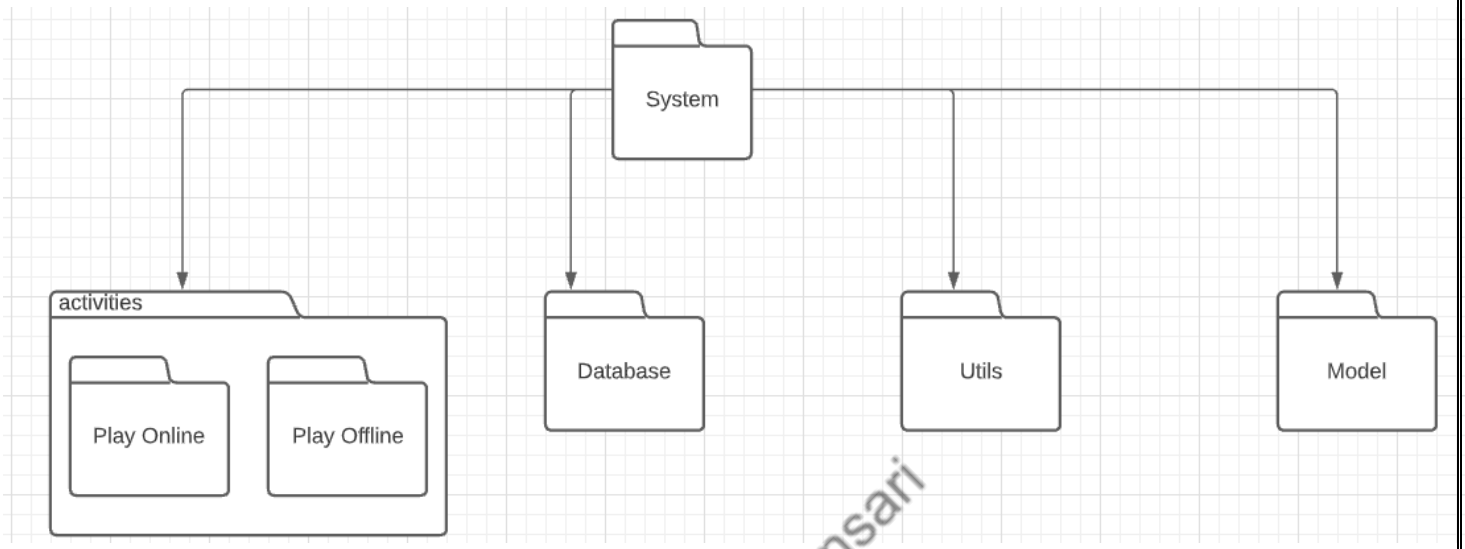


System design

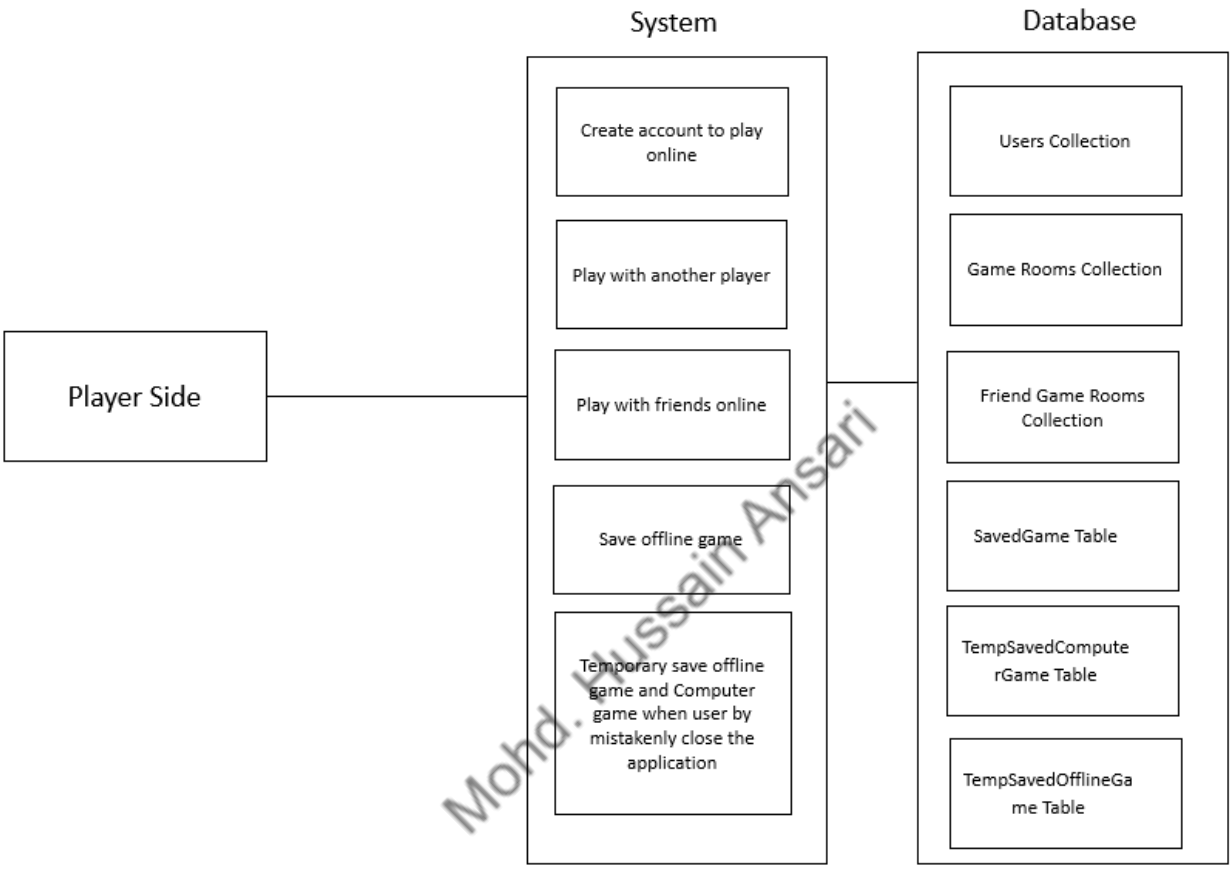
Component diagram



Package diagram

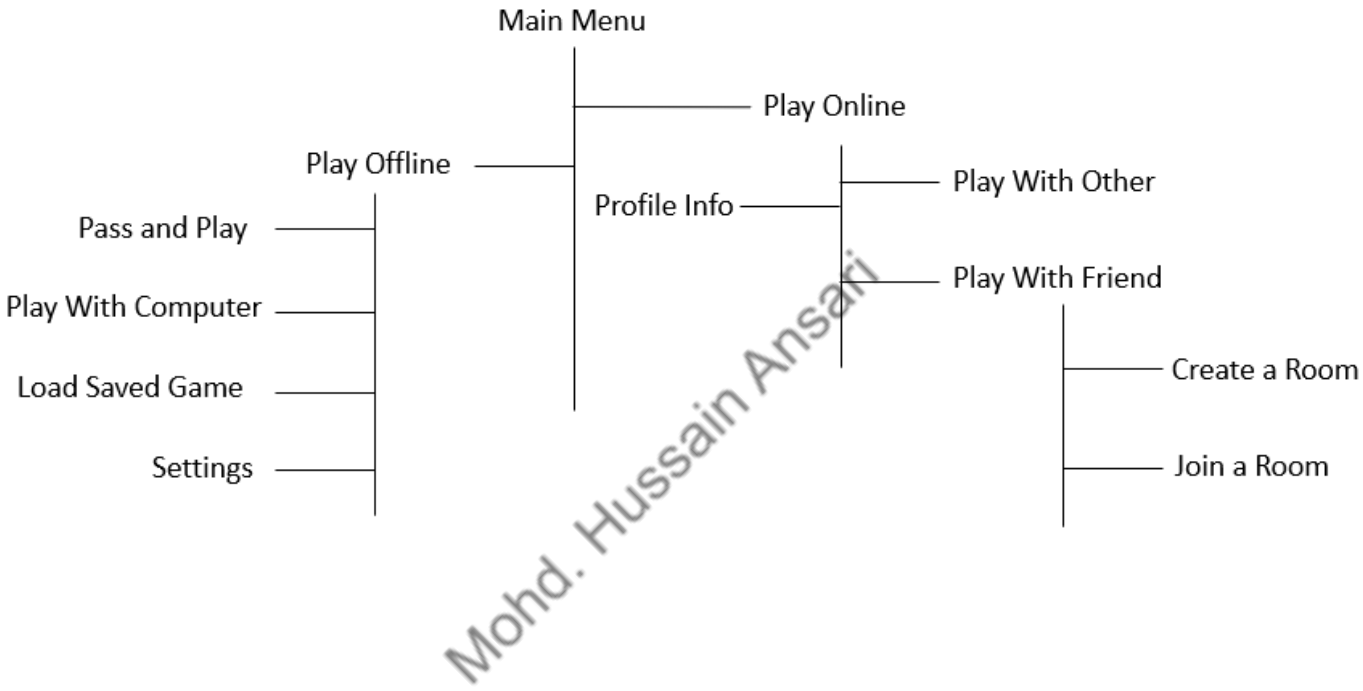


Deployment diagram

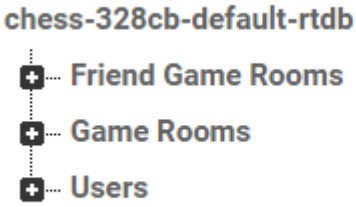


System coding

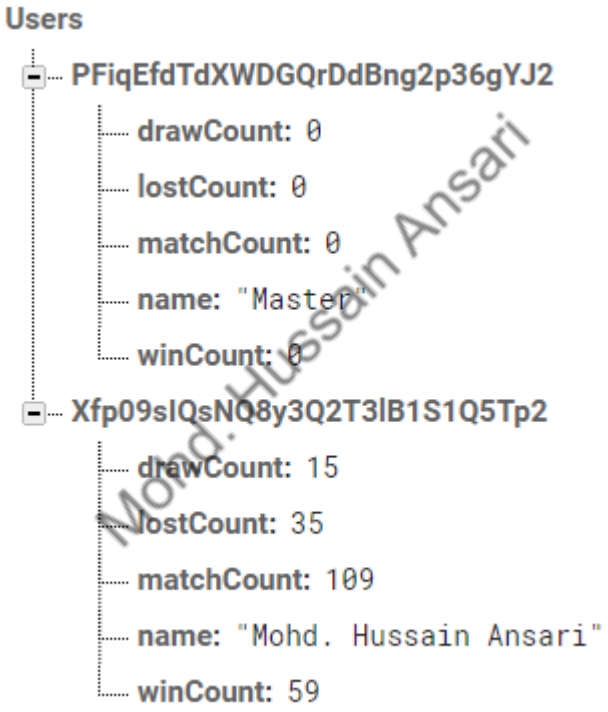
Menu Tree



Collections



Users Collection



Game Rooms Collection

Friend Game Rooms Collection

Tables

SavedGame Table

Field	Data Type	Constraints
id	Integer	Primary Key
gameObject	Text	Not Null

TempSavedOfflineGame Table

Field	Data Type	Constraints
id	Integer	Primary Key
gameObject	Text	Not Null

TempSavedComputerGame Table

Field	Data Type	Constraints
id	Integer	Primary Key
gameObject	Text	Not Null

Test cases, Test data and test results

Sr no	Test Cases	Expected Result	Actual Result	Pass/Fail
1	LoginTest (Google account)	Check for data in firebase authentication and login.	Output as expected.	Pass
2	Timer test	Only current turn player timer will run	Output as expected.	Pass
3	Rematch Test	Remove and recreate the game room	Output as expected.	Pass
4	Ask for draw in online game	Show the dialog box to the opponent and ask him/her whether he/she want to draw	Output as expected.	Pass
