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Shaqra University
Ministry of Higher Education
College of Science in Durma

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The Requirements for the Award of Bachelor Degree in Computer Science

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Chapter 1

INTRODUCTION

1.1 Introduction

This document discusses the development of ”Henkaa” app, which focuses on traditional Saudi games, specifically ”Um Tis’a”. Traditional games are an important part of performance arts and expressive forms, reflecting the cultural identity of communities and contributing to the understanding of the history and environment in which they originated. These games are characterized by their innate spontaneity and contain rich folkloric elements that showcase the diversity and creativity contributed by previous generations. They help convey customs, traditions, and knowledge while strengthening social bonds, ensuring the continuity of cultural values in individuals’ hearts. The ”Henkaa” application aims to revive this heritage by integrating traditional games into a modern platform. It features an AI system that plays and analyzes the game, learning various strategies and adapting to player styles. The app offers multiple difficulty levels to accommodate all players, along with a mode for playing against the AI. Additionally, it includes an online multiplayer mode for playing with friends, a tutorial section to teach the game’s rules and strategies, and a chatbot for assistance. The innovative design and interactive features provide an educational and entertaining experience simultaneously, ensuring that the stories and traditions of the past continue to thrive in the digital age.

1.1.1 Problem Definition

The ”Henkaa” app aims to address the challenge of preserving and promoting traditional Saudi games, which have not received sufficient scientific attention. This lack of attention is particularly concerning in a digital world that often overshadows local cultural identities. The emergence of new games during an era of globalization and cultural dominance has contributed to the neglect of traditional games, leading to increased isolation and a significant loss of cultural heritage. Current tabletop play methods can be inaccessible or ineffective, resulting in a decline in the popularity of these games. The project seeks to create an engaging application that utilizes AI to enhance the gameplay experience, facilitate learning, and encourage social interaction among users. By revitalizing these traditional games, the app will not only provide a means for entertainment but also serve as a vital tool in preserving the rich cultural legacy of Saudi Arabia, fostering a sense of community and identity among its users.

1.1.2 Motivation

The motivation behind transforming traditional Saudi games into electronic formats stems from a deep desire to preserve and promote Saudi cultural heritage in a modern context. As globalization and technology continue to shape the way people engage with culture, it is crucial to ensure that traditional games, which are an integral part of Saudi identity, are not forgotten or neglected.

Furthermore, as these electronic versions of traditional games gain popularity, they can reach a global audience, showcasing the richness of Saudi culture to the world. This project not only fosters a sense of pride in national identity but also encourages intergenerational dialogue and interaction, promoting understanding and appreciation of the cultural narratives that shape Saudi society.

In addition, the development of these games can stimulate the local gaming industry, creating new job opportunities and fostering innovation in game design. By providing an educational and entertaining platform, we hope to inspire curiosity and respect for Saudi traditions among both locals and international audiences. Overall, this project embodies a commitment to preserving cultural heritage while embracing the future of digital entertainment.

1.1.3 Proposed Solution

The proposed solution for transforming traditional Saudi games into electronic games involves a comprehensive approach that combines cultural preservation with modern technology. We will start by converting popular games such as ”Um Tis’a” into electronic versions with a heritage-themed design, making these games available in a dedicated mobile application. The project aims to provide an interactive experience that reflects the authenticity of Saudi heritage, allowing players to feel a part of the rich culture of the Kingdom.

In the future, we aim to cover most of the traditional Saudi games, expanding the project to include a marketplace for selling heritage-themed traditional games. This will help preserve the heritage and cultural identity for future generations by providing the audience with access to these games in a modern style that combines enjoyment and learning.

The games will be designed and programmed to maintain the essence of each game while enhancing them with interactive features, attractive graphics, and user-friendly interfaces.

1.1.4 Project Aim and Objectives

The project aims to convert traditional Saudi games into electronic games.

The objectives are:

- Preserving Saudi cultural heritage: Transforming traditional Saudi games into electronic versions contributes to preserving the Kingdom's cultural and traditional heritage, ensuring these games remain for future generations.
- Enhancing awareness of local culture: Providing a modern platform to educate the youth and the community about traditional games, thus strengthening national identity and connection to heritage.
- Globalizing traditional games: Digitizing these games allows them to reach an international audience, introducing the world to Saudi heritage.
- Developing strategic thinking skills: Some traditional Saudi games require deep thinking and strategic planning; converting them into electronic games helps players develop these skills.
- Encouraging intergenerational interaction: By integrating traditional games with modern technology, young people can interact with older generations who grew up with these games, fostering communication and understanding between generations.
- Providing an educational and entertaining platform: Electronic games can serve as an enjoyable educational tool, introducing children to Saudi culture and traditions in an interactive and engaging way.
- Reviving neglected games: Some traditional games may have been forgotten or are rarely played; transforming them into electronic games helps revive and renew interest in them.
- Promoting technological innovation: The project provides an opportunity for innovation by developing new techniques and creative methods for designing traditional games to align with modern technology.
- Enabling multiplayer options: Offering the possibility of online or multi-device gameplay enhances social interaction and allows friends and family members to challenge each other.
- Supporting the local gaming industry: This project can encourage the development of the local electronic gaming industry and create new job opportunities in this field.

1.1.5 Methodology

The Agile methodology is a dynamic framework that focuses on continuous collaboration, flexibility in adapting to changing requirements, and delivering value through periodic releases of usable products. In the project of transforming traditional Saudi games into electronic games, the Agile methodology will follow these steps:

1. Requirement Gathering

- The team begins by gathering project requirements through meetings with stakeholders, including creators and end-users. Techniques such as workshops and interviews will be used to collect feedback.

2. Planning and Release

- The project will be divided into a series of sprints, with each sprint typically lasting two to four weeks. Requirements will be prioritized based on the value they will add to users.

3. Design and Development

- In each sprint, the team will work on designing and developing the required features, focusing on interactive design and user experience (UI/UX). Techniques such as prototyping and early testing will be employed for immediate feedback.

4. Evaluation

- After completing each sprint, the team will hold review meetings to assess what has been achieved and showcase new features to stakeholders. This will help determine if the objectives have been met or if improvements are needed.

5. Iteration

- Based on the feedback gathered during the evaluation, the team will make necessary adjustments to features and iterate on designs. This allows for adaptation to changing requirements and ensures continuous product improvement.

6. Delivery

- Each final sprint release will be delivered to users, allowing them to utilize new features and provide feedback. This ensures that the project aligns with actual user needs.

7. Continuous Communication

- Continuous communication among all team members and stakeholders will be encouraged through daily stand-up meetings to update the current status and discuss challenges.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The importance of traditional games, such as ”Um Tis’a,” goes beyond recreation. In Saudi Arabia, these games play a crucial role in maintaining cultural identity and promoting national pride. They provide a window into the past, helping newer generations connect with their roots and understand the ways of life of their ancestors. Additionally, traditional games contribute to the development of cognitive and social skills, promoting problem-solving abilities and fostering a sense of community and shared experience. As Saudi society embraces modernization, the preservation and promotion of traditional games become even more vital to ensuring that cultural heritage remains a vibrant part of the nation’s identity.

In this chapter, we review previous research papers, studies, and similar applications related to traditional Saudi games, such as ”Um Tis’a.” These games hold significant cultural value, reflecting Saudi heritage, fostering social bonding, and promoting cognitive development. By examining the cultural significance of ”Um Tis’a” and similar games, we highlight their role in preserving Saudi traditions and their continued relevance in a modernizing world. Additionally, we discuss the project’s development environment, including the programming language, database technology, and project management tools used to build and manage the application.

2.2 Summary of Papers

Over the past few decades, Saudi society has undergone unprecedented changes across various social, economic, and cultural aspects. These changes have significantly contributed to a remarkable civilizational shift, transforming society into one that enjoys many benefits of modern civilization.

Despite the numerous positive aspects resulting from these transformations, they have also inevitably had some negative effects, particularly on significant elements of traditional culture within Saudi society. This has led to the near extinction of many cultural aspects, which now exist only as memories in the minds of adults and the elderly. One such cultural element is ”Um Tis’a,” a popular game found in many regions of the Kingdom, known by several other names, including ”Um Gharibeen,” ”Um Al-Khutut,” ”Al-Mukhattata,” ”Al-Sabba,” ”Maqtar Al-Tis’a,” ”Al-Souq,” ”Al-Qatra,” and ”Um Awidat.” In Al-Baha, it is referred to as ”Al-Maqta.” [1]

The game ”Um Tis’a” is enjoyable for both children and adults. Each player uses nine small pieces (such as pebbles, sticks, or date seeds), and four lines are drawn to create three intersecting squares. Players take turns placing their pieces on these intersections, aiming to line up three pieces in a row to win. Children refer to a successful outcome in the game as “Maltaakh,” which adds an atmosphere of excitement and competition. This game also plays an important role in the interaction between older adults, who engage in it for fun and accept challenges from younger players. Through this dynamic, the game strengthens bonds between generations, contributing to enhanced social interaction within the community. [2][3]

Building on this idea of enhancing social connections through play, Guilford’s theory emphasizes the role of traditional games in developing various types of intelligence. These games help cultivate cognitive, social, and physical skills through engaging play, ultimately improving individuals’ learning and adaptability in everyday life. Drawing on Guilford’s concept of divergent thinking, the research utilizes the golden section technique to redesign traditional games, promoting creativity through computer drawing programs.[4]

The study identified a total of 288 traditional games in Saudi Arabia, noting regional differences in names and styles that highlight the country's rich cultural diversity. In light of these findings, it is recommended that the government modernize these traditional games to reflect contemporary contexts, given their educational and social significance. The redesigned games should be incorporated into educational curricula and children's care centers, offering culturally meaningful alternatives to imported games.[4]

By integrating traditional games like "Um Tis'a" into educational settings, we can strengthen cultural identity while simultaneously developing essential skills such as leadership, teamwork, and problem-solving. These games foster social bonds and instill values of cooperation and respect for rules. Through participation in these games, children learn to appreciate their heritage and express gratitude to their ancestors. Additionally, traditional games aid in emotional expression and help overcome psychological and social challenges. Therefore, popular games are not merely a form of entertainment; they serve as educational and cultural tools that contribute to shaping children's personalities and connecting them to their heritage. The study emphasizes the urgent need to preserve these games, integrate them into school curricula, and adapt them to modern times through digital platforms.[5]

2.3 Interviews

In this section, I will discuss the interviews conducted with Mr. Abdulaziz Al-Mubaddil and Mr. Mansor Al-Assaf, both of whom are experts with extensive knowledge in the field of Saudi traditional games. They shared valuable insights on the importance of these games as part of the Kingdom's cultural heritage and discussed how modern projects, such as the "Henkaa" app, can contribute to preserving and promoting this heritage by presenting it in an innovative digital format that aligns with the interests of the current generation.

