ÇANKAYA UNIVERSITY COMPUTER ENGINEERING

CENG 407

SOFTWARE DESIGN DOCUMENT

(SDD)

GROUP 1

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1. Introduction

1.1 Purpose of this Document

The purpose of this project is to develop an innovative real-world mobile multiplayer game that blends laser tag and paintball elements within a unique FPS experience. By leveraging cutting-edge technologies like TensorFlow Lite and Flutter, the aim is to create an immersive gaming environment that transcends traditional virtual setups. The focus on real-world scenarios and body segmentation for hit detection sets this game apart, promising an engaging and authentic player experience.

1.2 Scope of the Document

The scope of this project encompasses the development of a mobile FPS game that integrates seamlessly with the real world. The use of TensorFlow Lite for body segmentation eliminates the need for virtual environments, allowing players to engage in combat within their actual surroundings. The game will feature distinct body regions for hit detection, 3D weapon models with animations, and dynamic gameplay elements driven by player identification through GPS, phone orientation, and image distance estimation. Bluetooth controllers further enhance the gaming experience by enabling physical interactions.

1.3 Definitions and Acronyms

Term	Definition
Activity Diagram	A flowchart showing how one activity leads to another activity.
Sequence Diagram	Shows process interactions in the area of software engineering that are time-ordered.
Class Diagram	A graphical notation for building and visualizing object-oriented systems.
Software Design Description	A description of software created to facilitate analysis, planning, implementation, and decision-making.
User Interface Design	The technique designers use to construct interfaces in software or technological devices, focused on appearances or style.
Android	An open source and free mobile operating system based on Linux, developed for use on mobile devices and mobile phones.
iOS	Apple's mobile operating system originally developed for the iPhone but later used on the iPod touch and iPad.

User	Someone that uses a product or service.
Application	
Admin	A person in charge of administration in a business or organization.
Database	A structured collection of information or data that is often saved electronically in a computer system.
Segmentation	The process of dividing a larger entity or dataset into smaller, more manageable parts, often used in networking or data analysis.
Lobby	A virtual waiting area where users gather before engaging in the main activity, common in online games and chat applications.
Screenshot	A captured image of the current display on a computer or mobile device, widely used for documentation and sharing visual information.
Health point	(HP) represent the vitality of a character or system in a game or application, indicating remaining life or well-being.
Algorithm	A step-by-step set of rules designed to perform specific tasks or solve problems, foundational in various IT processes.
Surrender	In online gaming or applications, is the voluntary act of ending a game or task before its natural conclusion.
Pop-up	A sudden graphical user interface element that appears on top of current content, commonly used to display information or options.
Host	A computer or device providing resources or services to connected devices, such as a server hosting a website or game session.

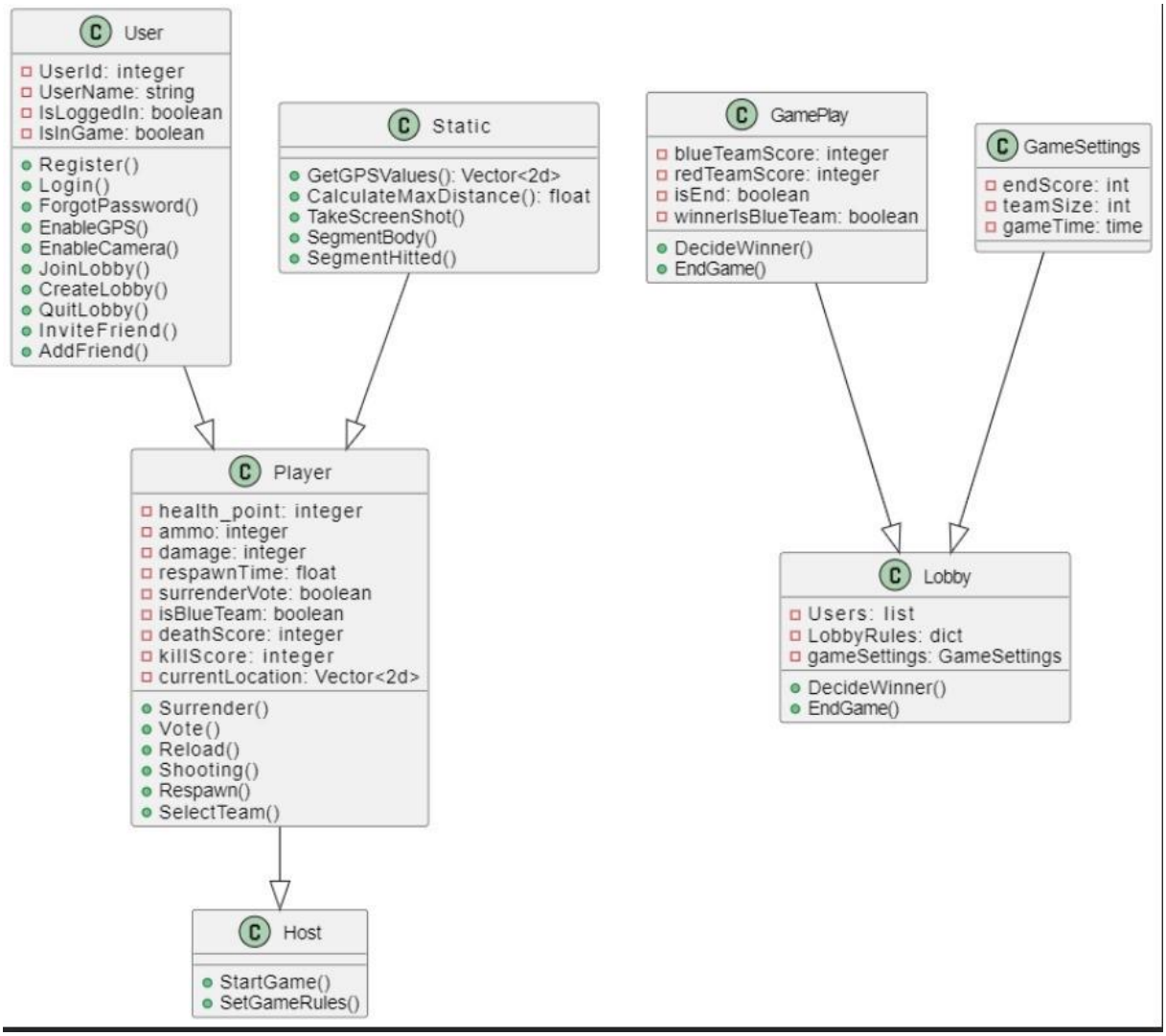
1.4 Motivation of this Document

The motivation behind this project is to redefine the mobile gaming experience by merging real-world elements with FPS gameplay. Traditional virtual environments can be limiting, and this project seeks to break free from those constraints. The use of TensorFlow Lite for body segmentation provides a novel approach to hit detection, while the incorporation of Bluetooth controllers adds a tangible and immersive layer to the gaming interaction. The desire is to create a game that not only entertains but also pushes the boundaries of what is possible in mobile gaming, offering players an experience that bridges the gap between the virtual and the real.

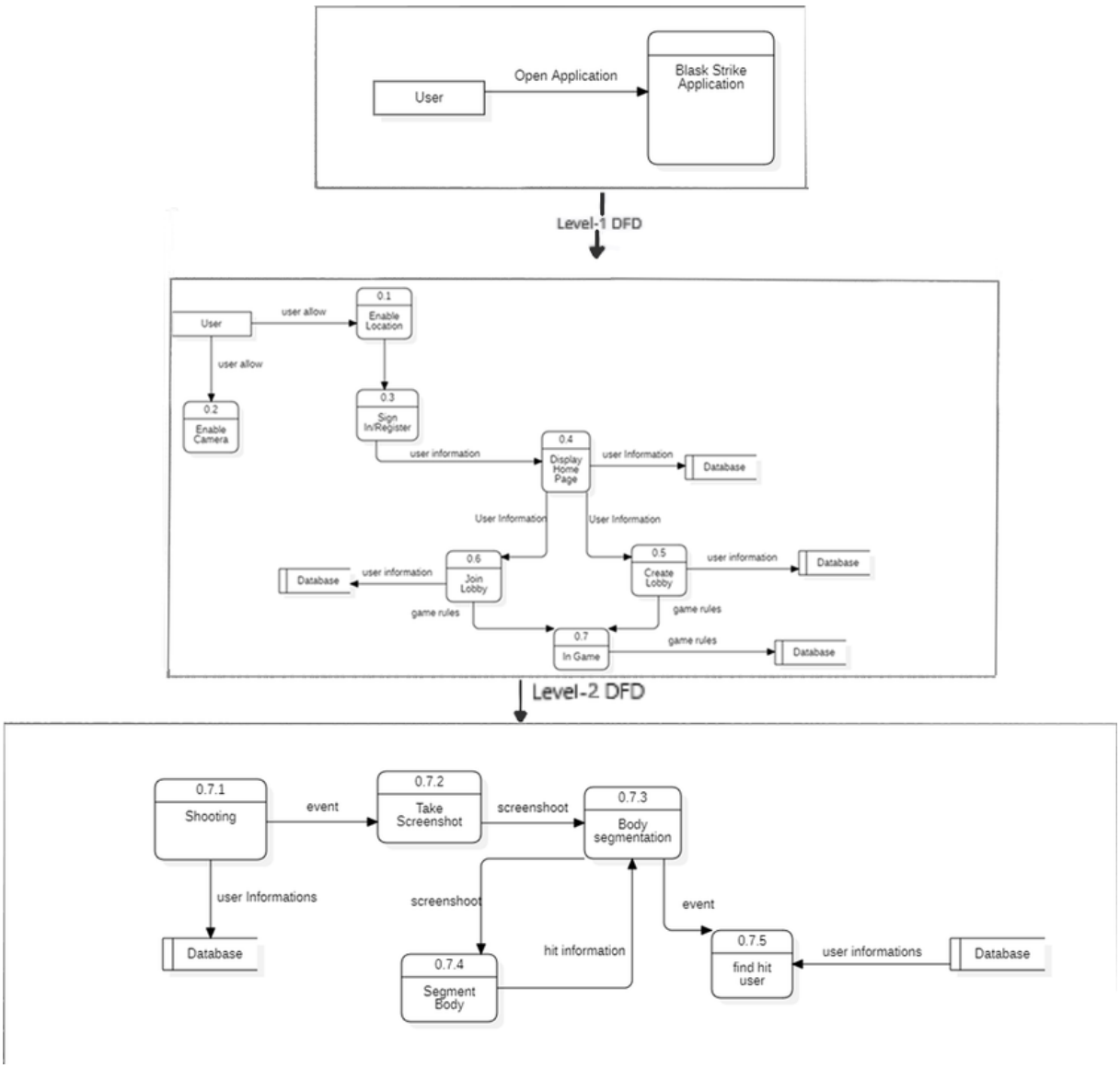
2. Design Approach

This section of the system design includes the system's architectural design, the definition of the problem, the technologies used, user interface design. It also includes diagrams such as Class Diagram, Activity Diagram, Sequence Diagram and Data Flow Diagram