5	Show valid available move to the user	Check is valid piece move is show to the user	Output as expected.	Pass
6	King check test	Check is another piece will not move to any location if it's not protecting the king.	Output as expected.	Pass
7	Check all game end condition	Check stalemate, checkmate and draw condition working properly	Output as expected.	Pass

Screen Shots

activity_main.xml

Description: When user open the application above activity will open.

.

Description: When user click on “PLAY ONLINE” then sign in dialog box will appear to tell the user to sign in.

.

.

Description: After sign user has to enter username which is visible to his/her opponent. After user click on save his/her account will be created successfully and he/she will move to another activity.

.

.

activity_play_online_option.xml

Description: In the above activity user can select to play with other user or play with friend or view his/her profile.

activity_play_online.xml

Description: When user click on “PLAY WITH OTHER” and user is the first player in the game room then one dialog box will appear and tell the user to wait for another player to join.

Description: When two players join in the game room, game will start with 10 minute timer for each opponent.

Description: When user click on "Options" button above dialog box will appear where user can end the game by asking for a draw to his/her opponent or resign from a match.

Description: When user click on “Draw” another user will get a message .”Your opponent is asking for a draw”. Now the user will decide whether to draw or not.

Description: User can only one time ask for draw another time draw option will disappear.

Description: After agreement of both the user the game will end and the above dialog box will appear.

Description: After user click on "REMATCH" the above dialog will appear to his/her opponent device. If opponent approve it then match will start.

Description: After user click on "REMATCH" and the opponent visited to main menu or close the application then user will get the above dialog.

activity_play_with_friend.xml

Description: When user click on “PLAY WITH FRIEND” in “activity_play_online.xml” then user move to the above activity.