2.3.1 Mr. Abdulaziz Al-Mubaddil

Building on the importance of traditional games, which represent a vital part of our cultural heritage and national identity by blending entertainment with social values, we had an inspiring meeting with Mr. Abdulaziz Al-Mubaddil, the renowned author of books on traditional games and a prominent advocate for preserving Saudi heritage. Known for his passion for safeguarding heritage and highlighting its value through artistic works and his active participation in cultural events, Mr. Abdulaziz emphasized the need to revive these games in innovative ways to ensure their continuity and strengthen the connection between generations in an era of rapid technological advancement.

During the meeting, he expressed his admiration for the "Henkaa" app, which embodies the digital transformation of traditional games in a creative way that preserves cultural heritage while offering a modern entertainment experience. He highlighted the cultural significance of traditional games, using the game "Um Tis'a" as an example, and provided a clear explanation of its rules, facilitating its adaptation into a digital format. This ensures its authenticity while integrating traditional elements into the game's design to enhance user experience and emphasize its heritage character.

As a testament to his belief in the project, Mr. Abdulaziz gifted the team his book "Traditional Games for Boys and Girls in Saudi Arabia" to support their efforts, expressing his full willingness to collaborate and contribute to the project's success. He also pointed out the noticeable lack of platforms dedicated to Saudi traditional games, considering "Henkaa" app a distinguished project that plays a vital role in reviving heritage and preserving cultural identity in the digital age.

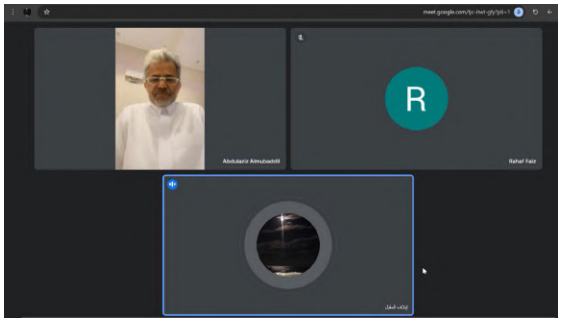


Figure 2.1: The conversation with Mr. Abdulaziz Al-Mubaddil.

2.3.2 Mr. Mansor Al-Assaf

In another inspiring meeting with Professor Mr. Mansor Al-Assaf, a prominent historian in Saudi culture, the importance of cultural heritage became evident in his profound discussion about the social and cultural transformations in the Kingdom. Al-Assaf is known for his passion for documenting these transformations through his journalistic and research work, which has significantly contributed to highlighting cultural heritage, especially traditional games.

He provided reliable sources about the origins and history of these games, such as the ”Encyclopedia of Traditional Culture in Saudi Arabia,” reflecting his commitment to preserving this rich heritage. Mr. Mansor emphasized that these games are not merely forms of entertainment; they are an essential part of Saudi cultural identity.

In the course of the conversation, he stressed the necessity of digitally documenting these games, warning of the risk of their extinction if preservation efforts are not undertaken. He also pointed to the significance of modern projects, like our application, aimed at reviving this heritage in an innovative way that meets the interests of the current generation and future ones, thereby enhancing their connection to their culture and identity.

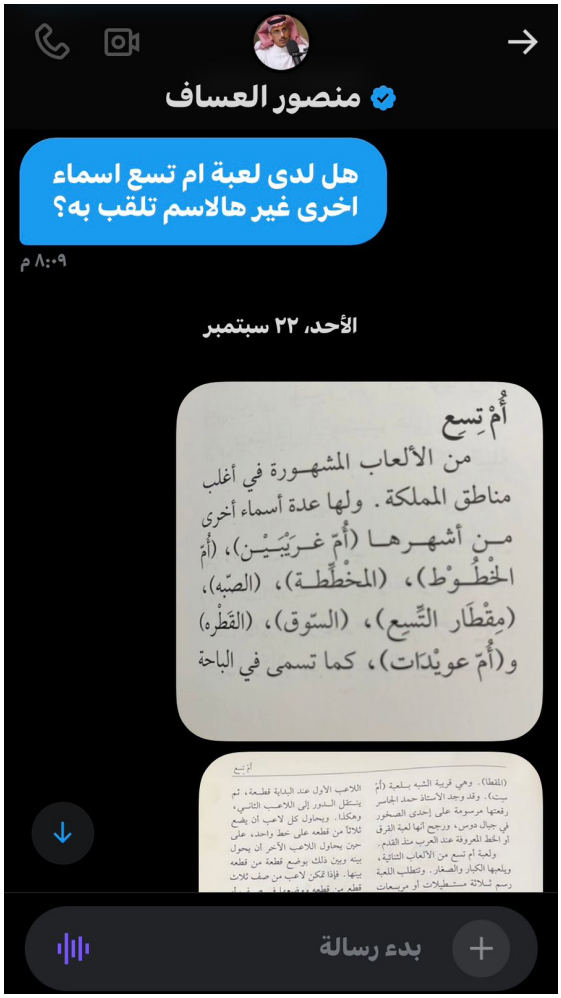


Figure 2.2: The conversation with Mr. Mansor Al-Assaf.

2.4 Similar Application

Game Icon			
Game name	Nine Men's Morris Multiplayer	Dos ne tyi-online bazi ealaa al'iintirnit	Mills-The Board Game
Design			
How to play	There are no stages but there are points and a ranking list with the rest of the players	There are no stages, but when you win, you get coins that you can play with	No levels, no points, no coins
Game teaching			
Technical support	Nothing	There is a chat box with technical support, but it only supports English and German, and it may take two days to respond	Nothing
Game rating in app store	3,2	4,5	4,3

Table 2.1: Comparison between similar games in ios

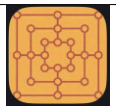
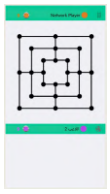
Game Icon			
Game name	”Um Tis’a almiq-tar”	The Mill-Nine Men’s Morris	Muhle and Mills
Design			
How to play	No levels, no points, no coins	There are player-specific achieve-ments and a rank-ing of the best players	There is a clas-sification of the best players
Game teaching			
Technical support	Nothing	There is an email to contact techni-cal support	Nothing
Game rating	The game has not been rated yet	4,3	4,0

Table 2.2: Comparison between similar games in ios

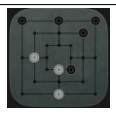
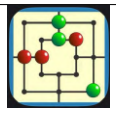
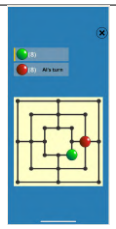
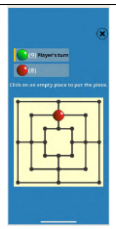
Game Icon			
Game name	Nine Men's Morris Board Game	Mills E	Nine Mens Morris
Design			
How to play	No points, achievements or rankings	Contains points and ranking	No points, achievements or rankings
Game teaching			
Technical support	Nothing	Nothing	Nothing
Game rating	The game has not been rated yet	The game has not been rated yet	The game has not been rated yet

Table 2.3: Comparison between similar games in ios

2.5 Application Technology

2.5.1 Programming Language

C#
C# is the primary programming language used for developing the functionalities of the game, especially within the Unity engine.

2.5.2 Software Tools

Unity
Unity is used as the primary game development engine to build and design the game environment.

Machine Learning AI in Unity (ML-Agents)
ML-Agents allow the integration of artificial intelligence into the game, making it more interactive and challenging.

Unity Asset Store
The Unity Asset Store provides a range of pre-made assets and tools that enhance the development process by reducing time and effort.

Firebase
Firebase is used for backend functionalities like player authentication, real-time databases, and analytics.

2.5.3 User Interface Tools

Adobe Photoshop
Used for designing high-quality game graphics and UI components.

Figma
Figma helps in prototyping the UI and ensuring a smooth user experience design workflow.

Draw.io
Draw.io is used for creating diagrams, including flowcharts and UML models, to visualize system designs.

Lucidcharts
Lucidcharts is used for advanced diagramming and collaboration on design models.

2.5.4 Management Tools

LaTeX
LaTeX is used for creating the project documentation with a professional and structured layout.

Monday
Monday.com is employed for project management and task tracking to ensure the team stays on schedule.

Asana
Asana is a project management tool that helps teams organize, track, and manage their work efficiently.

Chapter 3

REQUIREMENTS ANALYSIS

3.1 Introduction

In the previous chapter, we reviewed relevant research and discussed its conclusions in relation to our project. This provided essential insights into existing work, informing the direction of our approach. In this chapter, we will shift focus to a detailed analysis of the system requirements. We will examine the process of gathering and evaluating information, identifying potential challenges, and breaking down the system into its key components. The goal is to ensure a clear understanding of user needs and system capabilities, laying the groundwork for an effective and well-aligned system design.

3.2 Description

The ”Henkaa” app begins with a user registration process, requiring basic information such as name, email, age, and password. Once registered, users can log in to access the home page, where they can choose from various gameplay options.
Gameplay Options:

- **Play Against AI:** Users can play against the AI without the need to create an account, selecting from different difficulty levels (easy, medium, difficult).
- **Local Multiplayer:** Two users can play on the same device without needing accounts.
- **Online Multiplayer:**
  - **Play with a Friend:** Users must have an account and can invite a friend via ID or link to join a game session.
  - **Play with Random Players:** Users must have an account, and two random players will be matched for gameplay.

The app includes a tutorial section to teach users the rules and strategies of the game. Additionally, it features a chatbot that assists users by explaining game rules, offering historical insights, and providing technical support.
A ranking system evaluates players based on their performance and accumulated points, adding a competitive element to the game.
The primary goal of the app is to offer an engaging gaming experience while preserving and promoting traditional Saudi games, fostering a sense of community and cultural heritage.

Basic Rules of the Game "Um Tis'a"
Required Tools

- **Game Board:** The game board consists of a grid made up of three horizontal and three vertical lines, forming nine small squares.
- **Stones:** Each player has nine stones.