2.1 Class Diagram

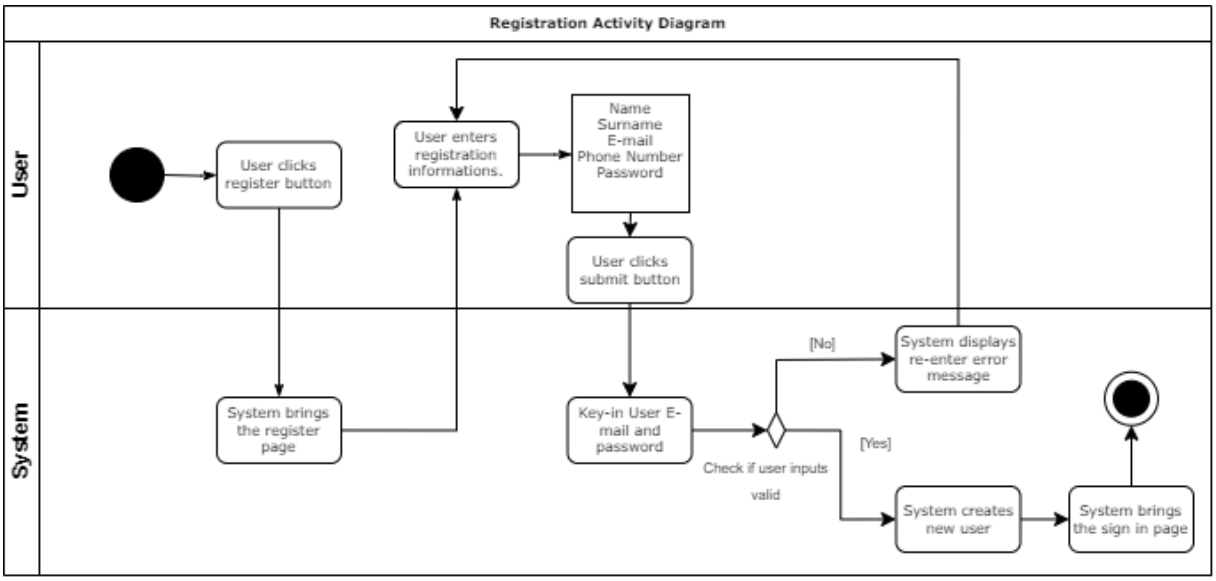


2.2 Dataflow Diagram

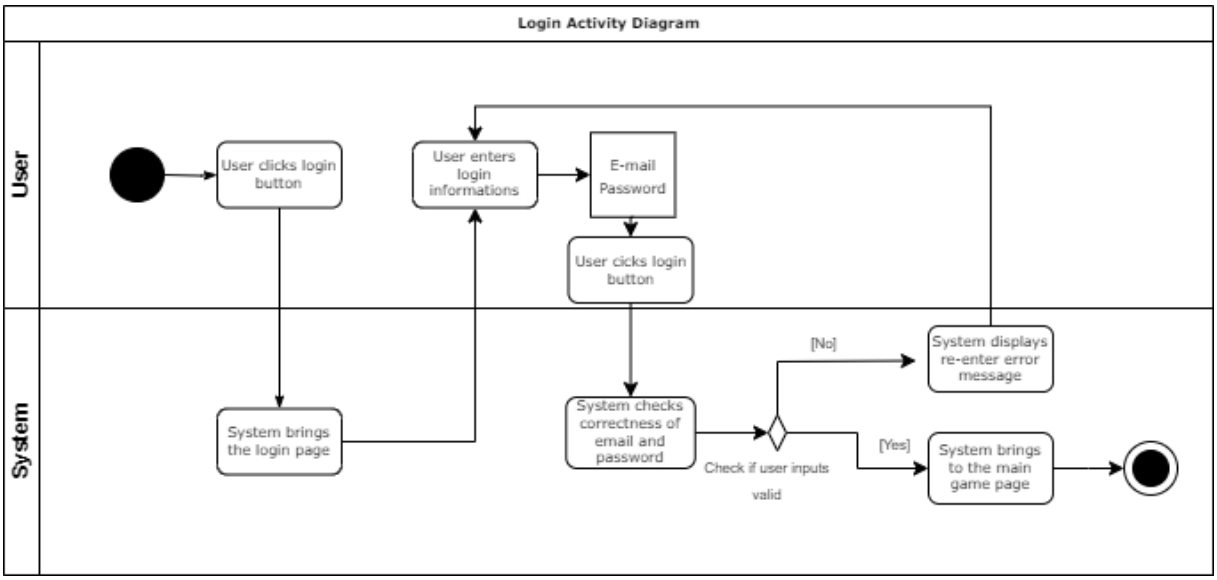


2.3Activity Diagrams

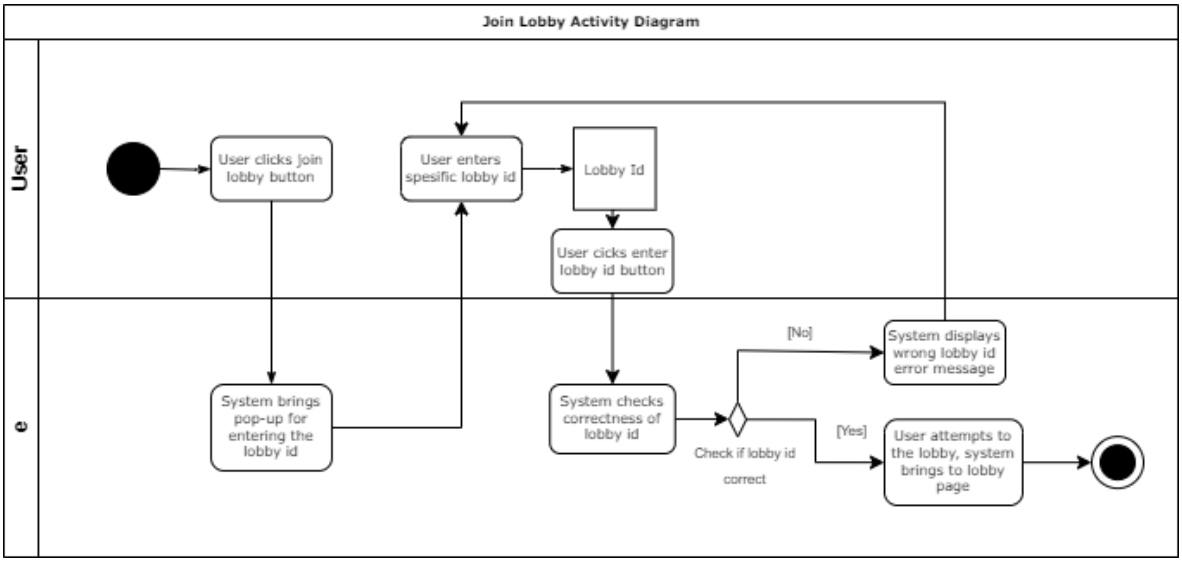
2.3.1 Register



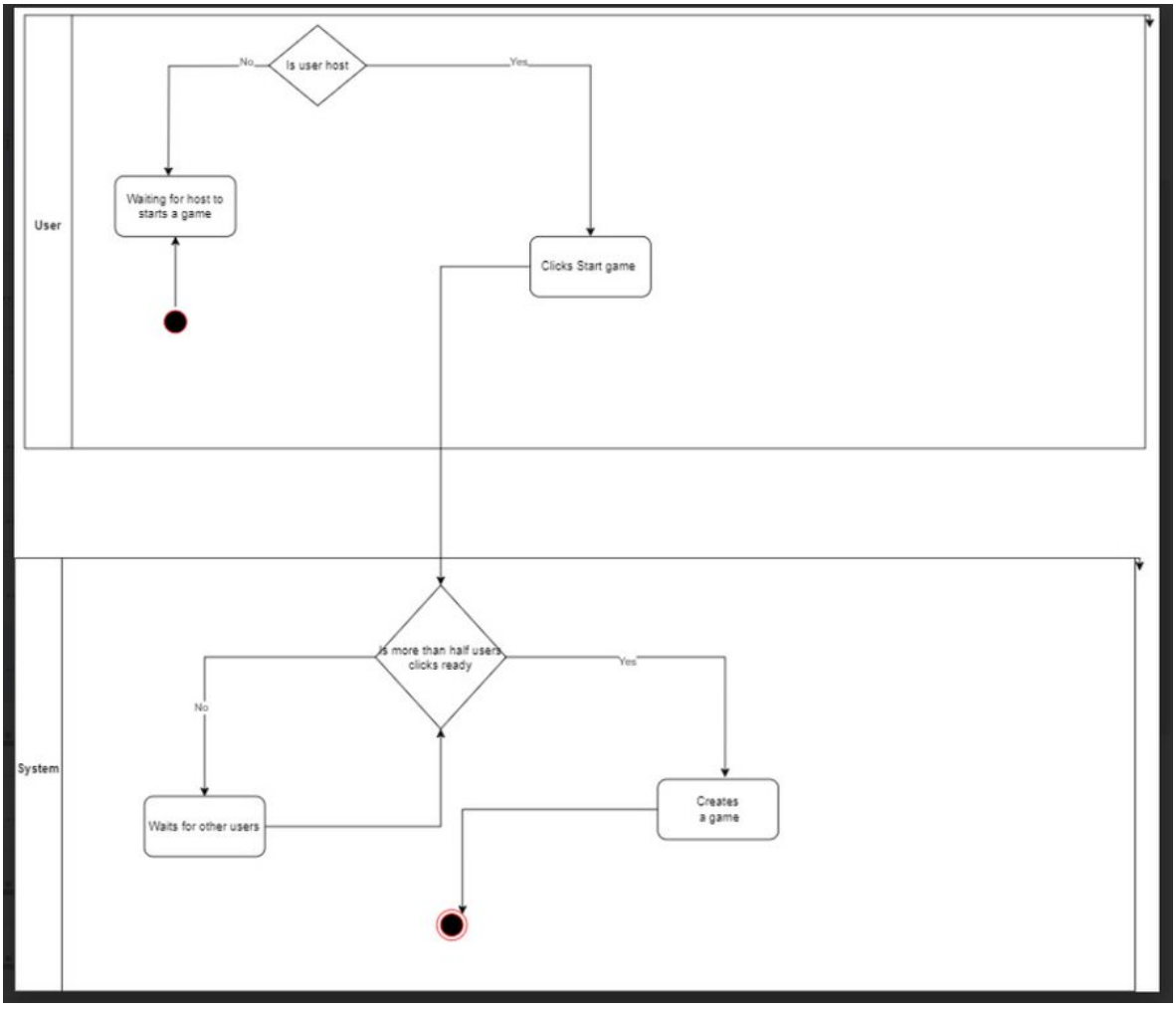
2.3.2 Login



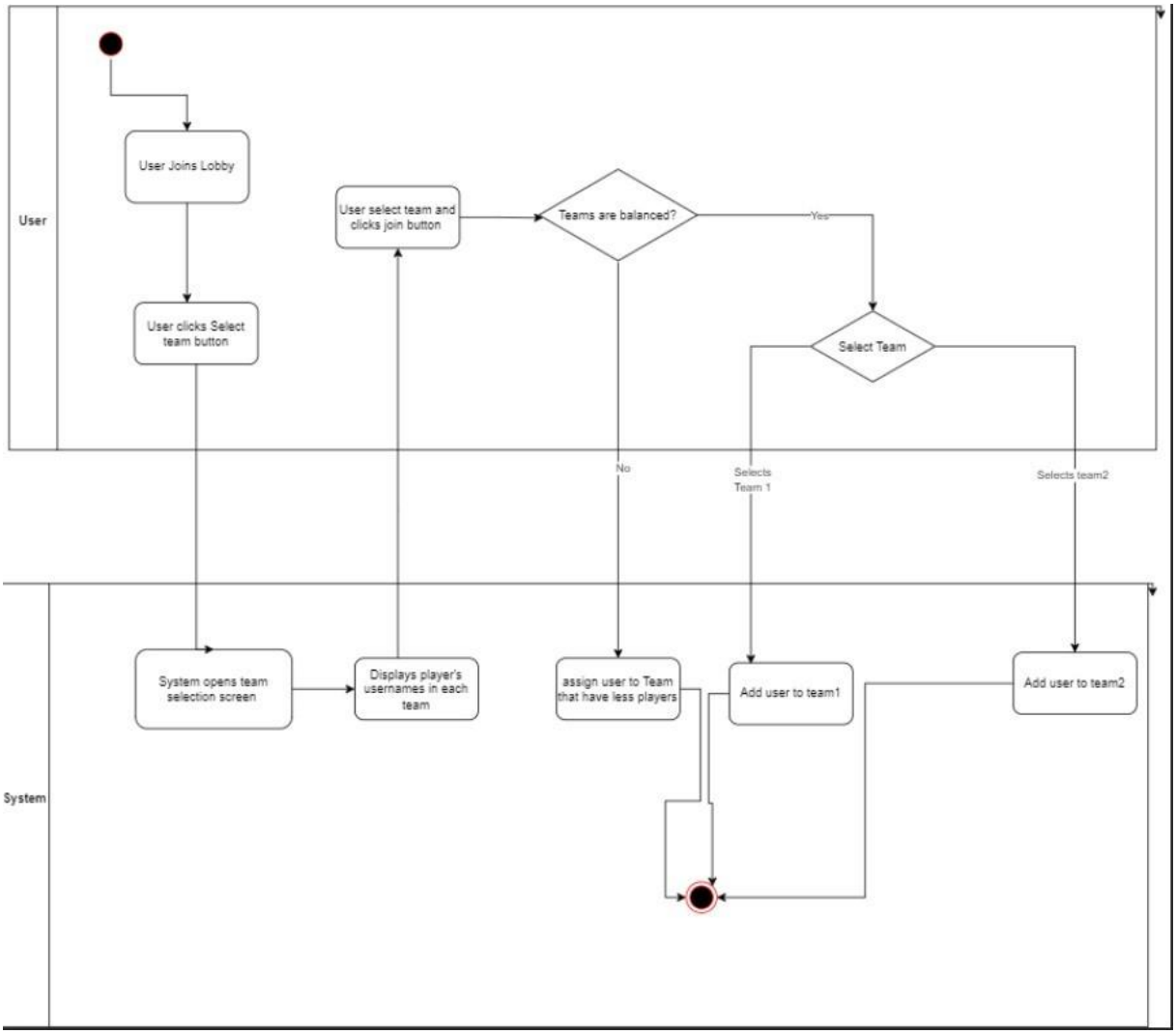
2.3.3 Join Lobby