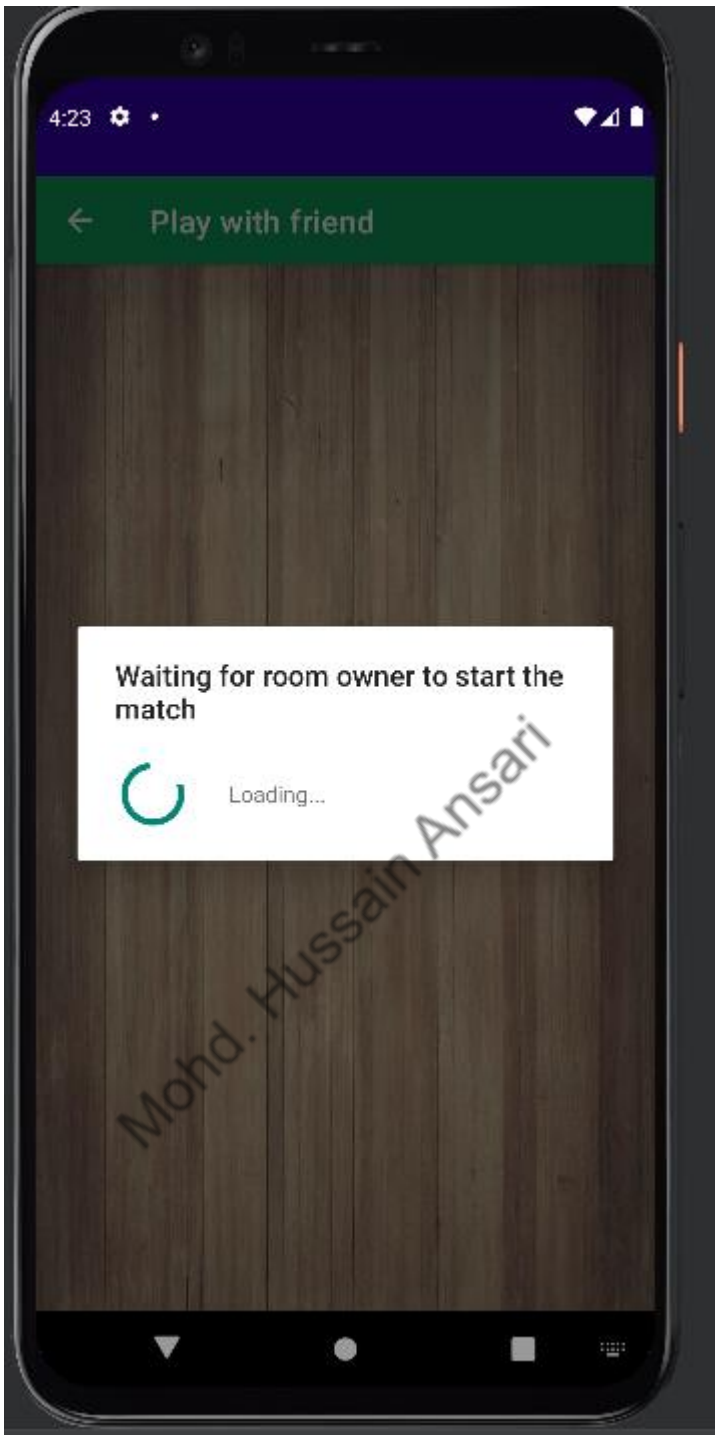
Description: When user click on "CREATE A ROOM" then the above dialog box will appear where user has to enter room name and password.

activity_room_details.xml

Description: When user click on "CREATE ROOM" then the user will move to above activity where user can see his/her opponent if opponent join the room. User can start the game only if its opponent join the room. Here user can also delete the room.

activity_play_with_friend.xml

Description: Opponent will join the room by clicking on "JOIN A ROOM" button in "activity_play_with_friend.xml" and entering the room name and password.



Description: After user fill room name, password and click on "JOIN ROOM" then above dialog box will appear until room owner start the game.

activity_room_details.xml

Description: When two player join in a room then owner can start the match by clicking on “START MATCH”

Description: After user click on "START MATCH" then game will start.

activity_profile.xml

Description: When user click on "PROFILE INFO" in "activity_play_online_option.xml" then user can see his/her username, Match played, win count, draw count, lost count, win rate and lost rate. Here user can also do log out and delete their account.