Objective of the Game The main objective of the game is for a player to be the first to place three stones in a row, whether horizontally, vertically, or diagonally.
Steps of Play

1. **Preparation for the Game:**
    - The game begins on a board divided into three squares by their intersections
    - Divide the stones equally between the players.
2. **Starting:**
    - Determine which player will start first by playing a game of Rock-Paper-Scissors.
    - The winning player places a stone in any empty square on the board, followed by the second player placing their stone in any other empty square.
3. **Turn-taking:**
    - The players take turns placing their stones until all the stones are placed on the board.
4. **Movement:**
    - After all stones have been placed, players can move their stones to try to form a row of three. One stone can be moved in each turn to an adjacent empty square (horizontally, vertically, or diagonally).

5. **Winning:**

    - Players take turns placing and then moving stones. The goal is to align three stones in a row, which allows a player to remove an opponent's stone. The game ends when one player has no stones left or cannot move, making the other player the winner.

3.3 System Requirements Specifications

The system requirements specifications outline all the necessary requirements for developing the system, which include both functional and non-functional requirements, as well as technical requirements. These specifications aim to ensure that the system effectively meets user needs and adheres to the required technical standards.

3.3.1 Scope

The scope of this project focuses on developing a Saudi traditional game that revives and preserves cultural aspects now fading into memories among adults and the elderly. The game aims to reconnect younger generations with these traditions by integrating elements of folklore, customs, and communal activities. Through interactive game play, it will serve as both entertainment and a cultural bridge, fostering inter-generational engagement and ensuring that these valuable traditions are passed down and kept alive.

3.3.2 Data Collection from Customer Questionnaires

Questionnaires are an essential tool for understanding player preferences, behaviors, and overall experiences, particularly when targeting a broad audience. In the case of the game ”Henkaa” a descriptive questionnaire approach was used to gather feedback from participants. This method allows us to collect valuable insights into how the game is perceived, what improvements can be made, and how players engage with its learning features. A Google Forms questionnaire, written in Arabic, was distributed, and 750 individuals responded. Their input offers key information to enhance gameplay and educational components, especially for beginners and more experienced players alike.

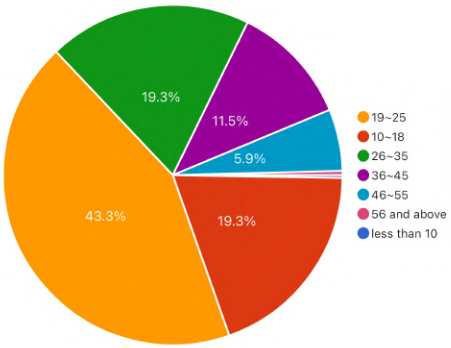


Figure 3.1: How old are you?
As shown in the figure, the largest age group is 19 to 25 years, accounting for 43.3% of the respondents. This is followed by two groups 10 to 18 years and 26 to 35 years each representing 19.3%. Participants aged 36 to 45 make up 11.5%, while the remaining age groups collectively account for less than 6%.

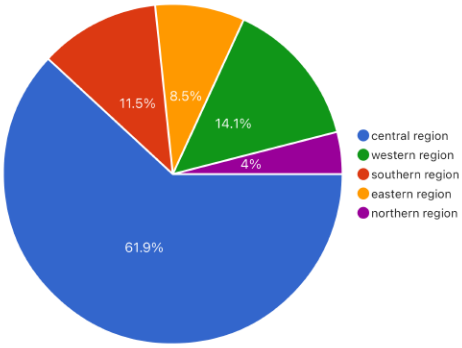


Figure 3.2: From which region in Saudi Arabia?
As shown in the figure, the majority of respondents, 61.9%, are from the central region. This is followed by 14.1% from the western region and 11.5% from the southern region. The eastern region accounts for 8.5%, while the northern region contributes less than 5% of the total responses.

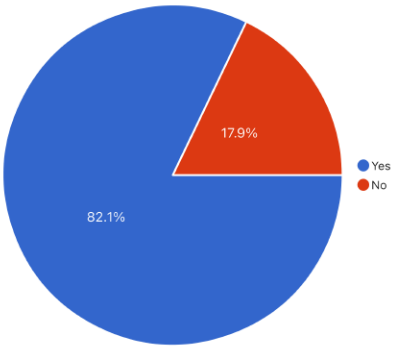


Figure 3.3: do you use mobile phone for gaming?
As shown in the figure, 82.1% of respondents use mobile phones for gaming, while 17.9% do not.

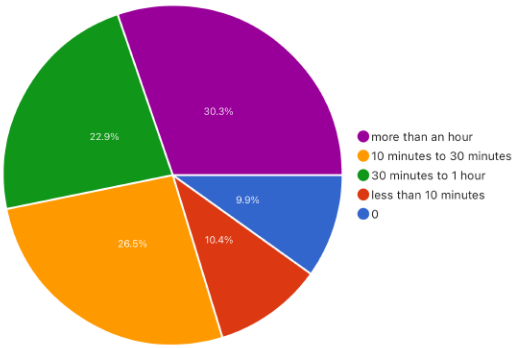


Figure 3.4: What is the average time you spend playing?
As shown in the figure, 9.9% of respondents spend 0 minutes on gaming, 10.4% spend less than 10 minutes, 26.5% spend 10 to 30 minutes, 22.9% spend 30 minutes to 1 hour, and 30.3% spend more than 1 hour gaming.

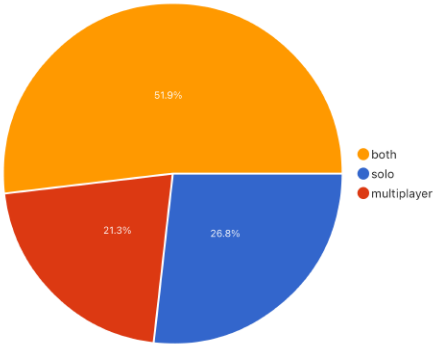


Figure 3.5: Do you prefer to play solo or multiplayer?
As shown in the figure, 51.9% of respondents enjoy both solo and multiplayer game play. Meanwhile, 26.8% prefer solo play exclusively, and 21.3% favor multiplayer experiences.

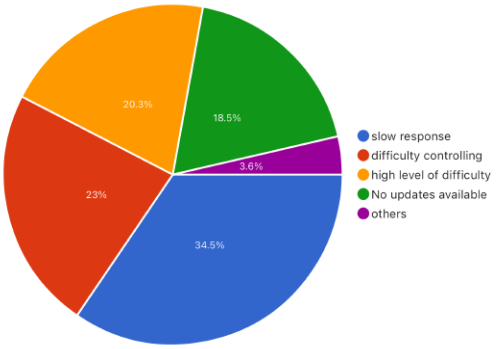


Figure 3.6: What issues do you face while playing electronic games?
As shown in the figure, the most frequently reported issue was slow response times, cited by 34.5% of respondents. This was followed by difficulty with controls at 23% and excessive game difficulty at 20.3%. Another 18.5% of participants expressed frustration over the lack of updates or new content, while the remaining 3.6% shared other concerns within their experiences.

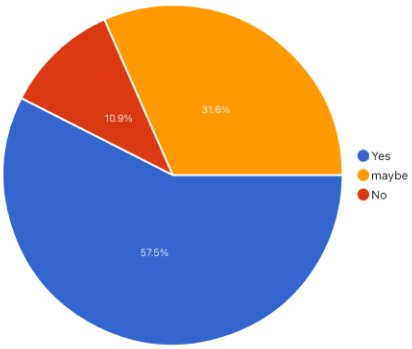


Figure 3.7: Do you have the desire to learn a new game?
As shown in the figure, 57.5% are eager to learn a new game, while 31.6% feel uncertain about their interest. Meanwhile, a definitive 10.9% express no desire to explore one at all.

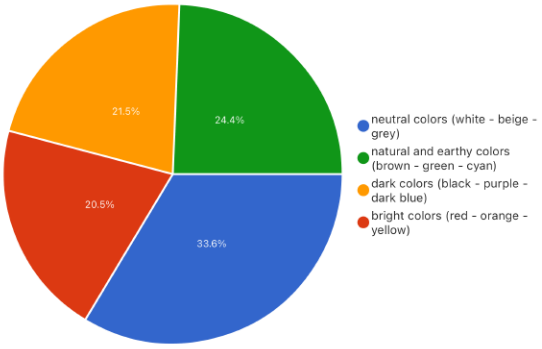


Figure 3.8: what color palette do you prefer?
As shown in the figure, 51.9% of respondents expressed a preference for neutral colors like white, beige, and gray in games. Meanwhile, 31.6% preferred bright colors such as red, orange, and yellow, and 33.2% opted for darker colors such as black, purple, and dark blue. Additionally, 37.5% of respondents favored natural, earthy colors brown, green, cyan.

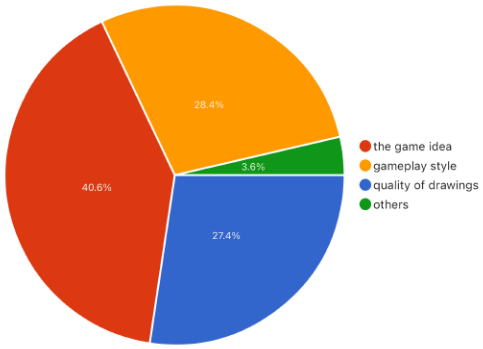


Figure 3.9: What attracts you most in games?
As shown in the figure, 40.6% of respondents are primarily drawn to a game's core concept or idea, making it the most influential factor. Following this, 28.4% are captivated by the gameplay style and mechanics, while 27.4% appreciate the artistic quality and visual design. Lastly, 3.6% of participants highlighted a range of other aspects that enhance their gaming experience.

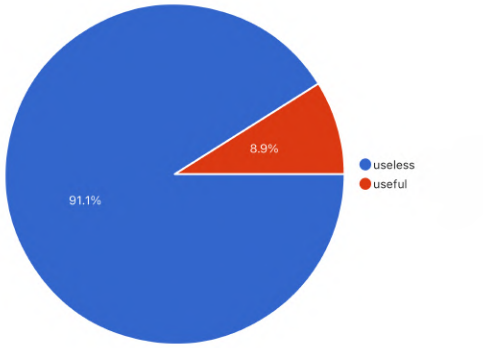


Figure 3.10: Can you share a game with us that you want to be in mobile?
As shown in the figure, 91.1% of the responses proved unhelpful for our research, with many replying with vague answers like 'No,' 'IDK,' or suggestions such as adapting PC and PS games for mobile. However, the remaining 8.9% provided valuable insights for our future work. As the saying goes, "Quality is better than quantity when the latter adds no value."