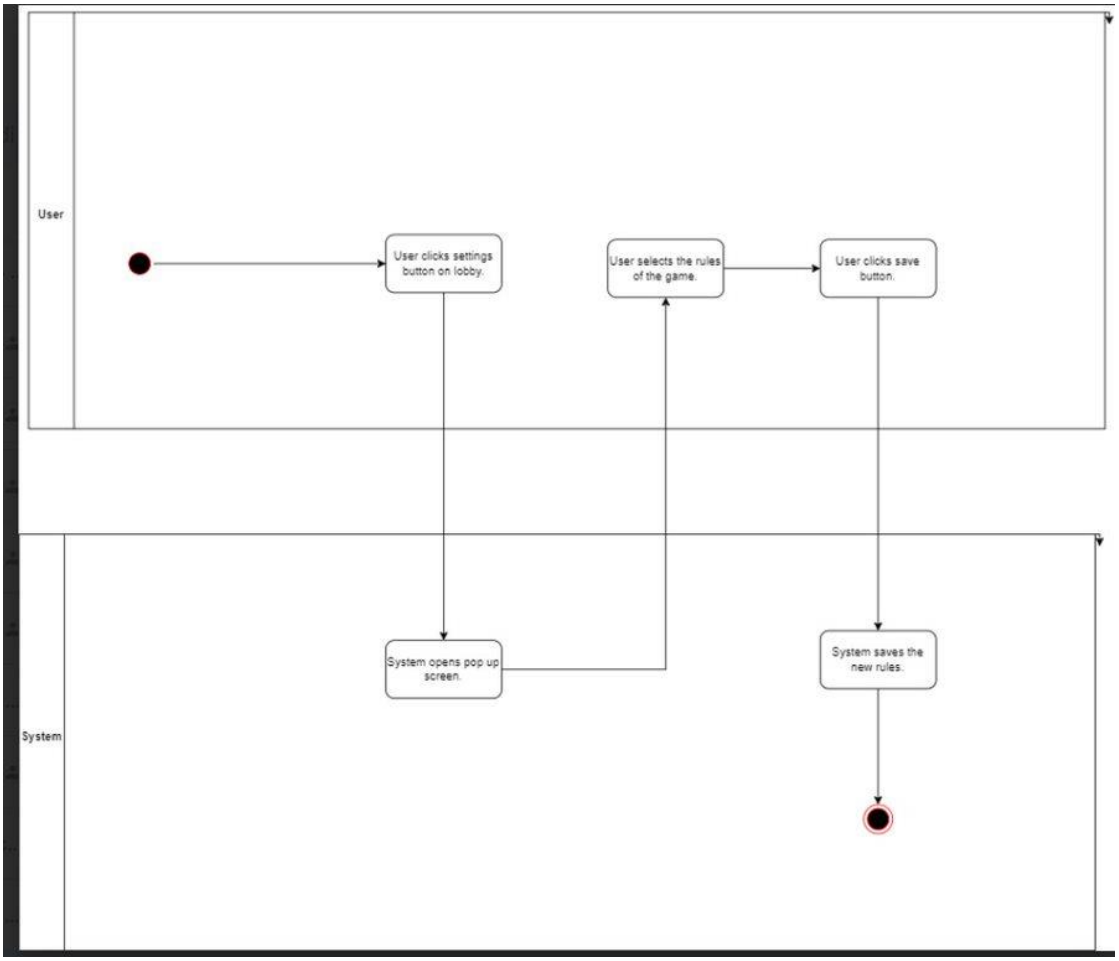
2.3.4 Start Game



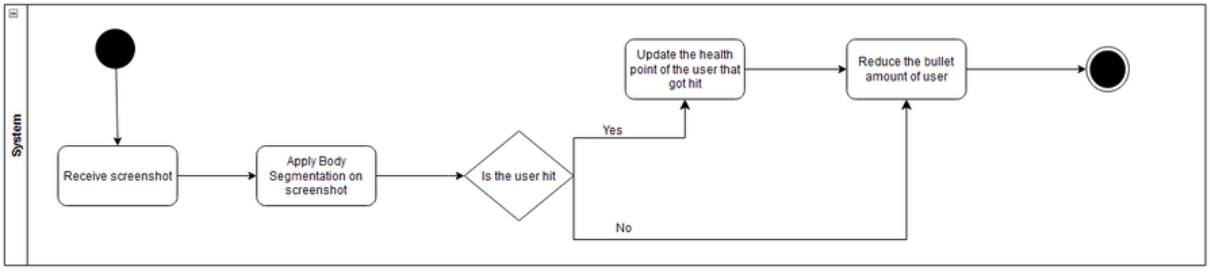
2.3.5 Select Team



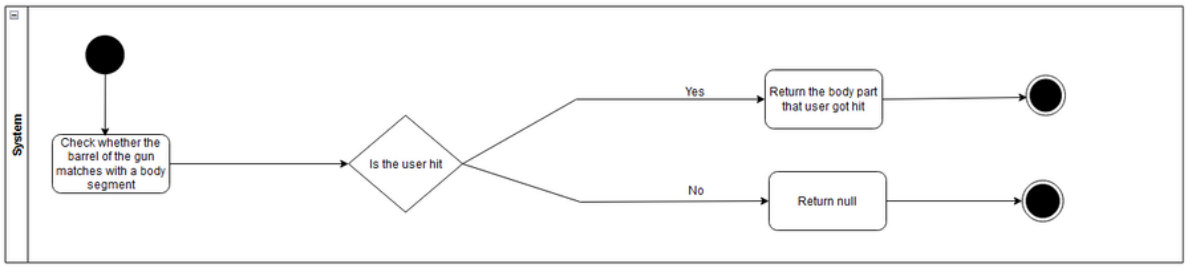
2.3.6 Set Game Rules



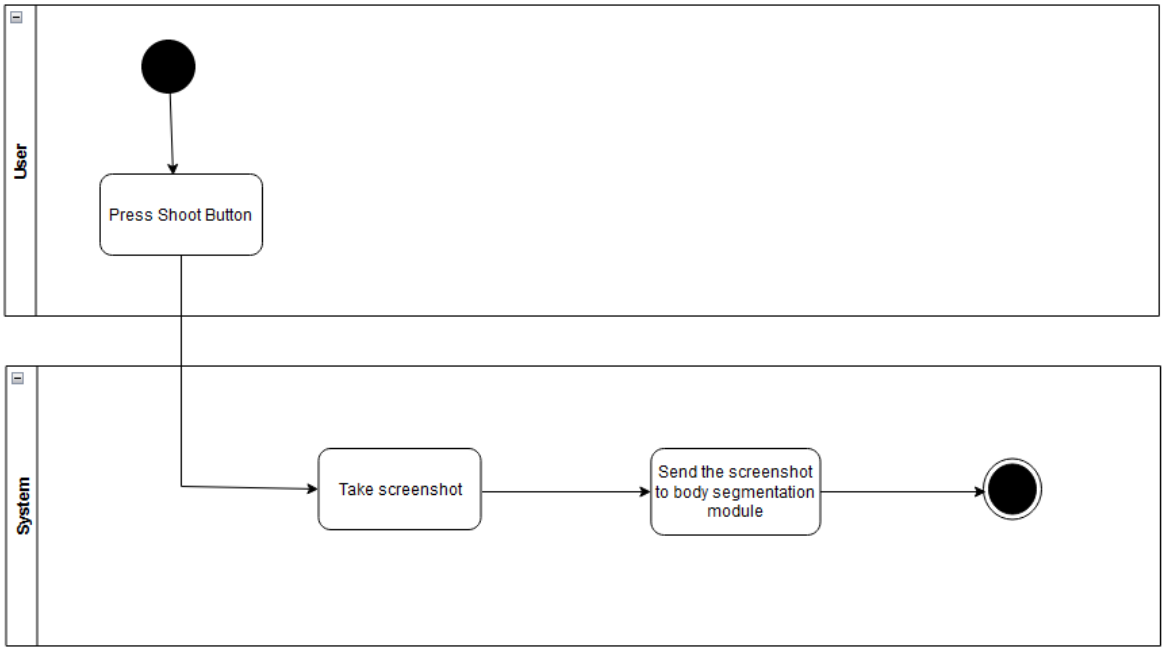
2.3.7 Segment Body



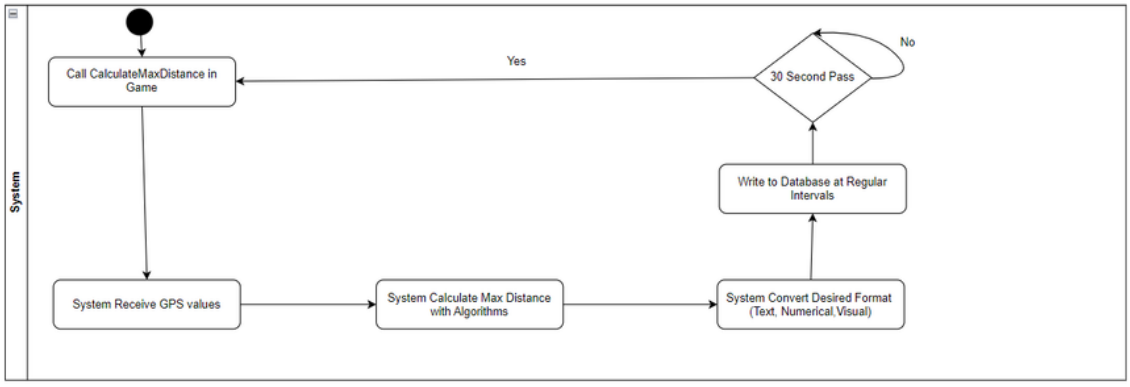
2.3.8 Segment Hit



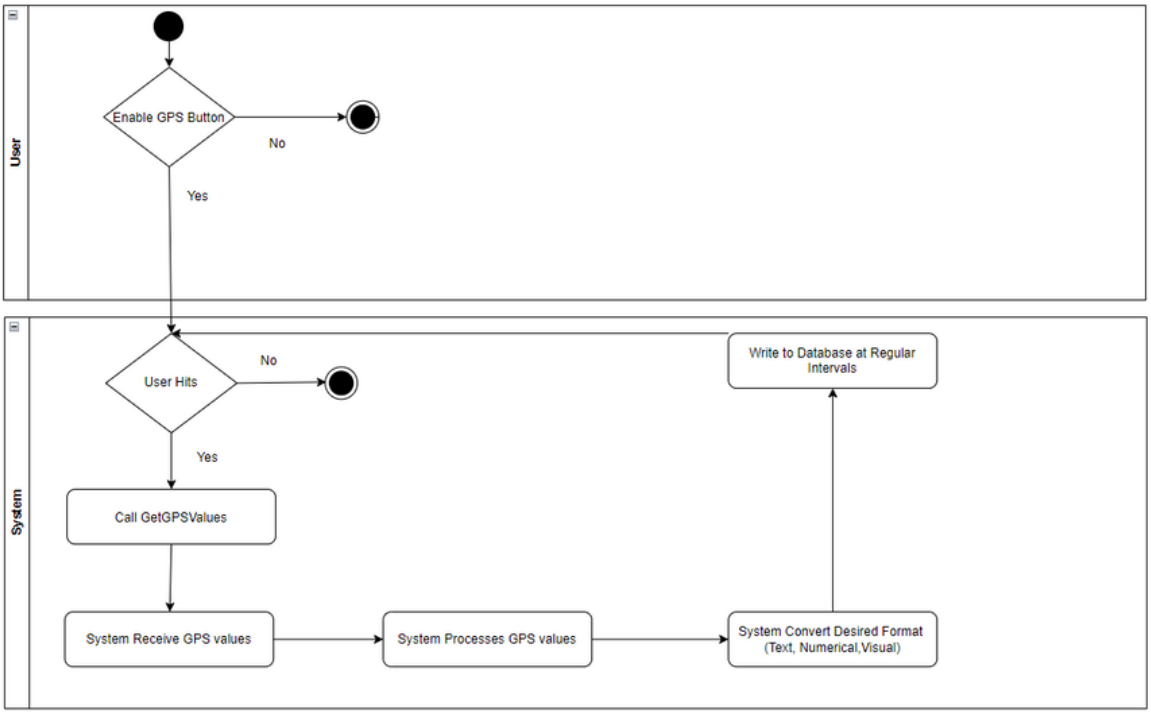