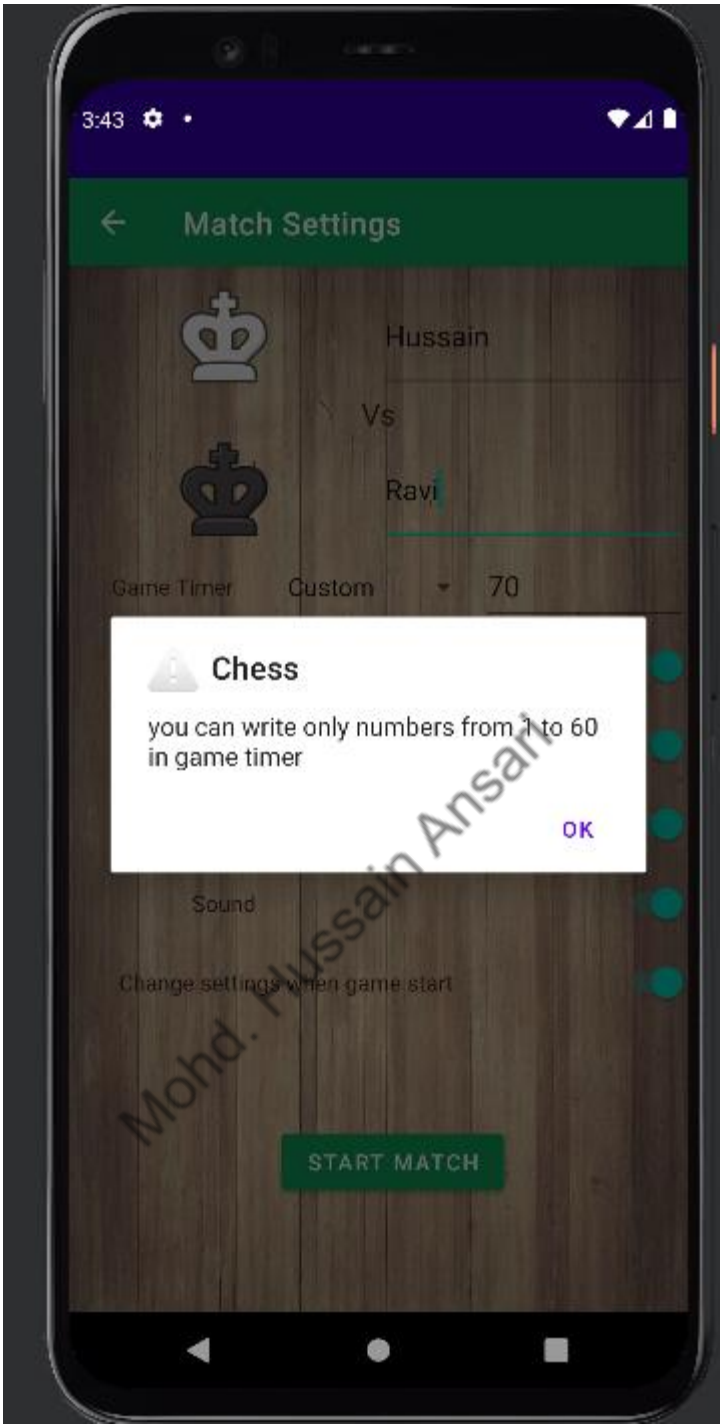
activity_play_offline_option.xml

Description: When user click on "PLAY OFFLINE" in "activity_main.xml" then above activity will open.

activity_match_setting.xml

Description: When user click on "PASS AND PLAY" then above activity will open where user will enter white player name, black player name , timer and other settings.

Description: When user select "Custom " in game timer dropdown then he/she can add custom timer in the game..