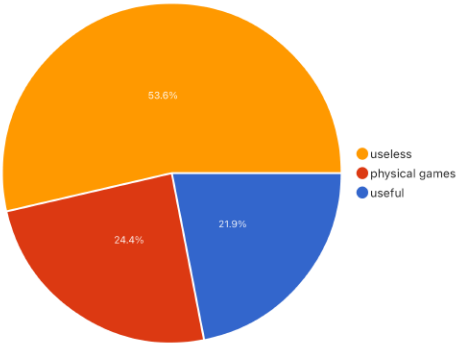


Figure 3.11: share with us some of the traditional games you know from your region As shown in the figure, 53.6% of the responses were either blank or irrelevant to the question, followed by 24.4% that focused on physical games somewhat relevant and potentially useful for future projects. Finally, the real breakthrough came from the remaining segment with 21.9%, packed with insights and valuable contributions that will significantly drive our research forward.

3.3.3 Users Requirements

User sign up:

- The user need to have an account to start play or they can choose to access as a guest.
- The user must create a secure password that meets specified criteria during the sign-up process.
- The user receives an email verification link upon sign-up to confirm their email address before full account activation.
- The user has the option to provide additional profile information, such as a display name or profile picture, country.

User Login:

- The user can log in using their registered username or email address along with their password.
- The user can choose a ”Remember Me” option to stay logged in on their device for convenience.
- The user can initiate a password recovery process through email verification if they forget their password.

User Log out:

- The user can log out of their account by clicking the ”Log out” button, which will terminate their session.

Friends Management:

- The user must be able to send and receive friend requests.
- The user should have the option to easily remove or unfriend others.
- The user should have access to a dedicated section displaying their list of friends.

Game play Integration: The user should be able to invite friends to join games.

Notifications:

- The user should receive notifications for incoming friend requests.
- The user should receive alerts when friends invite them to play.

Profile Viewing:

- The user can view their friends' profiles, including achievements.
- The user should have the ability to block unwanted or harassing users.

Increased score:

- The user is shown the wheel of fortune to increase the chances of getting more score.
- The user can get an additional chance to change the location of the room during the game through points or the wheel of fortune.

Comments during play: The user can send ready-made written comments that are available in a box that appears during the game, such as(Good game, I will defeat you).

3.3.4 Technical Requirements

Technical requirements address the fundamental aspects necessary to ensure the successful operation of the game application,including the challenges that need to be overcome.These aspects include performance,maintenance,updates,technical support,and gameplay mechanics.These technical requirements serve as effective solutions to those areas.

3.3.5 Functional Requirements

The following is a list of the core functional requirements for the system, aimed at enhancing user experience and providing all necessary elements for smooth and enjoyable performance.

1. **Initial Access to Learning Section** The system shall display a ”Start Tutorial” button on the learning section’s initial page.

2. **Start Tutorial Button** The system shall display a ”Start Tutorial” button for the first tutorial. Once pressed, it shall switch to a ”Next Tutorial” button as the user progresses through the lessons.

3. **Tutorial Techniques** The system shall provide a lesson guide with explanations, animated images, and visual aids such as game board diagrams.

4. **Progress of Tutorial** The system shall allow the user to press the ”Next” button to proceed to the next tutorial. The system shall allow the user to press the ”Previous” button to return to the previous tutorial.

5. **Playing Against AI** The system shall provide selectable AI difficulty levels, allowing players to choose between Easy, Medium, and Difficult levels.

6. **Chatbot Services** The system shall feature an in-game chatbot to provide real-time guidance and answer frequently asked questions. The chatbot shall provide educational information about the game and its cultural heritage. Example:

   - **Player:** ”What is the history of the Um Tis’a game?”
   - **Chatbot:** ”The Um Tis’a game is an ancient traditional game rooted in Saudi culture. It was played in open spaces and relies on balance and accuracy.”

7. **Leaderboard Rankings** The system shall display the rankings of players with the highest ranks on the leaderboard.

8. **Rank Points** The system shall award the user 100 rank points for each match they win.

9. **Display Mode** The system shall allow the user to toggle between Dark Mode and Light Mode.

10. **Character Customization** The system shall enable the user to select and customize their playable character.

11. **Stone Customization** The system shall allow the user to customize the shape and color of the game stones.

12. **Sound Settings** The system shall allow the user to enable or disable sound effects.

3.3.6 Non-Functional Requirements

The non-functional requirements focus on how the system performs a certain function' so that we can make the system work more efficiently and with higher quality . They are divided into performance requirements, such as Speed security, reliability, performance, maintainability, scalability, and usability. These serve as constraints or restrictions on the design of the system.

- Speed: the system speed of detection movement and gestures must be as fast as possible. The interaction between the user and the system should not exceed 2 seconds.
- Portability: ensure If the application runs as efficiently on the new phone as it did the old phone,
- Reliability: ensure the number of failures is low, in order to let system operates properly.
- The system shall be able to check if the user is registered in the database and system is password-protected for users.
- The system shall be able to provide secure access to user data.

Chapter 4

SYSTEM ANALYSIS

4.1 Introduction

In this chapter, we present the software design model, which consists of four designs: class design, architectural design, interface design, and component design, and we illustrate them using a diagram. As you can see, we will subsequently display the application's overall design, Use case diagram, Data Flow diagram, Class diagram, and lastly the sequence diagram.

4.2 Use Case Diagram

A use case diagram is a visual representation of how a user could interact with our system. It specifies the system's behavior as it replies to the request from the user's perspective. Each use case is described as a set of phases that start with the user's objective and finish with the goal being met. They are seen in Figure 4.3.

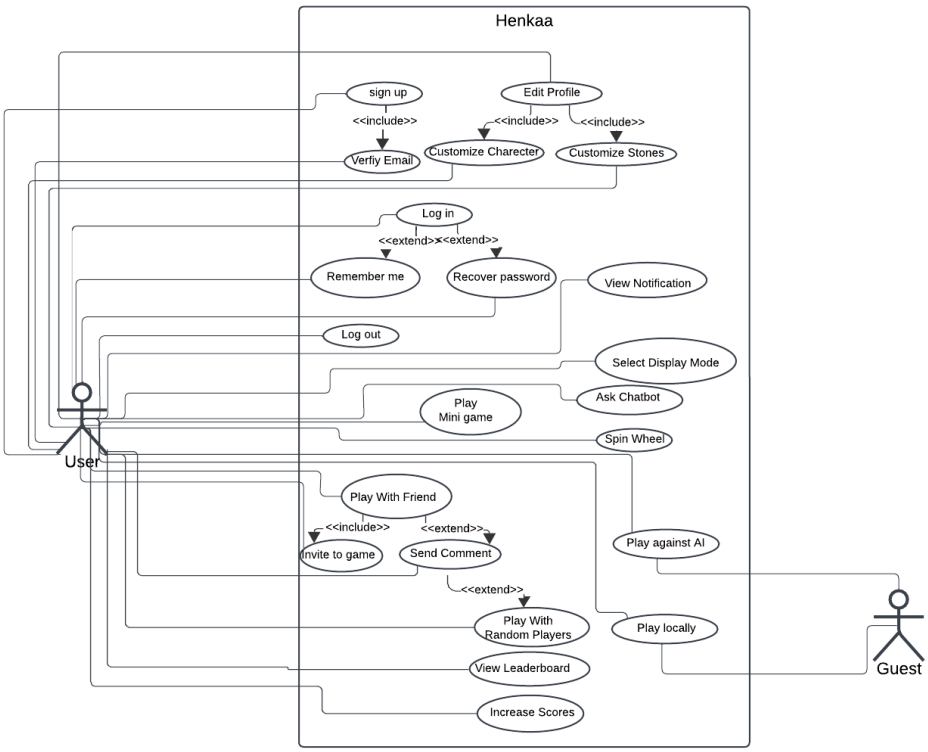


Figure 4.1: Use case diagram for the system.

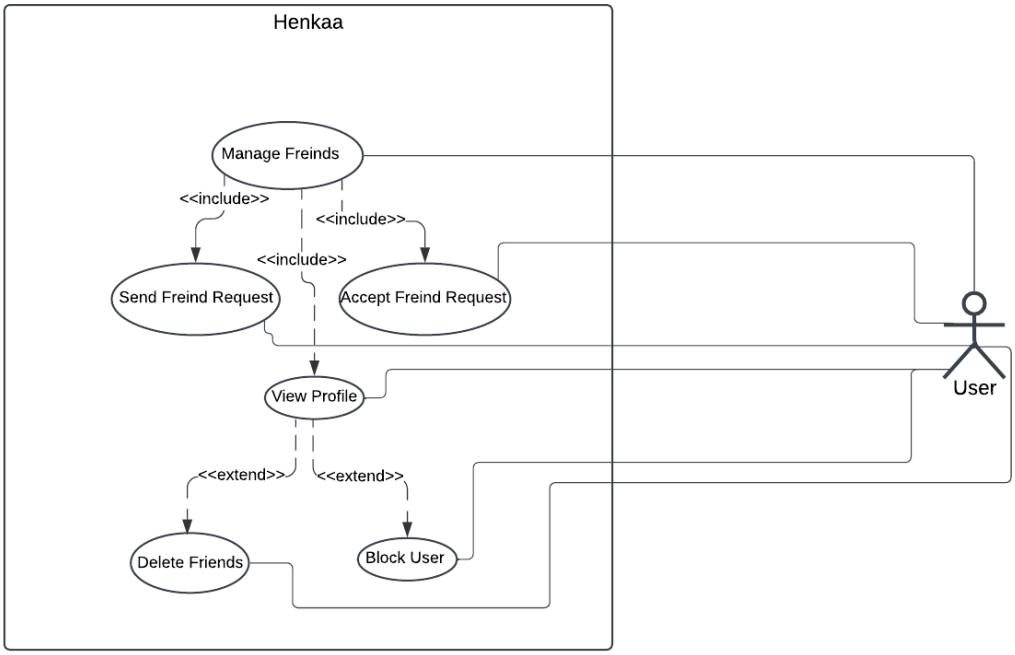


Figure 4.2: Use case diagram for the Freinds.