2.3.9 Take Screenshot



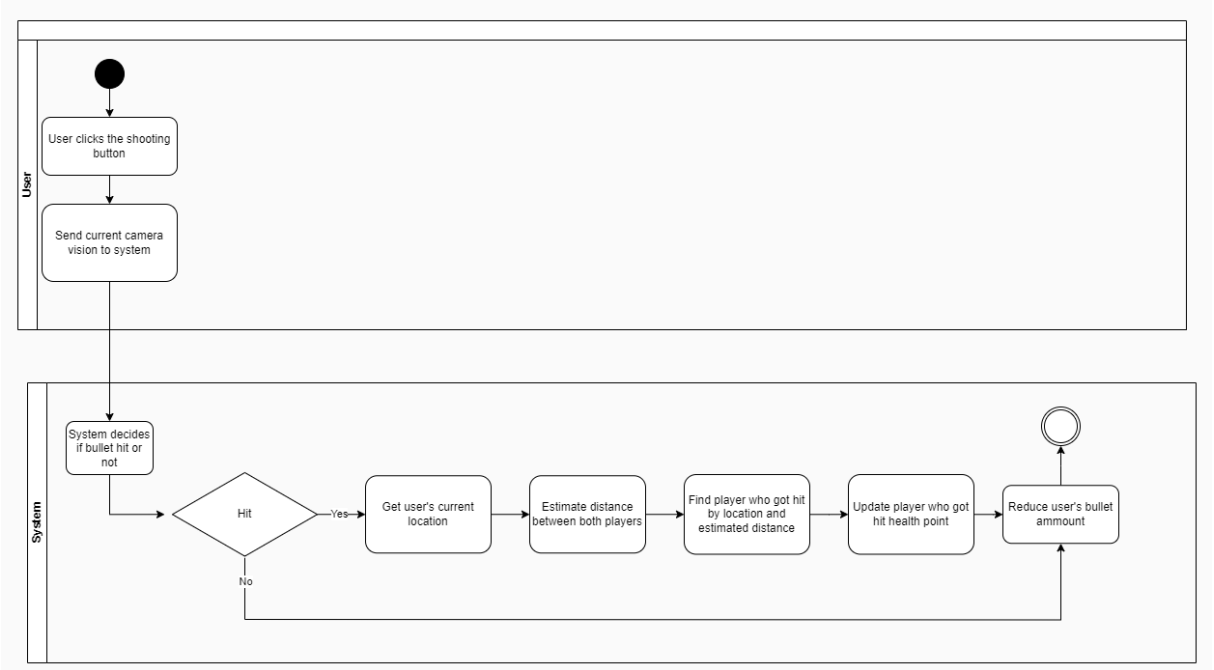
2.3.10 Calculate Max Distance



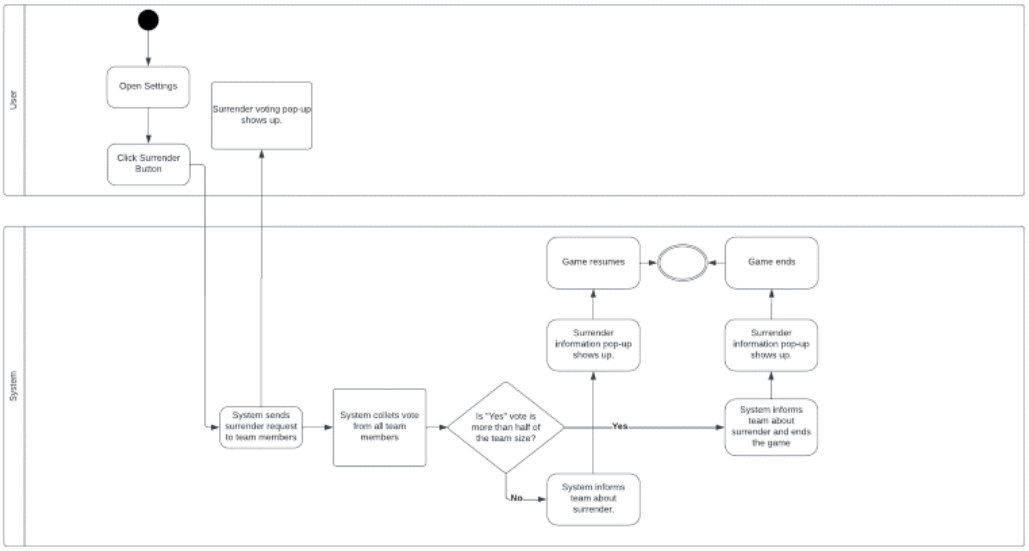
2.3.11 Get GPS Values



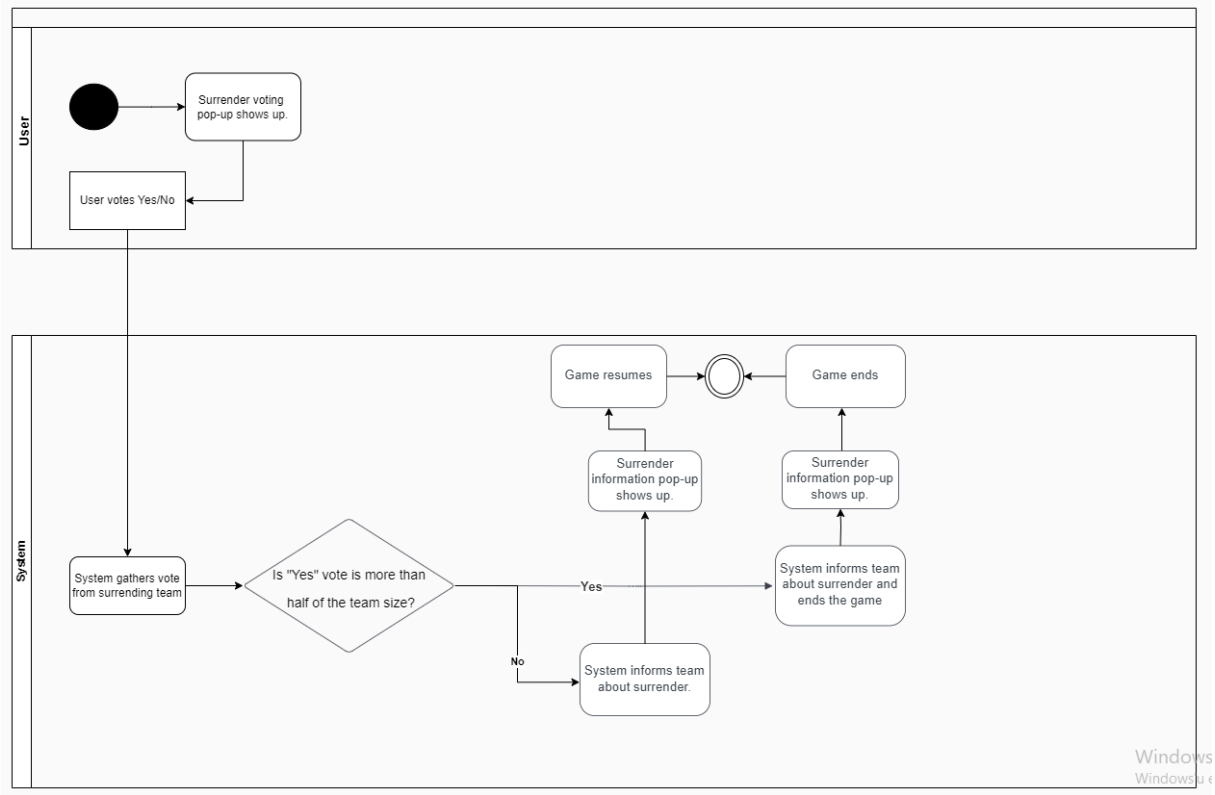
2.3.12 Hit



2.3.13 Surrender

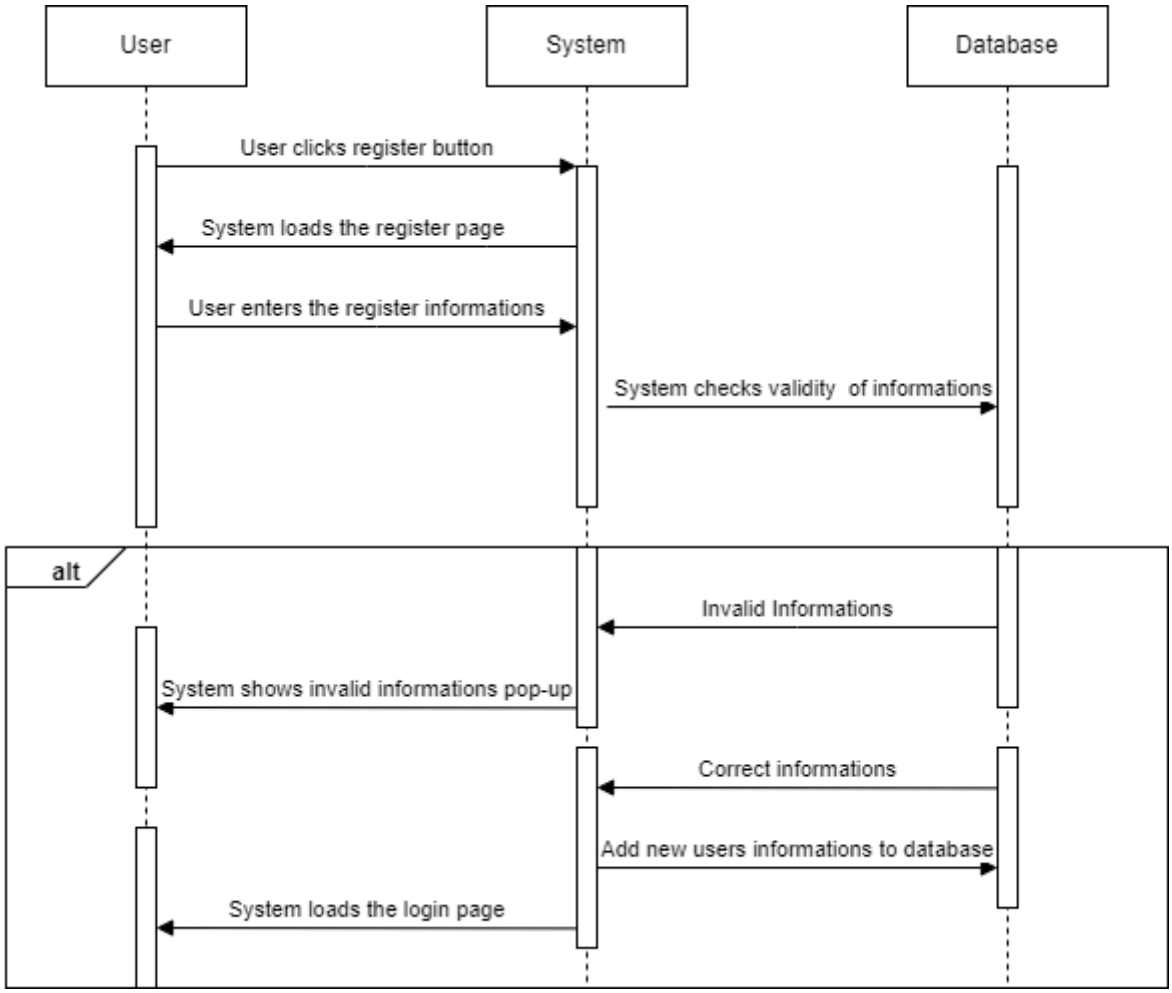


2.3.14 Vote

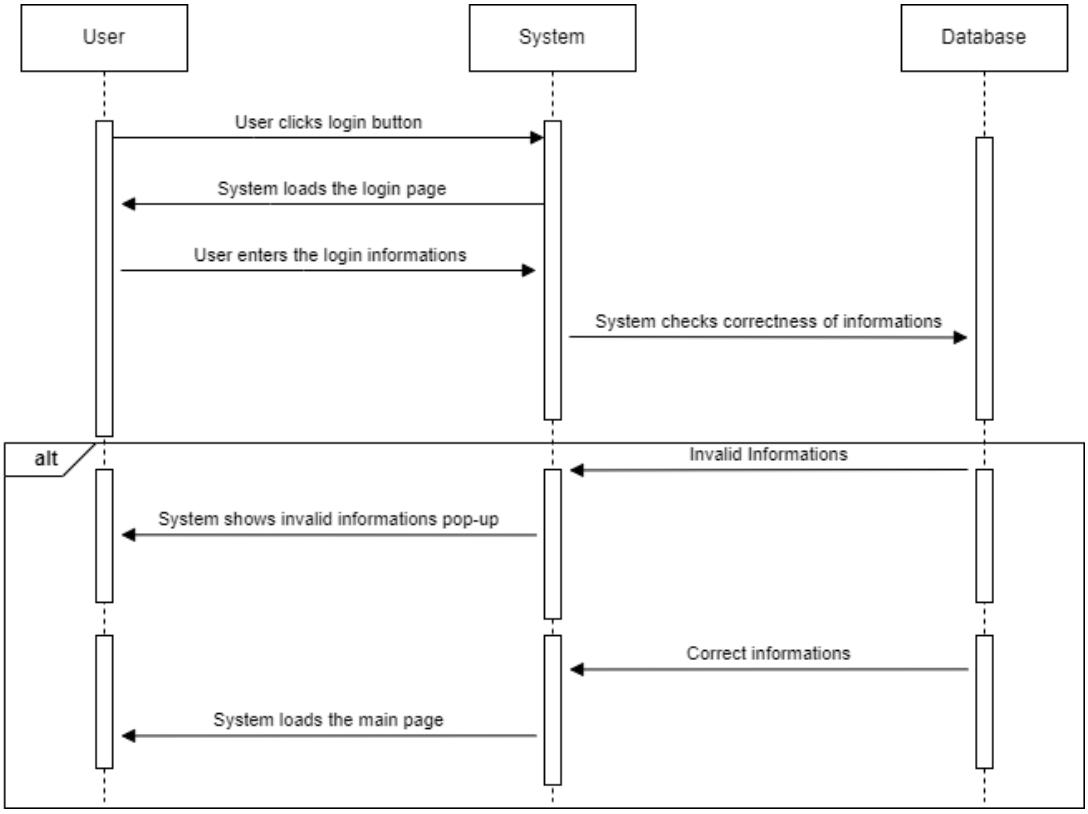