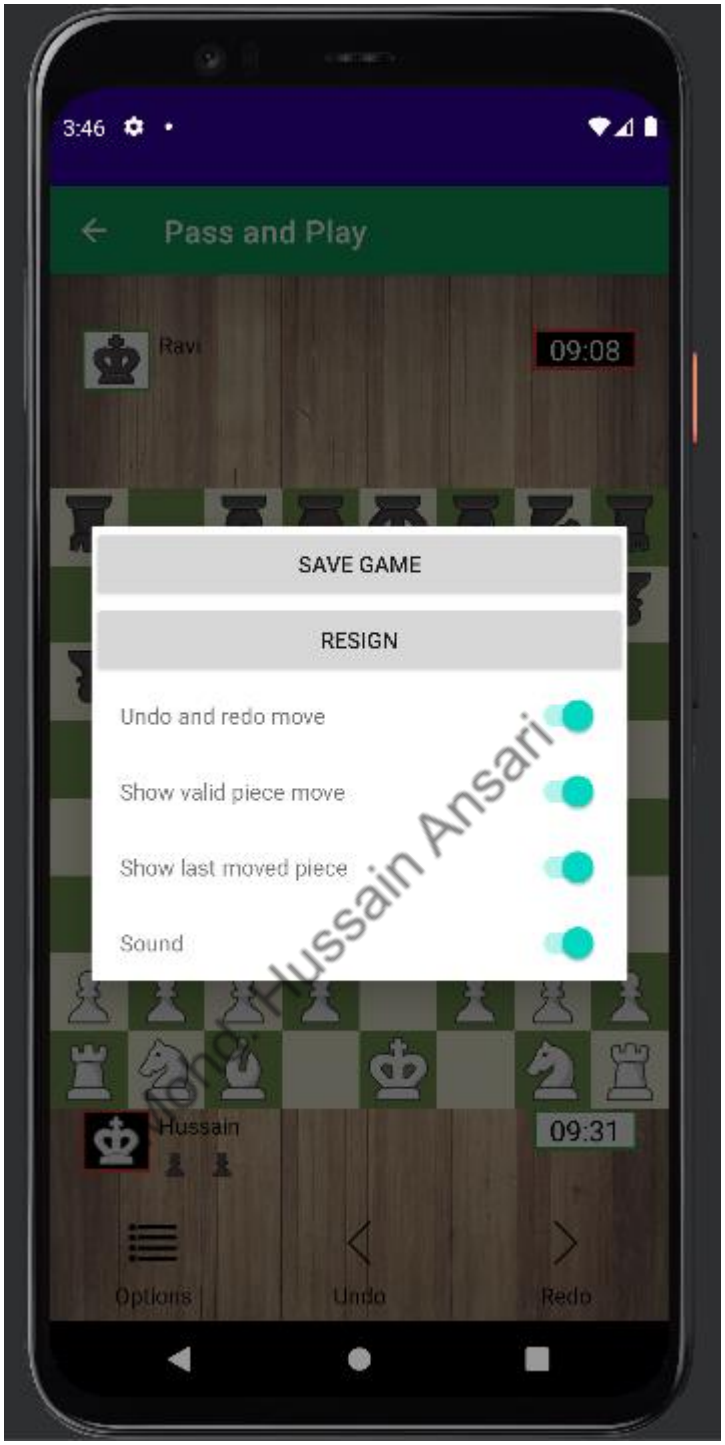


Description: When user enter number more than 60 or below 1 or nothing then above dialog box will appear when user click on “START MATCH”

activity_pass_and_play.xml

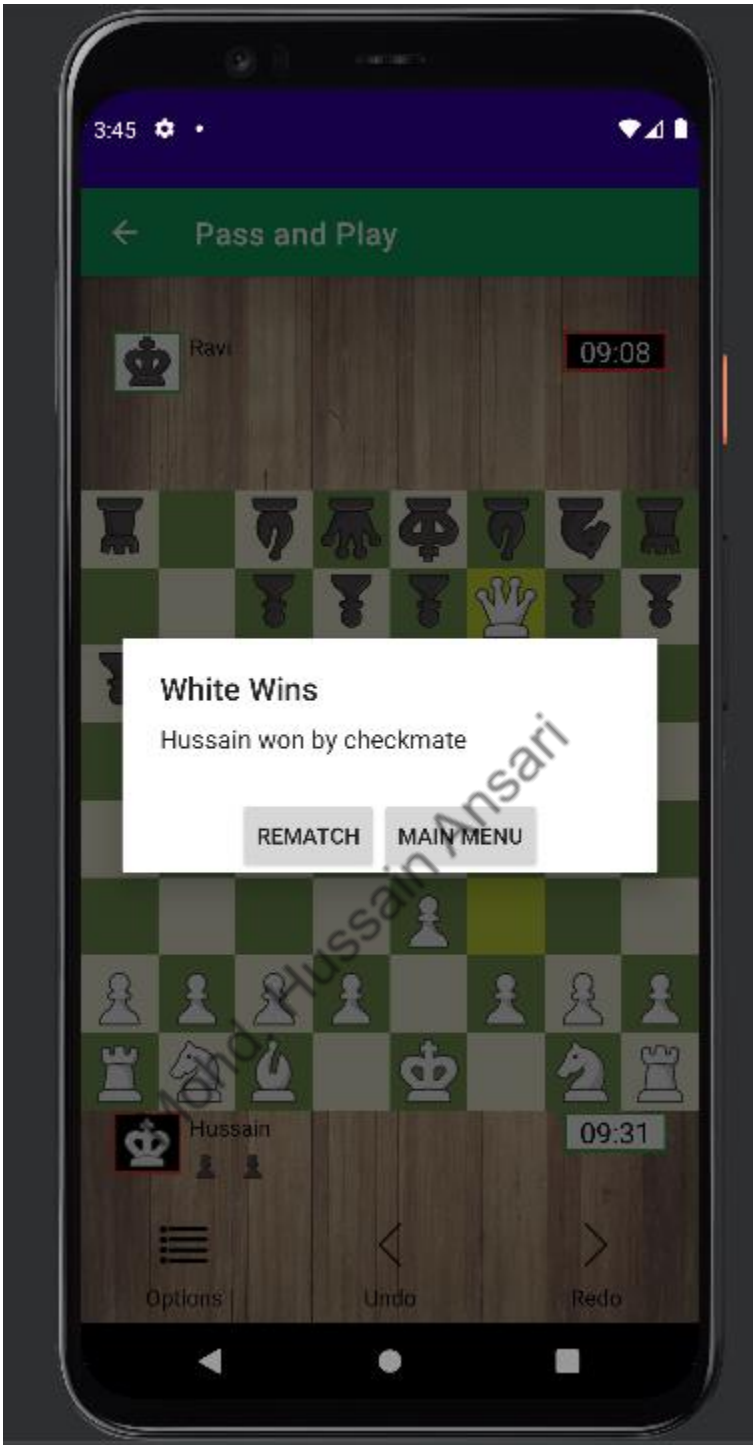
Description: When user click on "START MATCH " then above activity will open and the game will start.