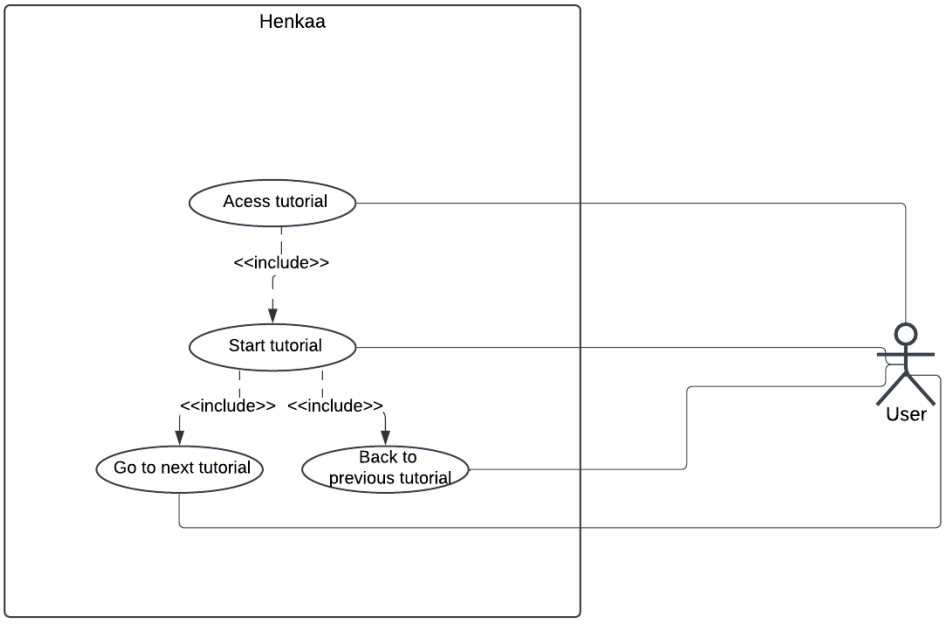


Figure 4.3: Use case diagram for the Tutorials.

4.2.1 Description of Use Cases

Log in

The log in use case allows the user to access the system by providing valid credentials. Figure 4.4 shows the details.

Use Case Name	Log in
Actors	User
Description	Allows the user to log in to the system using their credentials
Steps	1-The user starts by opening the login page 2-The user enters their username andPassword 3-The system verifies the credentials 4-If the credentials are correct, the user is logged into the system
Extensions	-Remember me: The user can choose to remember their login details for quicker access next time - Recover password: If the user forgets their password, they can request a password reset

Figure 4.4: Use Case Description: Log in

Send Friend Request

This use case allows a user to send a friend request to another user. Figure 4.5 illustrates the details.

Use Case Name	Send Friend Request
Actors	Actor
Description	Allows the user to send a friend request to another user to interact within the applicatio
Steps	1-The user selects the profile of the other user they want to add as a friend. 2-The user clicks on"Send Friend Request" 3-The system records the request and sends a notification to the other user
Includes	-Manage Friends: Used to manage and update the friend list

Figure 4.5: Use Case Description: Send Friend Request

Play against AI

This use case allows the user to play a game against an AI opponent. Figure 4.6 contains the description.

Use Case Name	Play Against AI
Actor	Guest, User
Description	Allows users or guests to play against the AI system as a solo experience
Steps	1- The user or guest selects the "Play Against AI" option 2-The system initiates an AI-based challenge in the game 3- The result is evaluated based on the user or guest's performance
Includes	-None

Figure 4.6: Use Case Description: Play against AI

View Profile

This use case allows the user to view their own profile or the profile of another user. See Figure 4.7 for details.

Use Case Name	View Profile
Actor	User
Description	Allows users to view the profile of their friends or other users
Steps	1-The user selects a friend or another user's profile 2-The system displays all available details about that user
Includes	-Block User: The user can choose to block another user from accessing their profile or interacting with them

Figure 4.7: Use Case Description: View Profile

4.3 Data Flow Diagram

4.3.1 Context Diagram

The context diagram provides a high-level view of the system, showing the interactions between external entities and the system. It represents the entire system as a single process with its external interactions. See Figure 4.8.

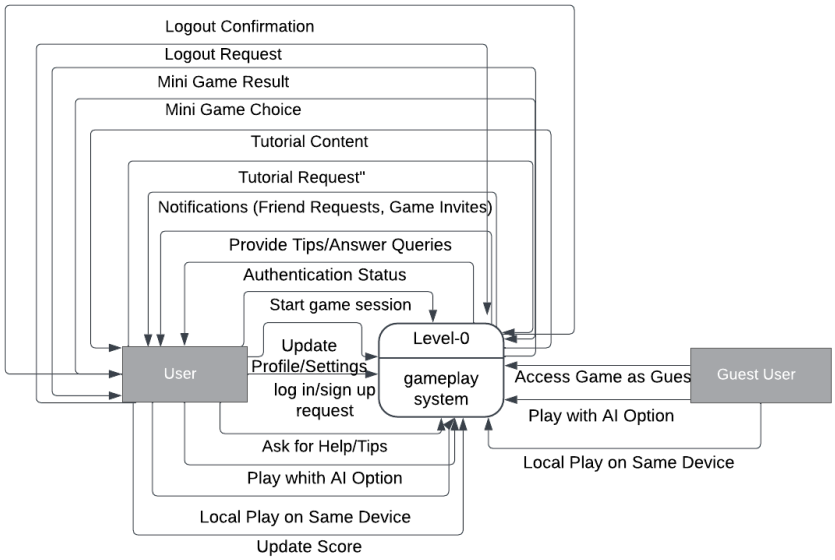


Figure 4.8: Context Diagram of the System

4.3.2 Level-0 DFD

The Level-0 Data Flow Diagram (DFD) decomposes the system into major processes and shows how data flows between these processes and external entities. This diagram provides a more detailed view compared to the context diagram. Figure 4.9 shows the Level-0 DFD.

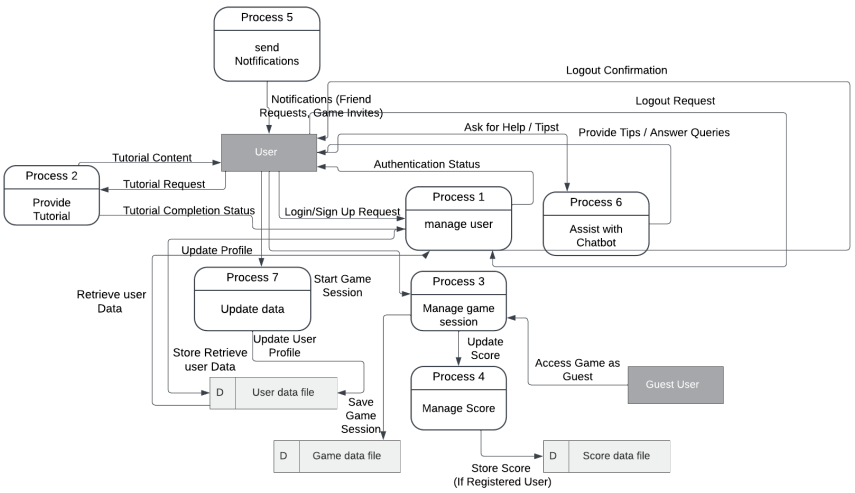


Figure 4.9: Level-0 DFD

4.3.3 Level-1 DFD

The Level-1 DFD provides a detailed view of Process 3.0 from the Level-0 DFD. This decomposition shows the sub-processes within Process 3.0 and illustrates the data flows between them. Refer to Figure 4.11.

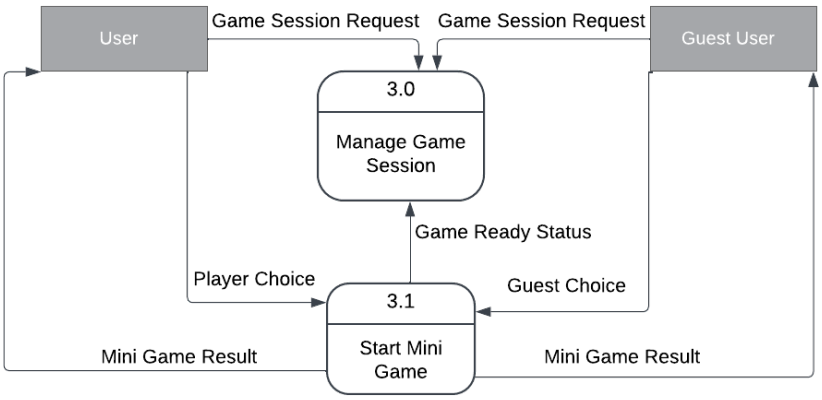


Figure 4.10: Level-1 DFD Showing the Decomposition of Process 3.0

4.3.4 Level-2 DFD

The Level-2 DFD provides a detailed view of Process 3.0 from the Level-1 DFD. This decomposition shows the sub-processes within Process 3.1 and illustrates the data flows between them. Refer to Figure 4.11.

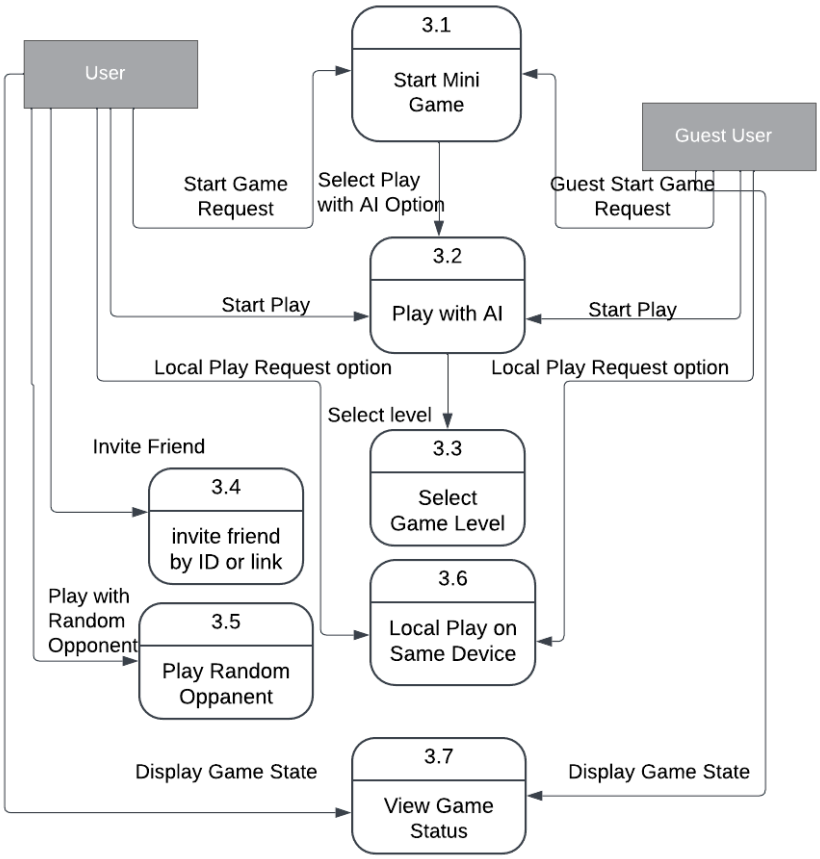


Figure 4.11: Level-1 DFD Showing the Decomposition of Process 3.1

4.4 Class Diagram

A class diagram is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods),and the relationships among objects.