2.4 Sequence Diagrams

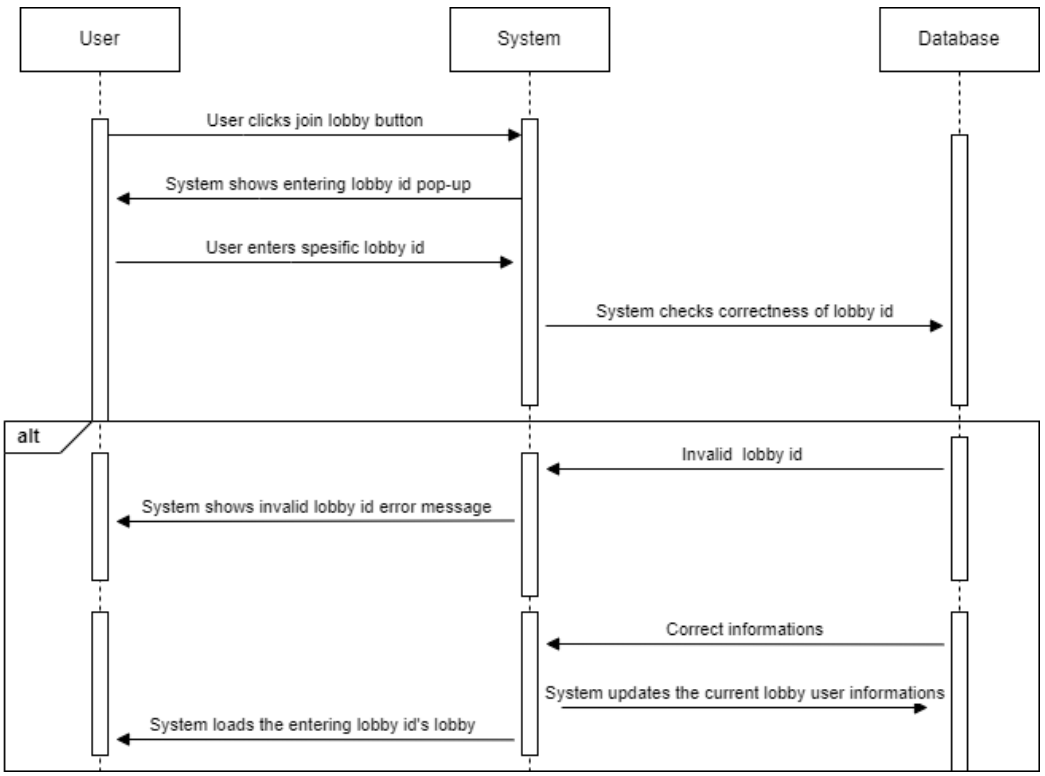
2.4.1 Register



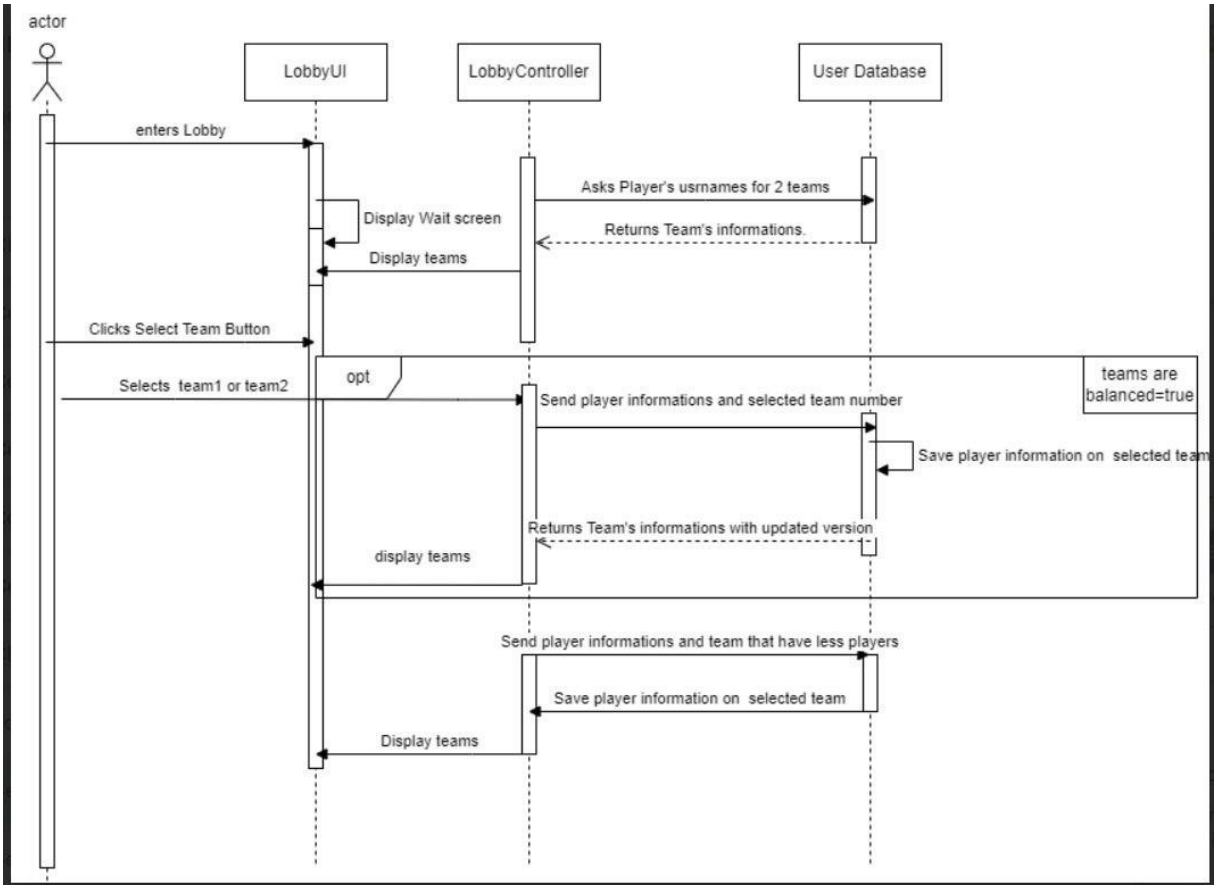
2.4.2 Login



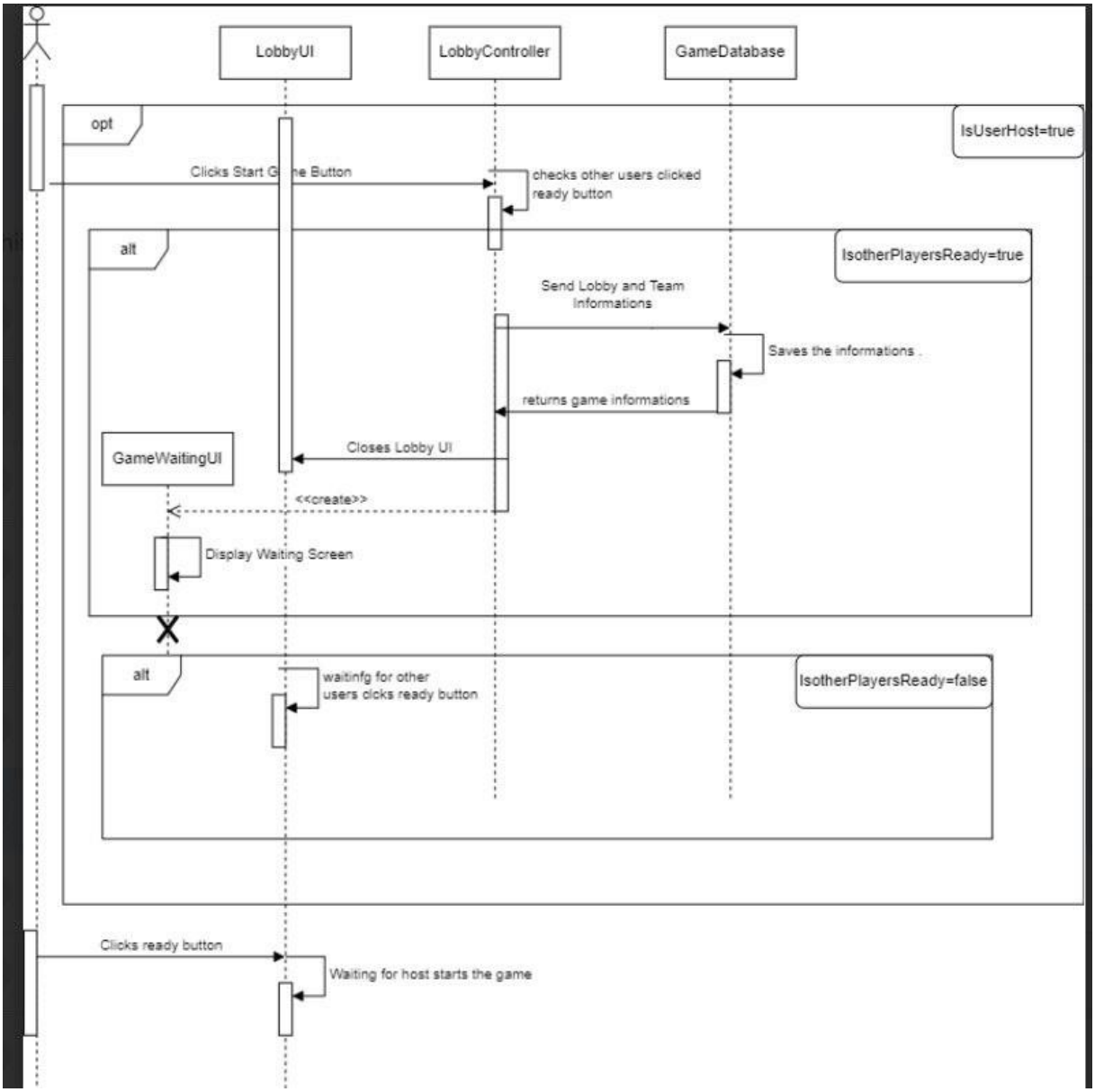
2.4.3 Join Lobby



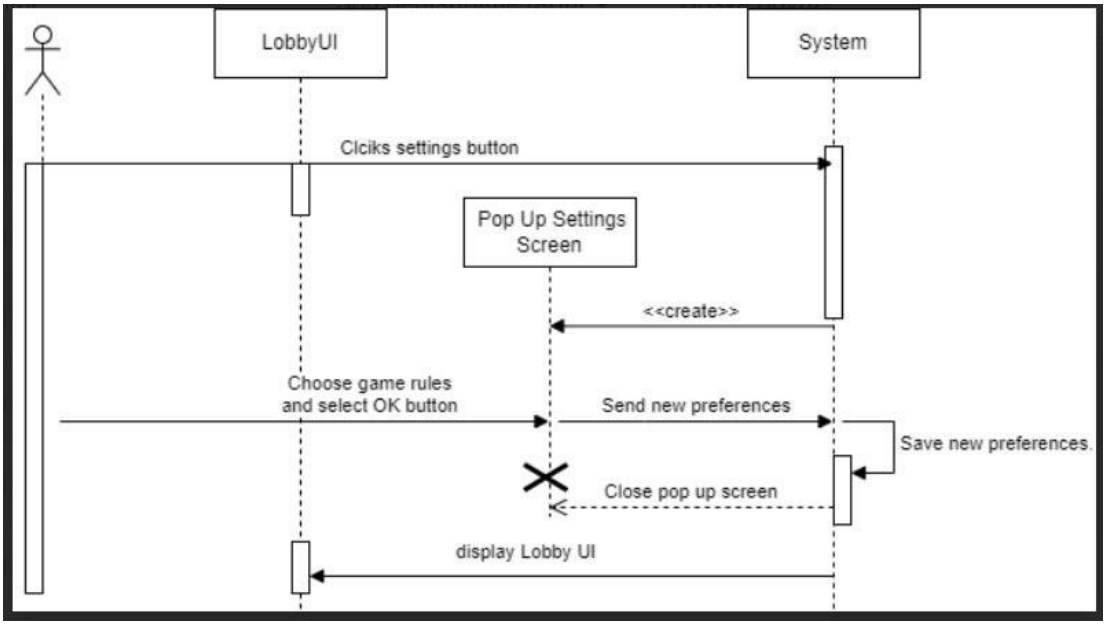
2.4.4 Select Team



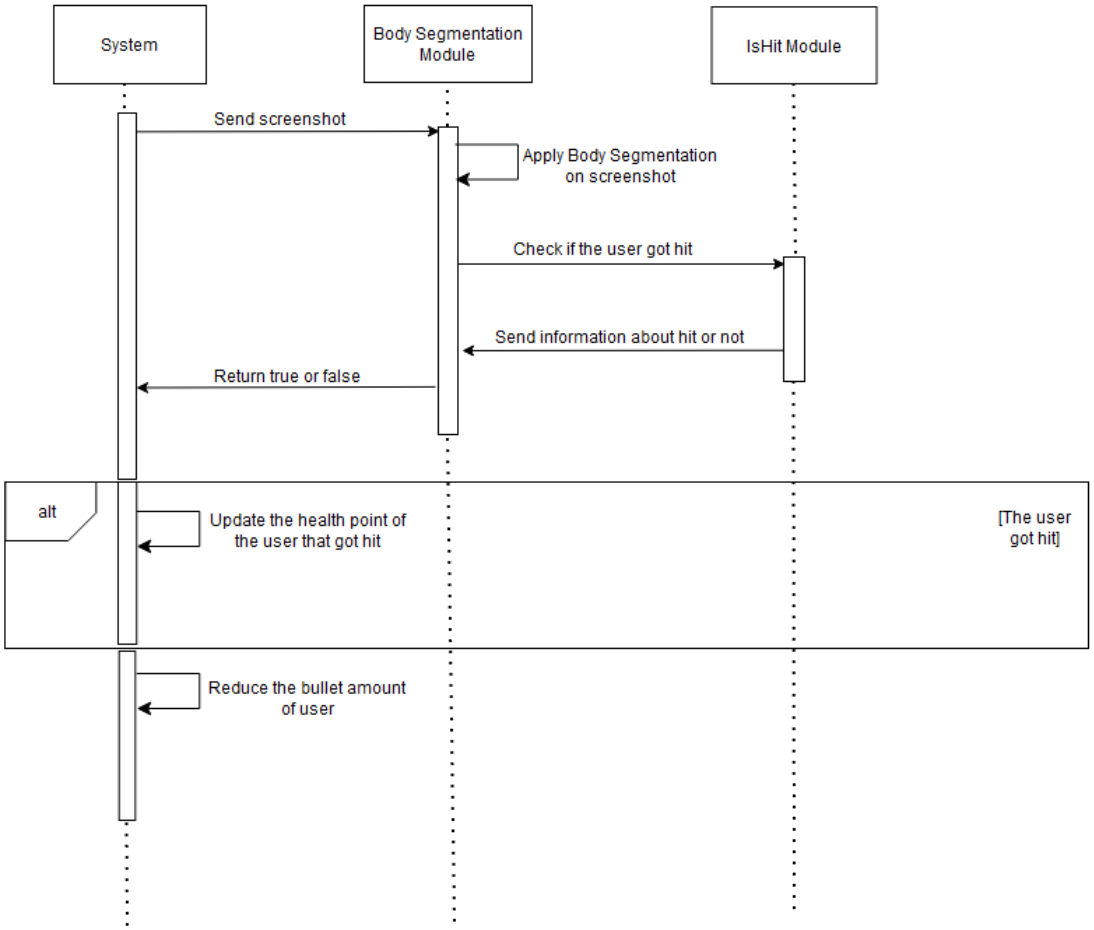
2.4.5 Start Game



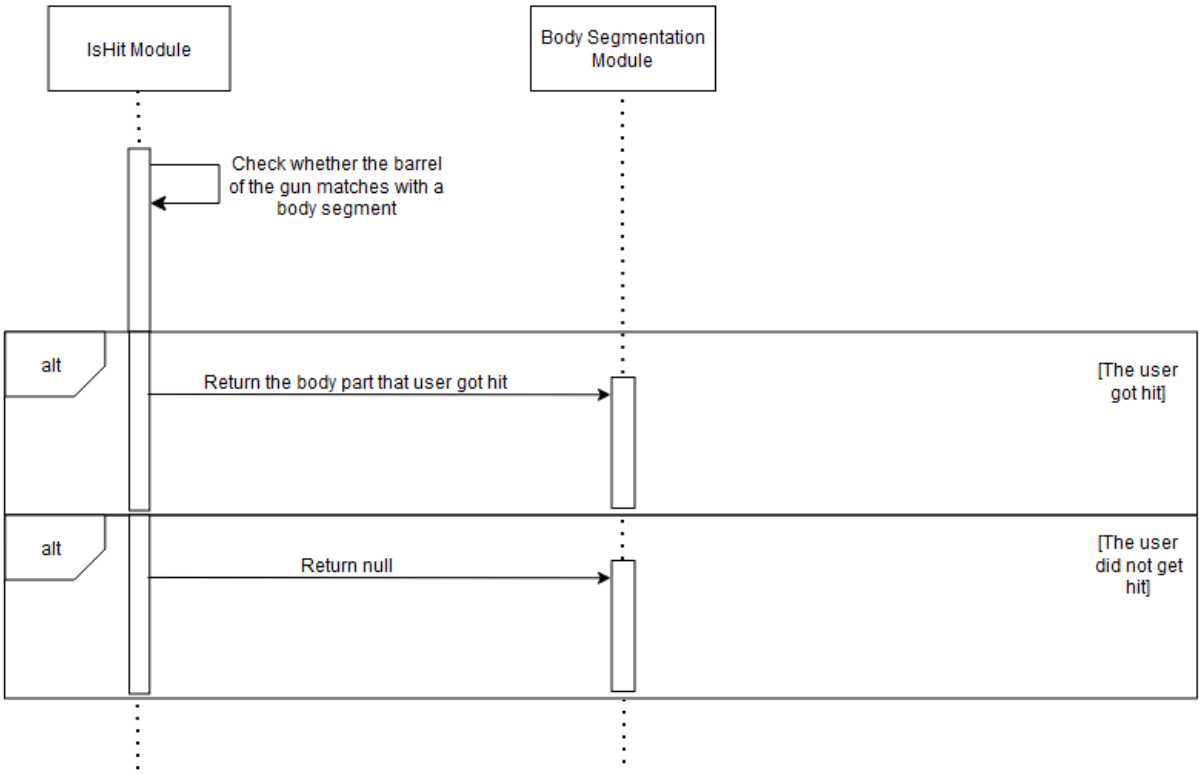