Description: When any user kill opponent piece then the killed piece will appear in the user side killed piece box.



Description: When user click on “Options” then above dialog will appear where user change settings or save the game or resign the match.

Description: When user click on "RESIGN" then opponent will win and the game will end and above dialog will appear.



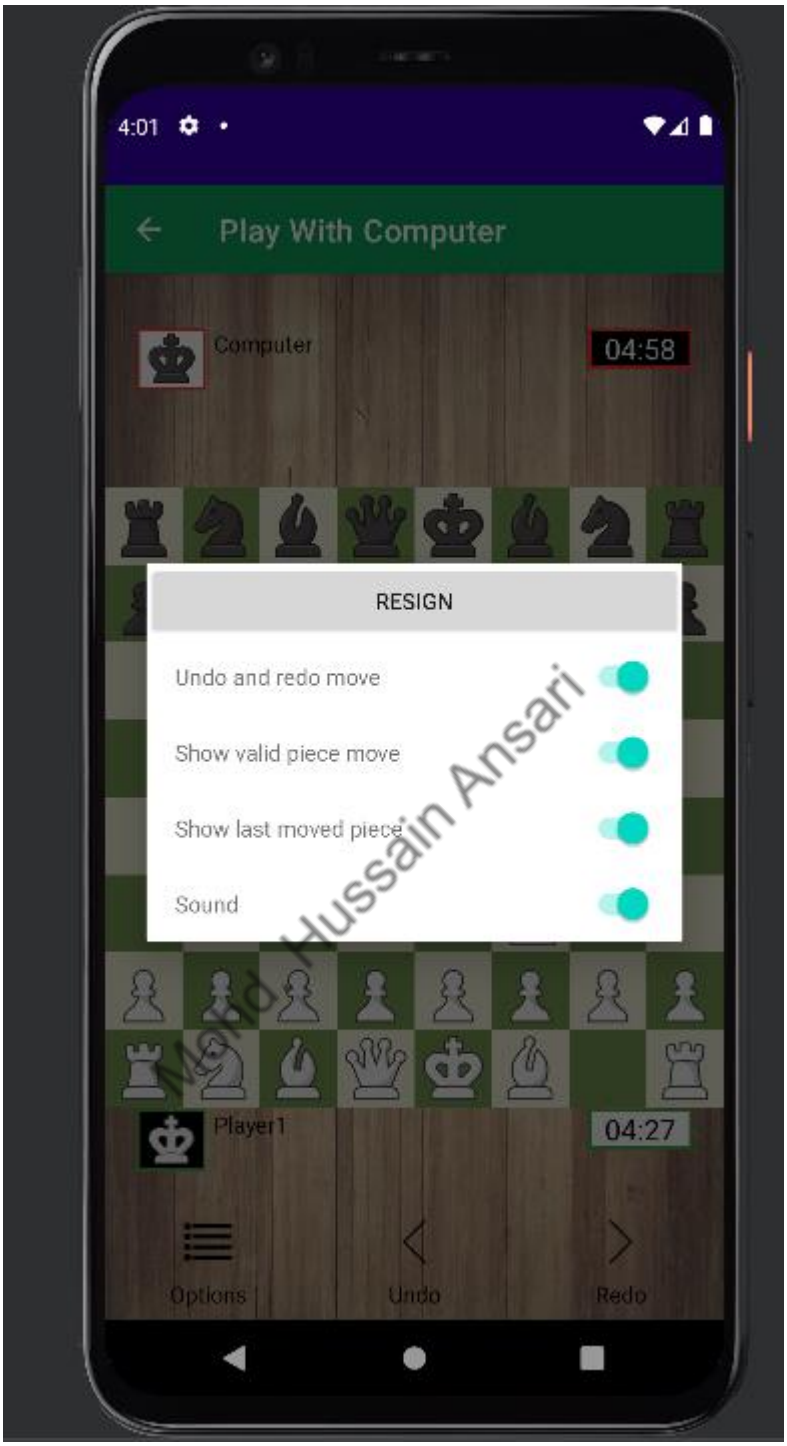
Description: When game end by “checkmate” then above dialog will appear.

activity_computer_settings.xml

Description: When user click on "PLAY WITH COMPUTER" in "activity_play_offline_option.xml" then above activity will open where user will enter his/her name, select his/her piece color, set game timer and change other settings.