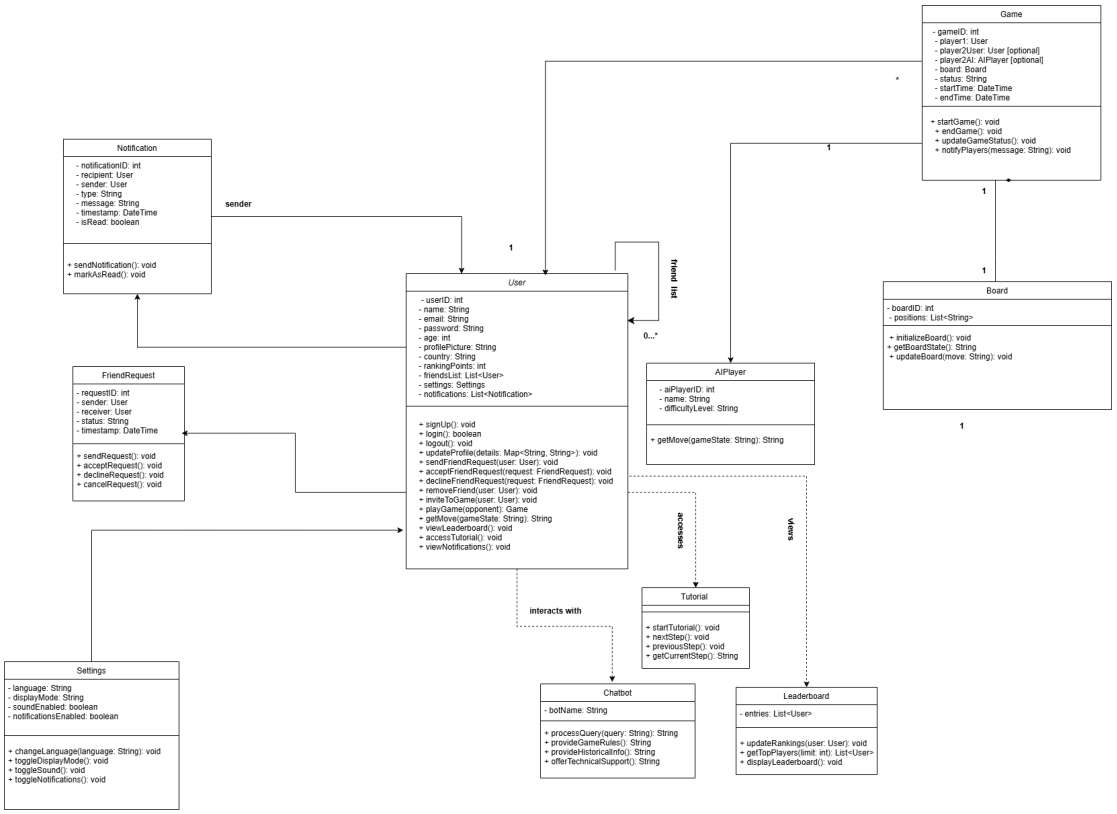


Figure 4.12: Class diagram for the system.