2.4.6 Set Game Rules



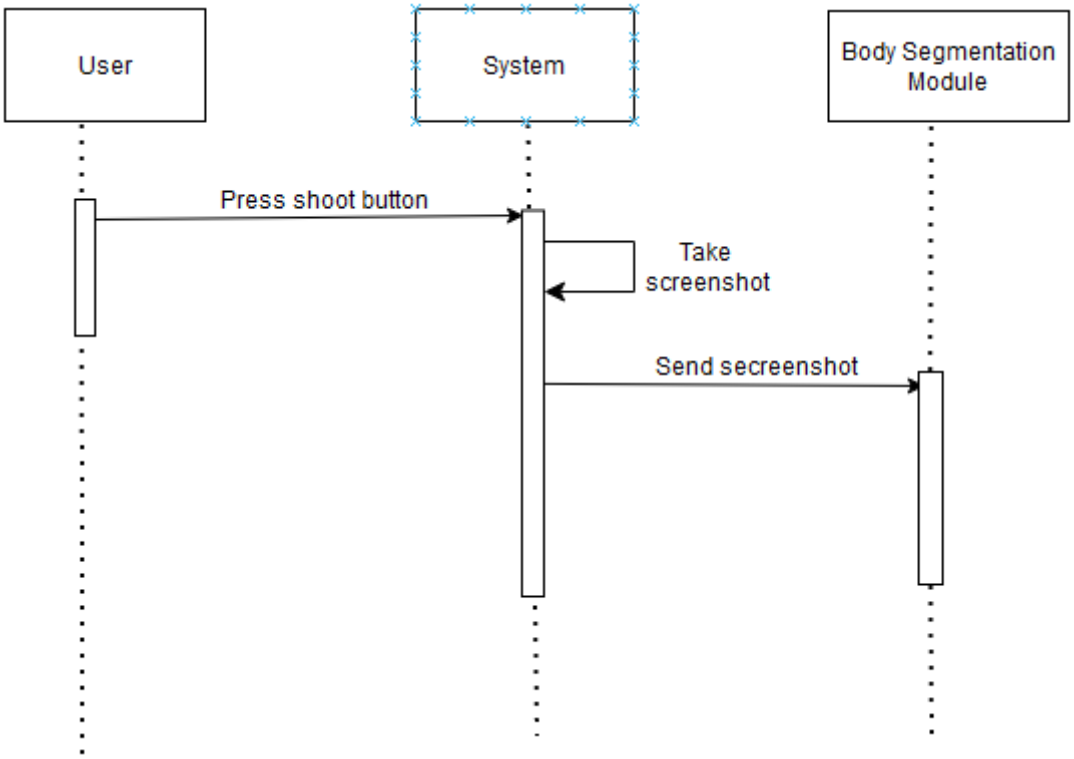
2.4.7 Segment Body



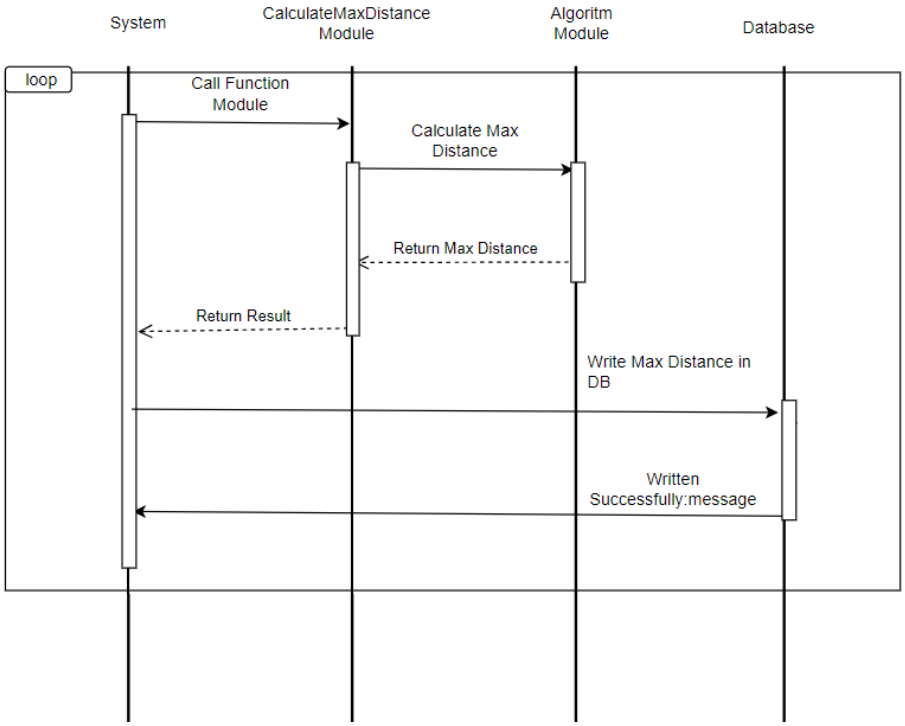
2.4.8 Segment Hit



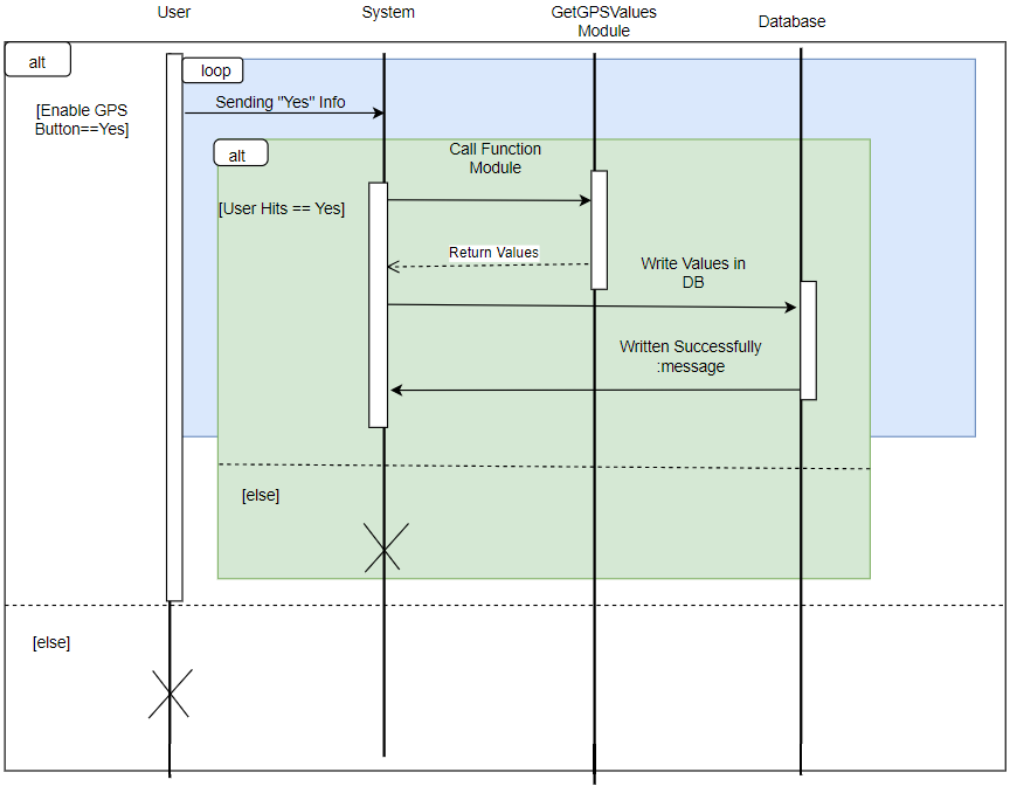
2.4.9 Take Screenshot



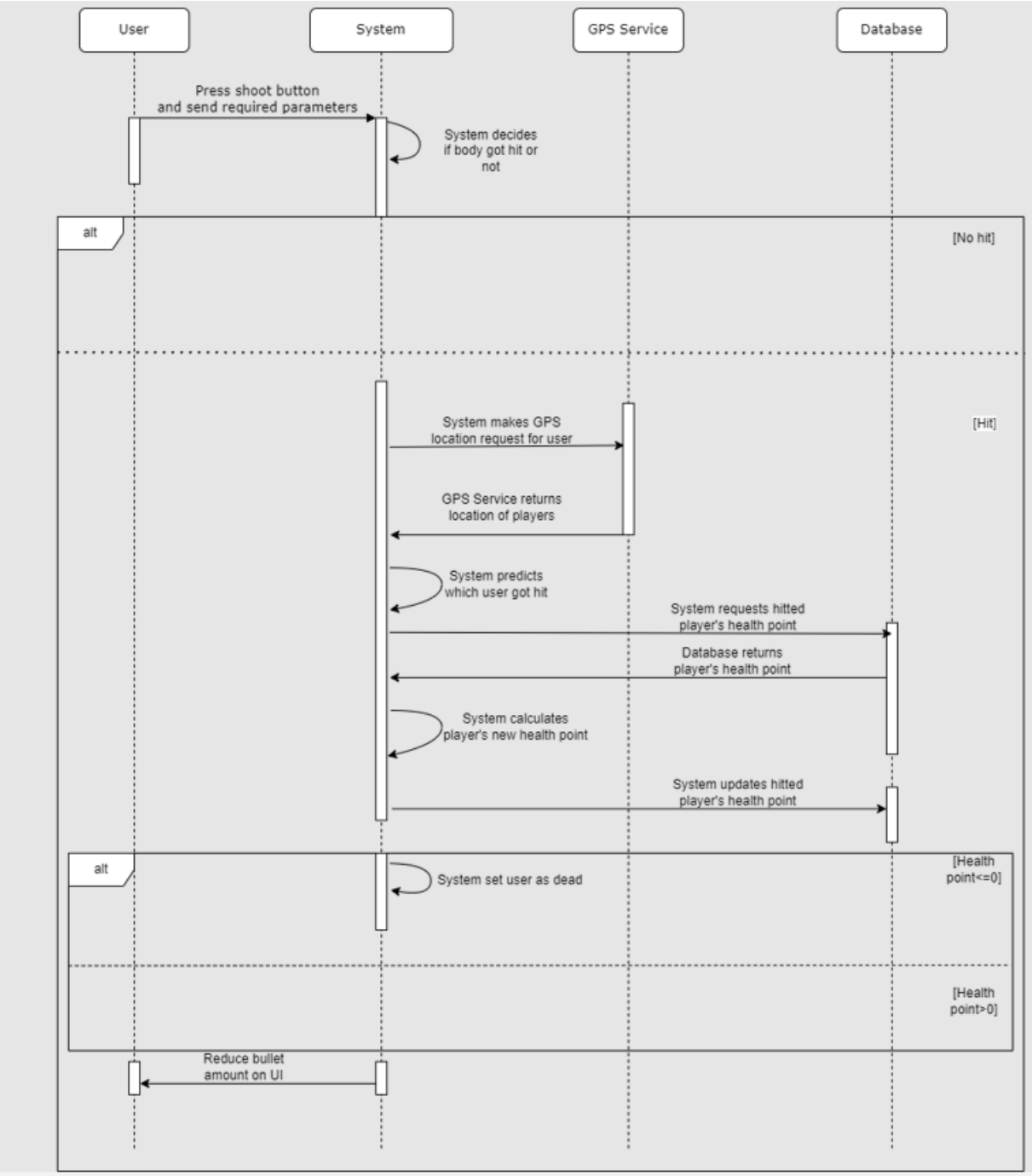
2.4.10 Calculate Max Distance



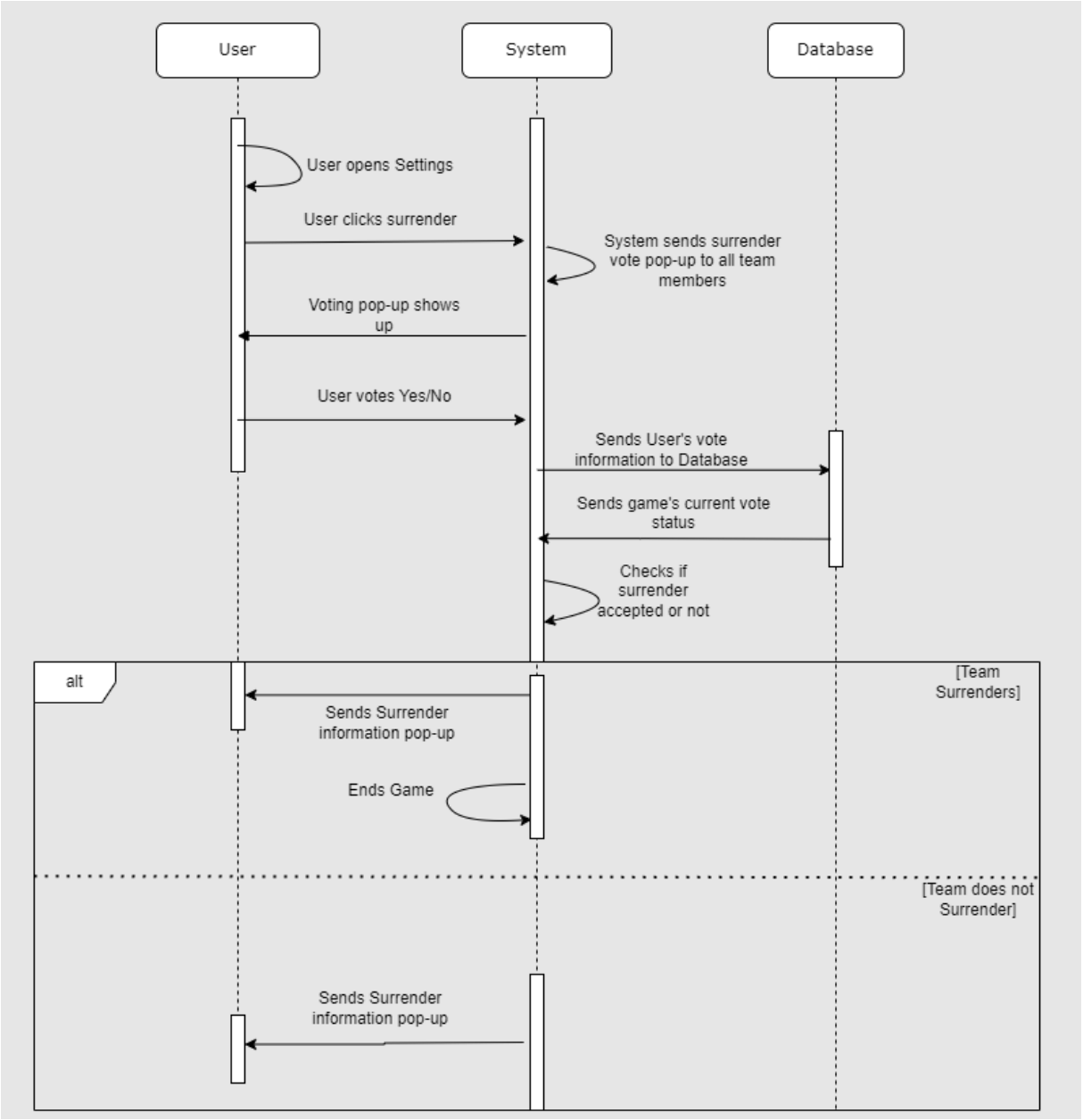