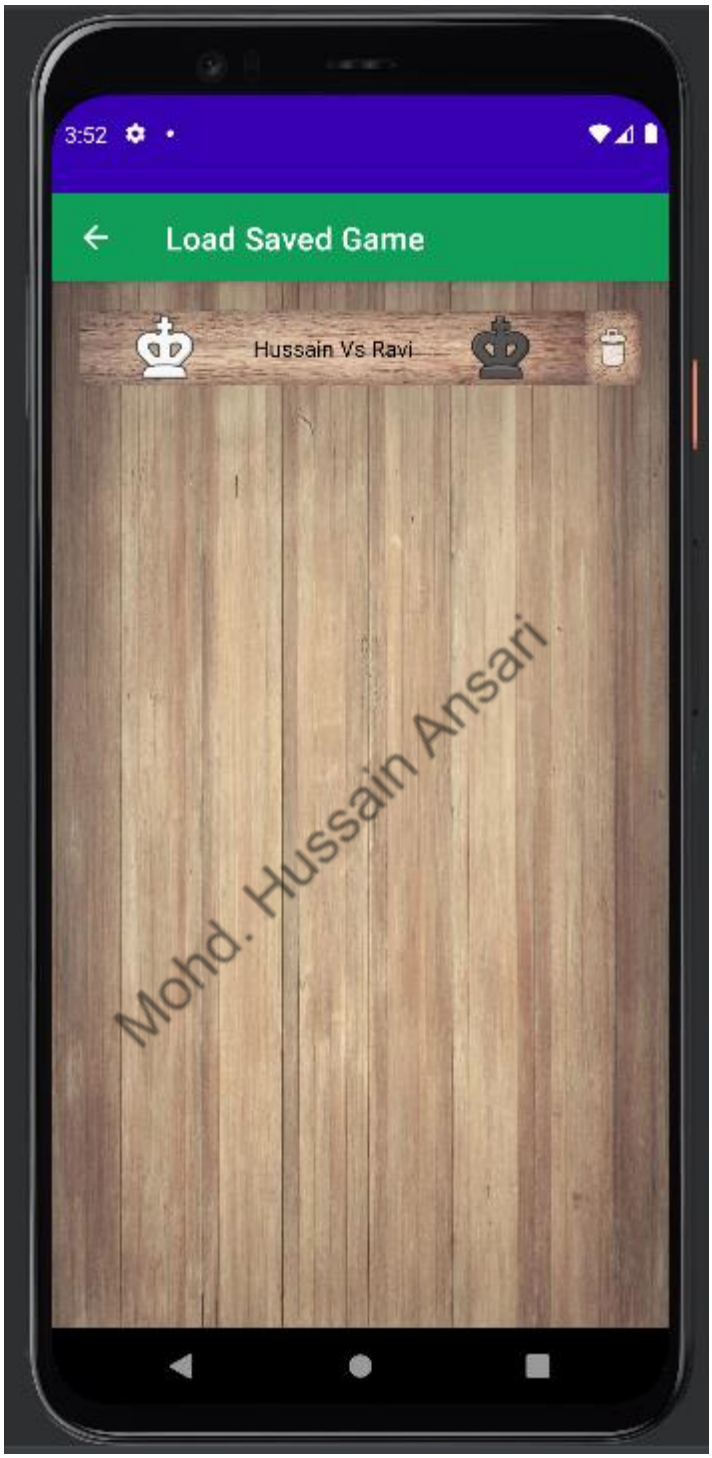
activity_computer_game.xml

Description: When user click on "START MATCH" then above activity will open and game start..



Description: When user click on "Options " then user can resign or do changes in the setting..

activity_load_saved_game.xml



Description: When user click on "LOAD SAVED GAME" in "activity_play_offline_option.xml" then above activity will open where user can open or delete saved game..

settings_activity.xml

Description: When user click on "SETTINGS" in "activity_play_offline_option.xml" then above activity will open where user change offline game settings globally..

}

Future Enhancement

Following expansion can be done:

- More User comfortable GUI.
- Store online user data to own server instead of firebase real-time database.
- Add Tournament in online chess mode.
- Add machine learning concept in play with computer option.
- Find other user online.
- Sign in with other social media connection like Facebook, Microsoft, etc.
- All the future enhancements will take into consideration the four game changing developments: consumerization, commoditization, virtualization, and globalization.

Reference and bibliography

Reference Books and Journal

- Android Developer Fundamentals Journal.
- Android Developer Fundamentals Book (By TechKnowledge Publication)

Referring online manual from website

- developer.android.com
- StackOverflow.com
- StackExchange.com

PHASE COMPLETION TABLE

phase	Expected Date of Completion	ActualDate of Completion	Remarks
Planning	8th Jan 2022	15th Jan 2022	
Analysis	25th Jan 2022	31st Jan 2022	
Design	9th Feb 2022	5th Mar2022	
Coding	3rd Mar 2022	25th Mar 2022	
Testing& Implementation	22nd Mar 2022	28th Mar 2022	
Documentation	28th Mar 2022	28th Mar 2022	