4.5 Sequence Diagram

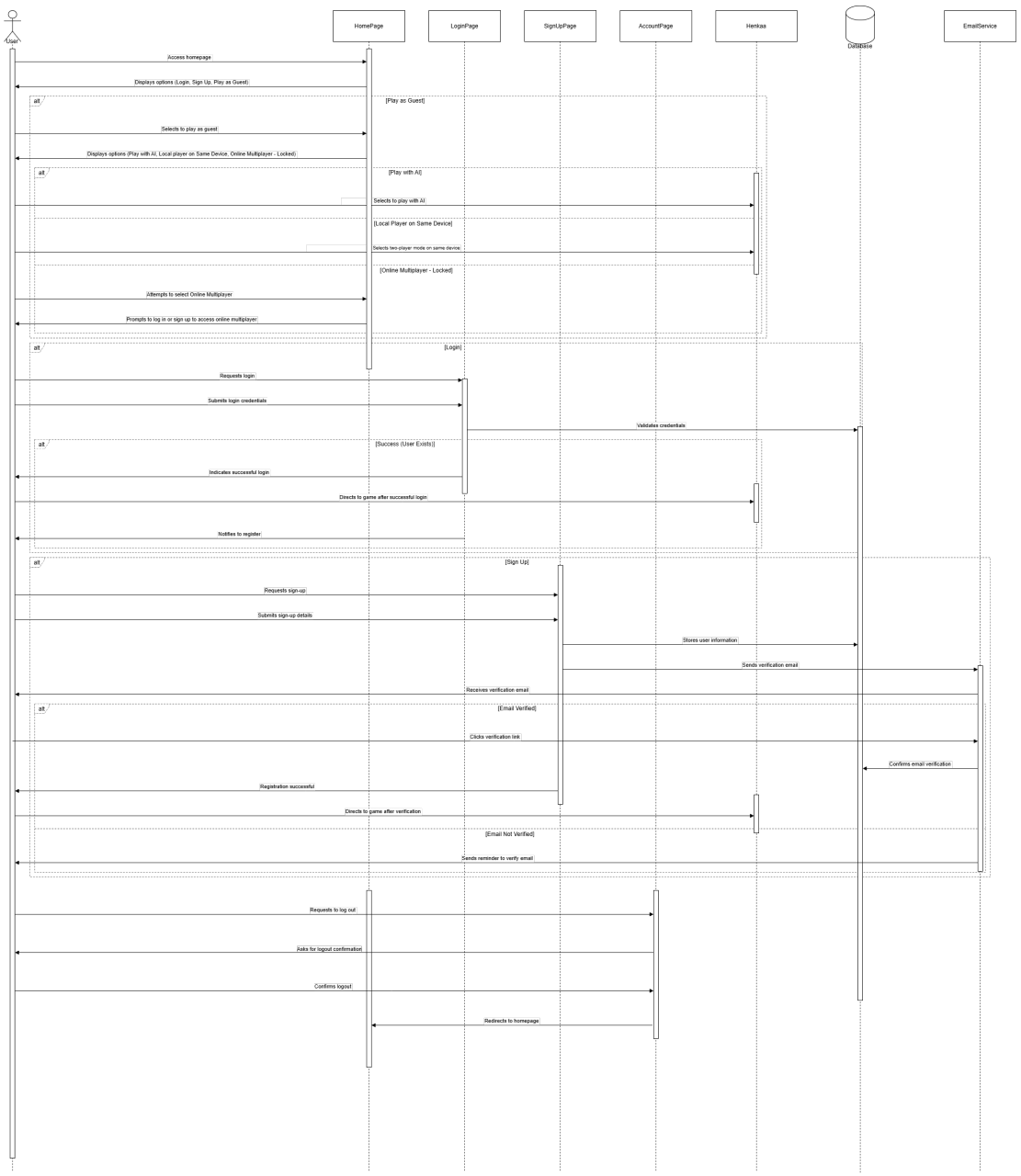


Figure 4.13: Account registration sequence diagram for game account

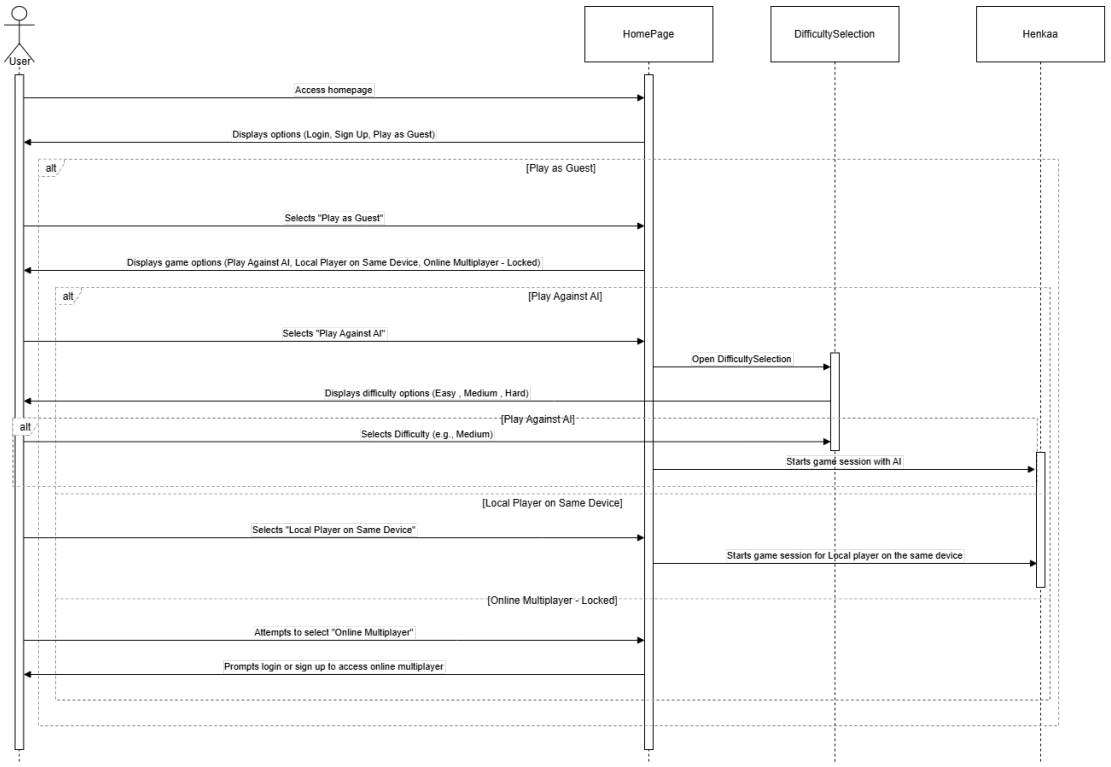


Figure 4.14: Guest play sequence diagram

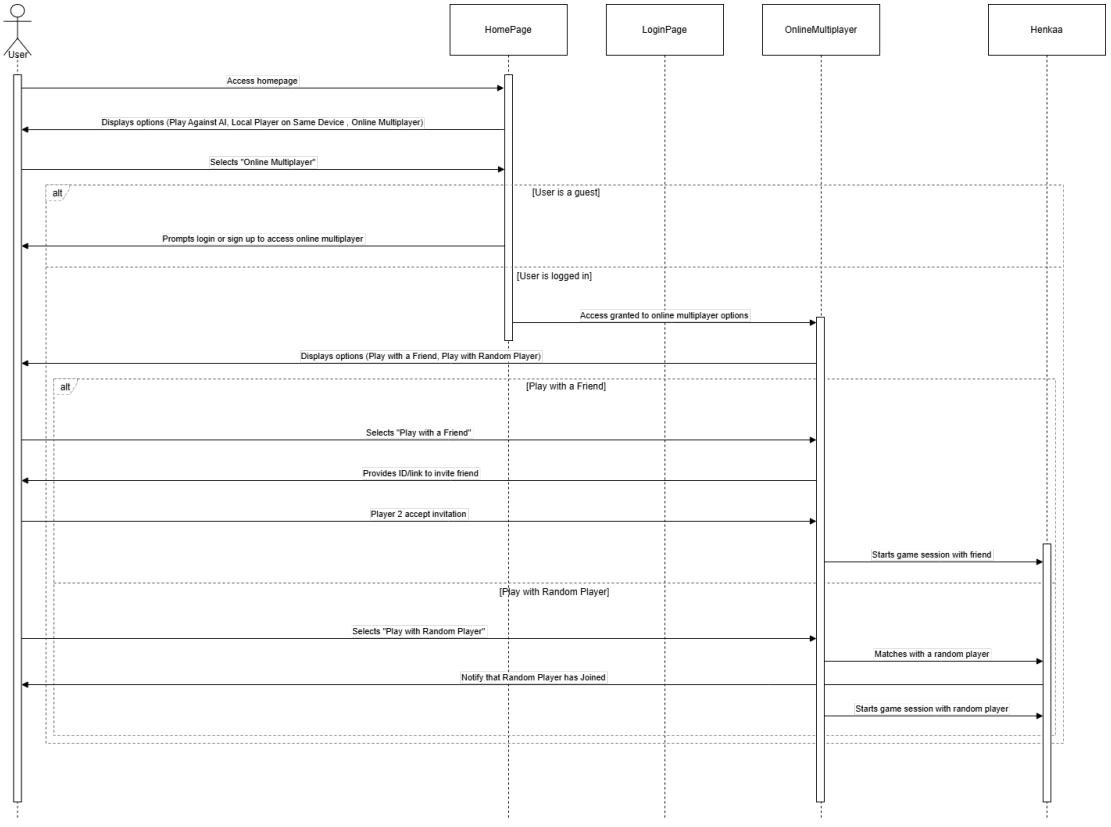


Figure 4.15: Online play sequence diagram

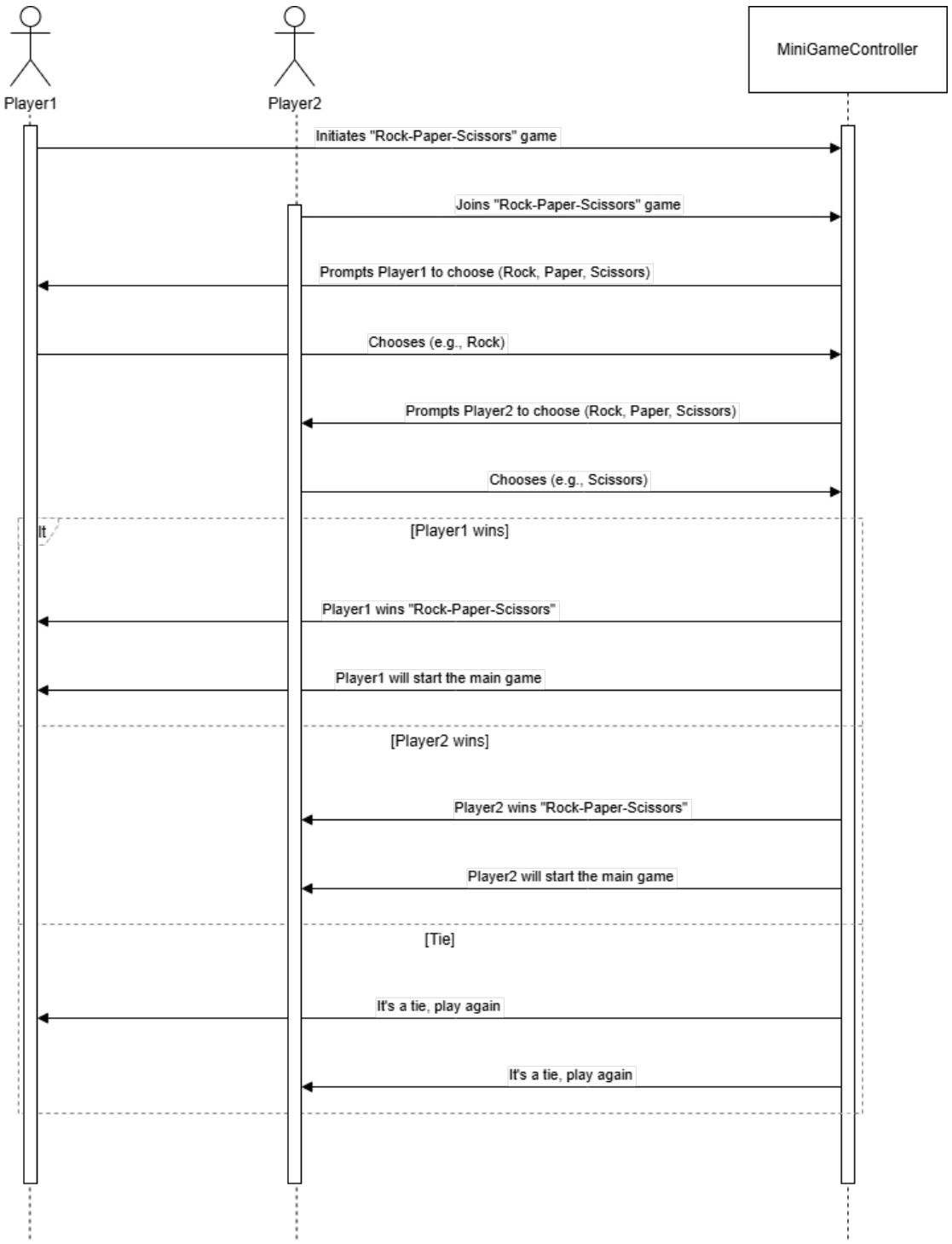


Figure 4.16: Mini Game sequence diagram

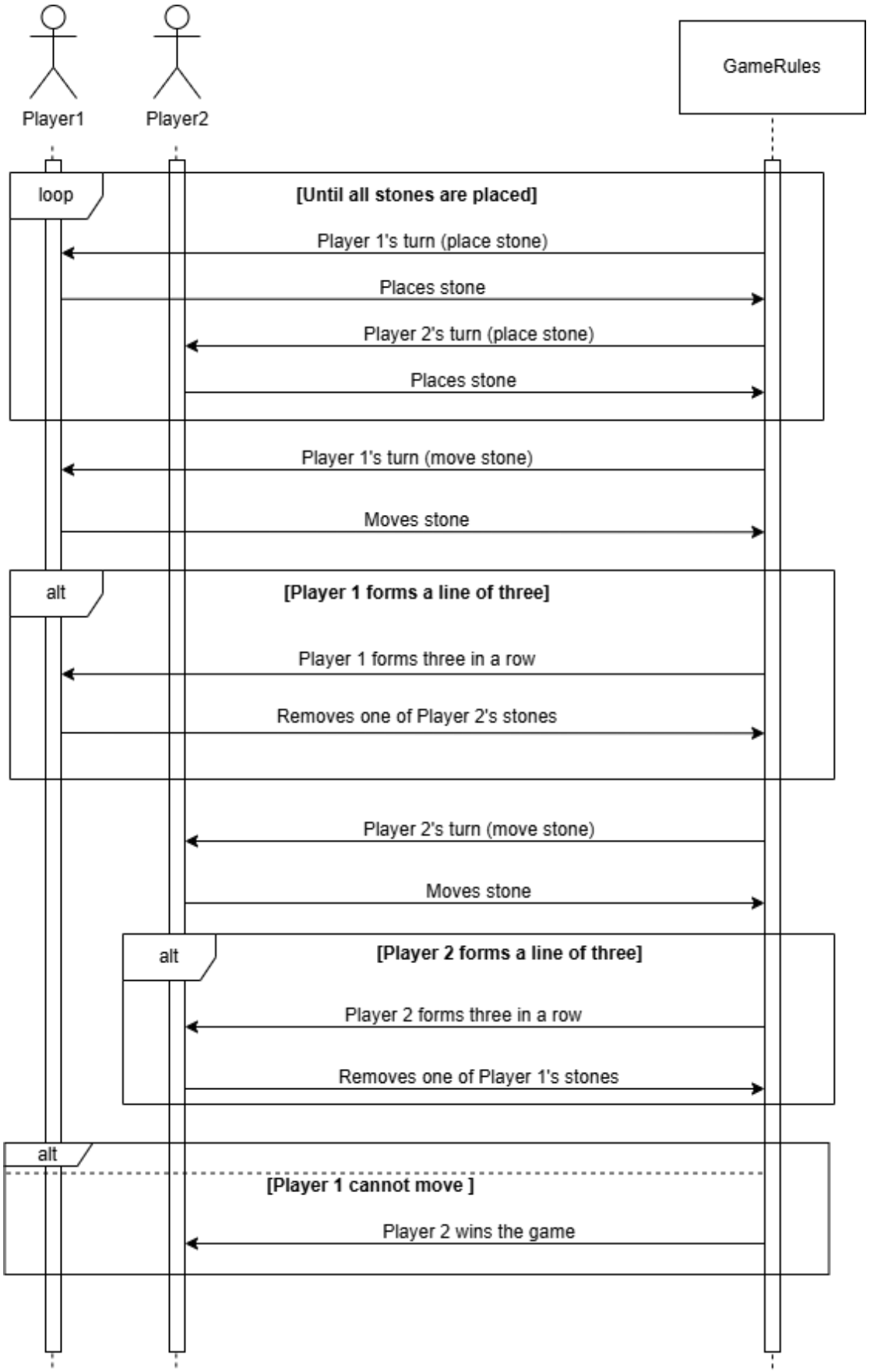


Figure 4.17: Rules of game sequence diagram

Chapter 5

Data Analysis

5.1 Introduction

In this section, we will show all the data and relationships between the database tables that we will need to use in this project.