2.4.11 Get GPS Values



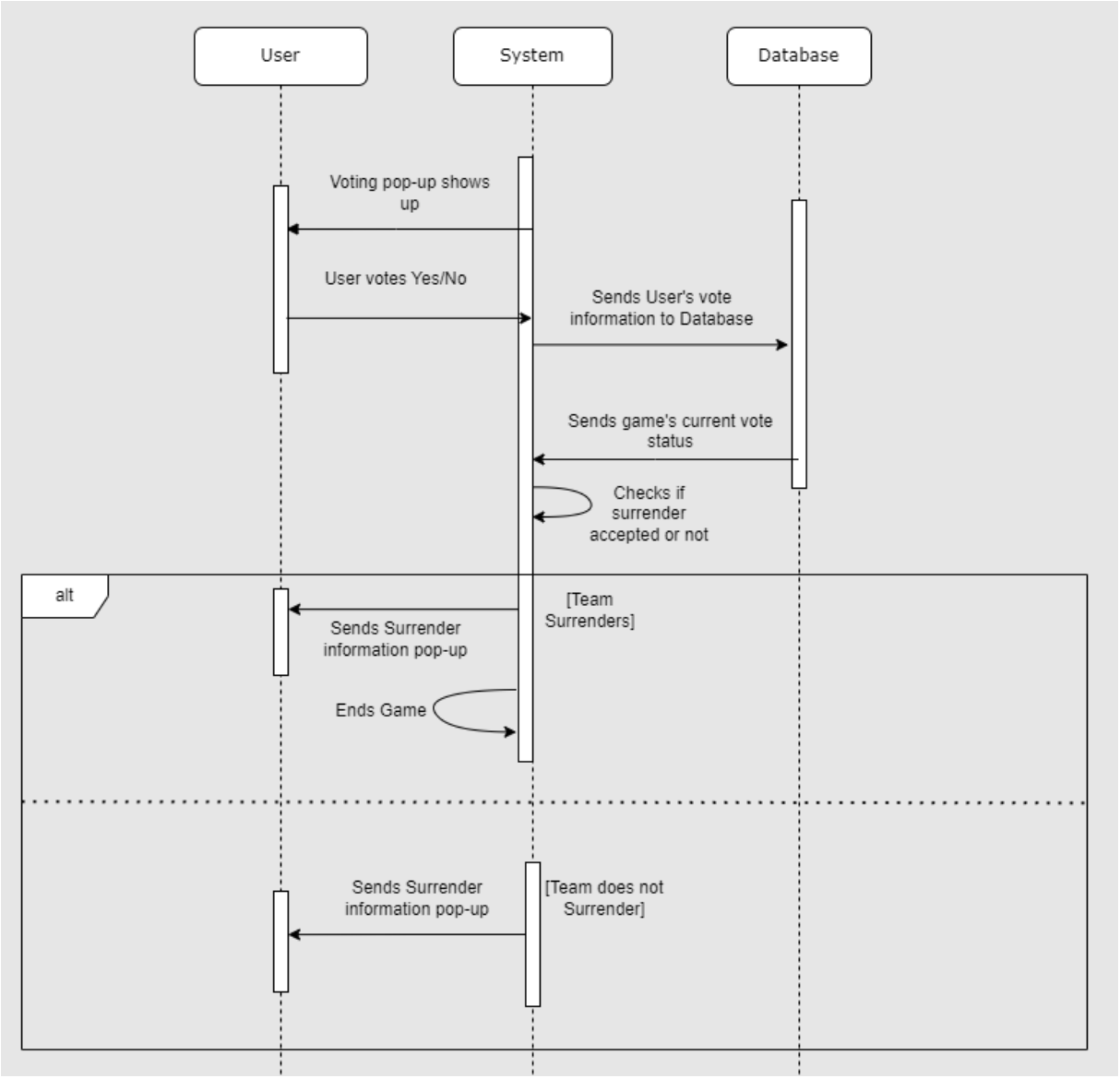
2.4.12 Hit


User
System
GPS Service
Database
Press shoot button
and send required parameters
System decides
if body got hit or
not
alt
[No hit]
[Hit]
System makes GPS
location request for user
GPS Service returns
location of players
System predicts
which user got hit