5.2 ER Diagram

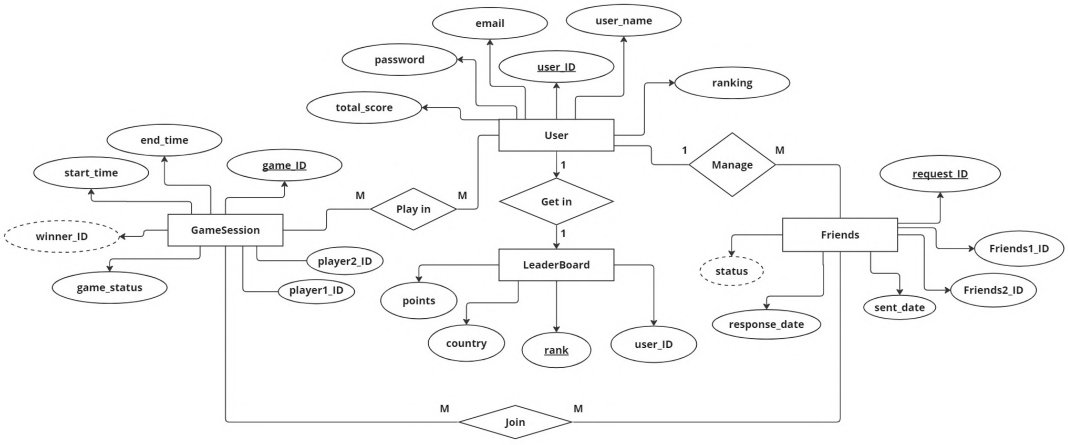


Figure 5.1: Entity-Relation for the system

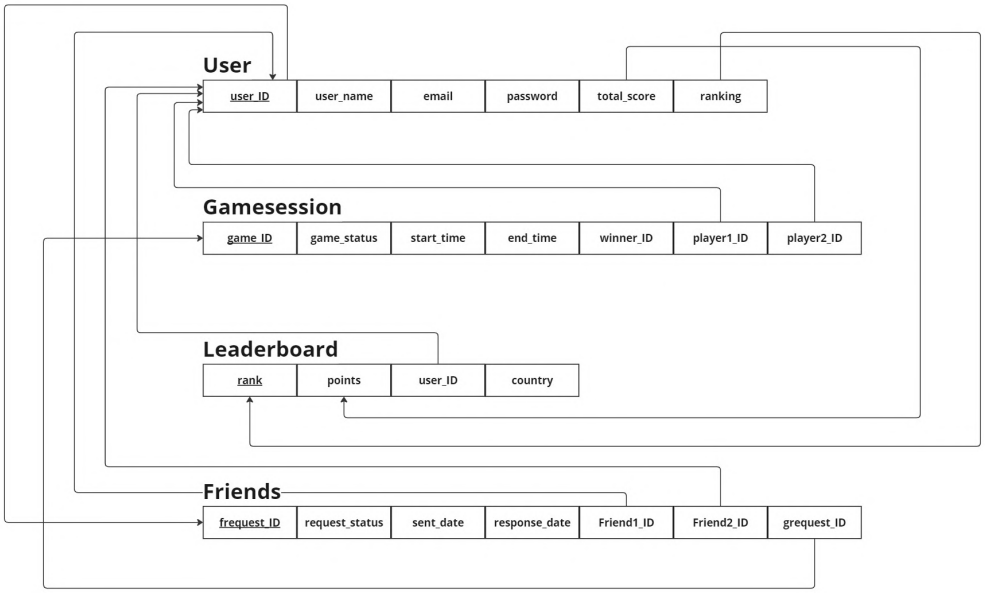


Figure 5.2: Schema for the ER

5.3 Data Schema

A database schema is an abstraction used to represent the storage of data in a database. It describes the organization of data and represents the relationship between various tables in a database, and in Figure (5.2), we're showing you the schema for our database.

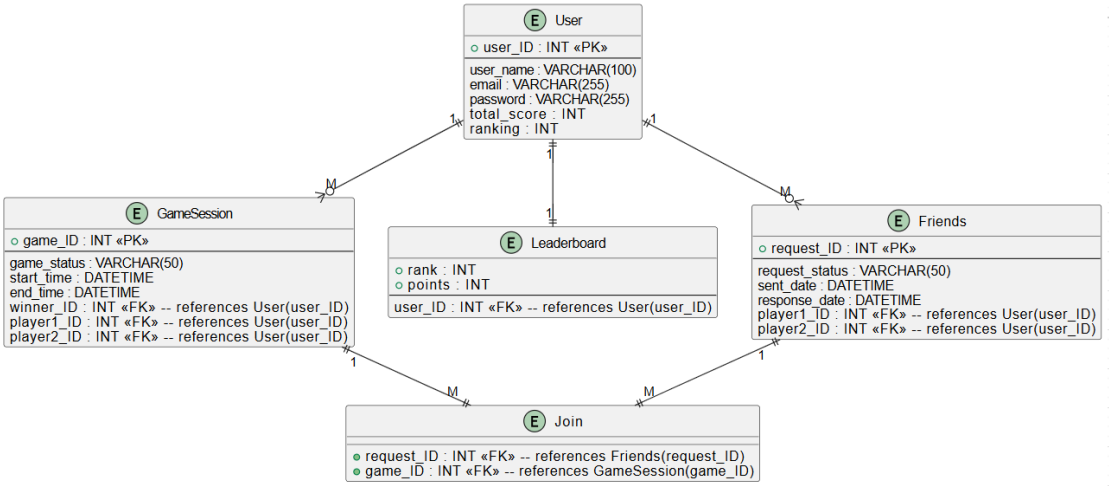


Figure 5.3: Data Schema for the system.

5.4 Data Dictionary

User Table

Field	Type	Length	Key	NULL?	Unique?	Table Description
user_ID	INT	10	PK	NO	Yes	Unique identifier for each user
user_name	VARCHAR	100	-	YES	No	Username of the user
email	VARCHAR	255	-	NO	Yes	Email address of the user, unique
password	VARCHAR	255	-	NO	No	Password for user authentication
total_score	INT	10	-	YES	No	Total score accumulated by the user
ranking	INT	10	-	YES	No	Ranking position of the user

Figure 5.4: User table in database.

GameSession Table

Field	Type	Length	Key	NULL?	Unique?	Table Description
game_ID	INT	10	PK	NO	Yes	Unique identifier for each game session
game_status	VARCHAR	50	-	YES	No	Status of the game session (e.g., ongoing, completed)
start_time	DATETIME	-	-	YES	No	Start time of the game session
end_time	DATETIME	-	-	YES	No	End time of the game session
winner_ID	INT	10	FK	YES	No	References `user_ID` of the winning user
player1_ID	INT	10	FK	YES	No	References `user_ID` of player 1
player2_ID	INT	10	FK	YES	No	References `user_ID` of player 2

Figure 5.5: Game Session table in database.

LeaderBoard Table

Field	Type	Length	Key	NULL?	Unique?	Table Description
rank	INT	10	-	NO	No	Rank of the user on the leaderboard
points	INT	10	-	YES	No	Points accumulated by the user
user_ID	INT	10	PK	NO	Yes	References `user_ID` in `User` table

Figure 5.6: Leaderboard table in database.

Friends Table

Field	Type	Length	Key	NULL?	Unique?	Table Description
request_ID	INT	10	PK	NO	Yes	Unique identifier for each friend request
request_status	VARCHAR	50	-	YES	No	Status of the friend request (e.g., pending, accepted)
sent_date	DATETIME	-	-	YES	No	Date when the friend request was sent
response_date	DATETIME	-	-	YES	No	Date when the friend request was responded to
player1_ID	INT	10	FK	YES	No	References `user_ID` of the user who sent the request
player2_ID	INT	10	FK	YES	No	References `user_ID` of the user who received the request

Figure 5.7: Friends table in database.

Join Table (for Friends and GameSession relationship)

Field	Type	Length	Key	NULL?	Unique?	Table Description
request_ID	INT	10	FK	NO	Yes	References `request_ID` in `Friends` table
game_ID	INT	10	FK	NO	Yes	References `game_ID` in `GameSession` table

Figure 5.8: Join Table in database.

Chapter 6

Interfaces

6.1 Introduction

User interface (UI) design is one of the most important parts of the program. It is an easy way for users to communicate with the applications as it helps the users to enter the required data and present the application results in a way that the users can understand. The user interface is the first thing that the user can see from the program, and it is the tangible part of it as the aim of designing the interfaces is to make the user's interaction with the device as simple as possible to reach the user's goals.In this chapter, we will introduce user interfaces for our "Henkaa" app.

6.2 Login interface

Figure 6.1: Login and registration interface

6.3 Play interface

Figure 6.2: Game options interface and game board

6.4 Learning interface

Figure 6.3: Game learning interface

6.5 Friends and Rank Interface

Figure 6.4: Friends and rank interface in the game

References

[1] S. Al-Suwaian, *Encyclopedia of Traditional Culture of the Kingdom of Saudi Arabia, Volume 12: Games*. Dar Al-Daira for Publishing and Documentation, 2000.

[2] M. b. A. Al-Kuwai, *Heritage of the Ancestors*. Thuluthia Publishing House, 2009.

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[5] A. b. A. Al-Khudair, "Popular games and their social impact on the youth," *Journal of the Faculty of Arts, Benha University*, vol. 55, no. 3, pp. 1–30, 2021.

[6] A. Galassi, "Datasets for um tis'a," 2019. Accessed: 2024-12-1.

Here is a reference with a clickable link: Datasets for "Um Tis'a" .