System requests hitted
player's health point
Database returns
player's health point
System calculates
player's new health point
System updates hitted
player's health point
alt
[Health
point<=0]
System set user as dead
[Health
point>0]
Reduce bullet
amount on UI

2.4.13 Surrender

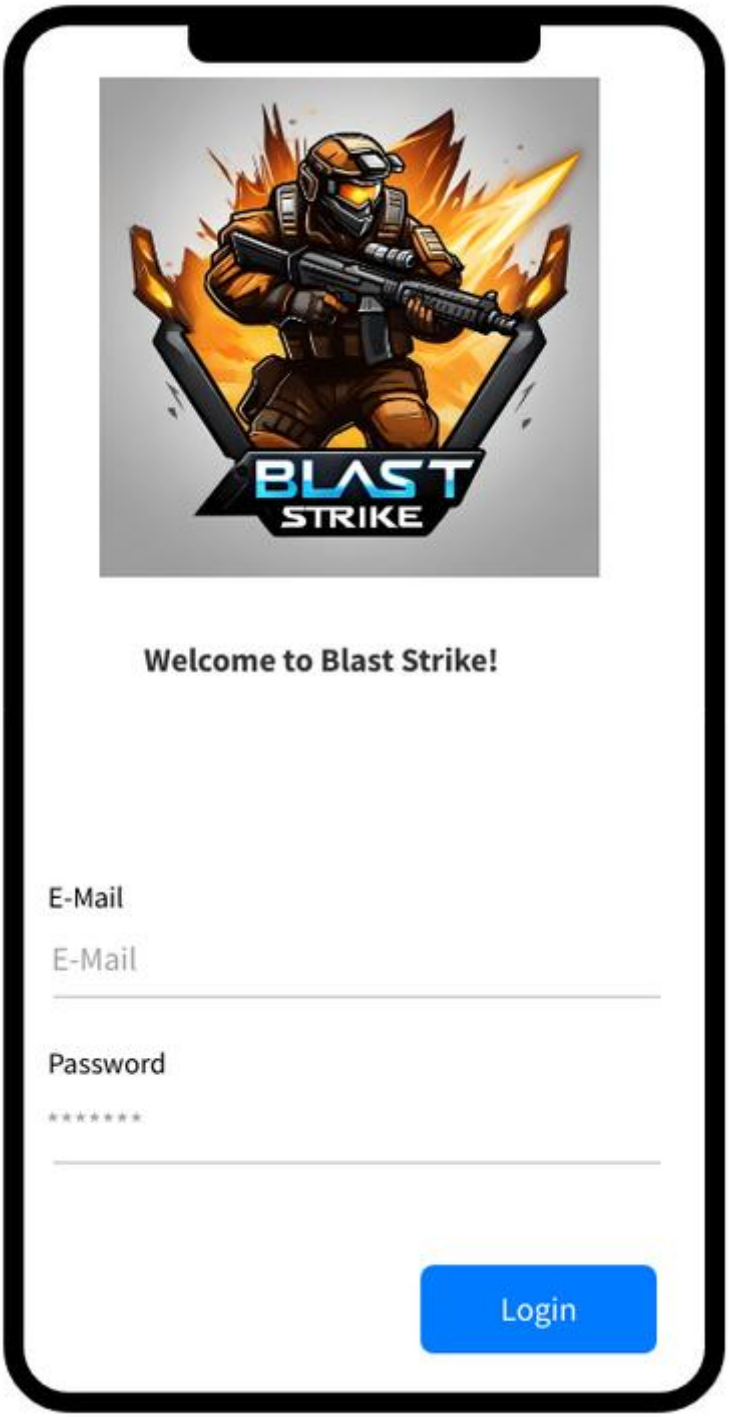


2.4.14 Vote

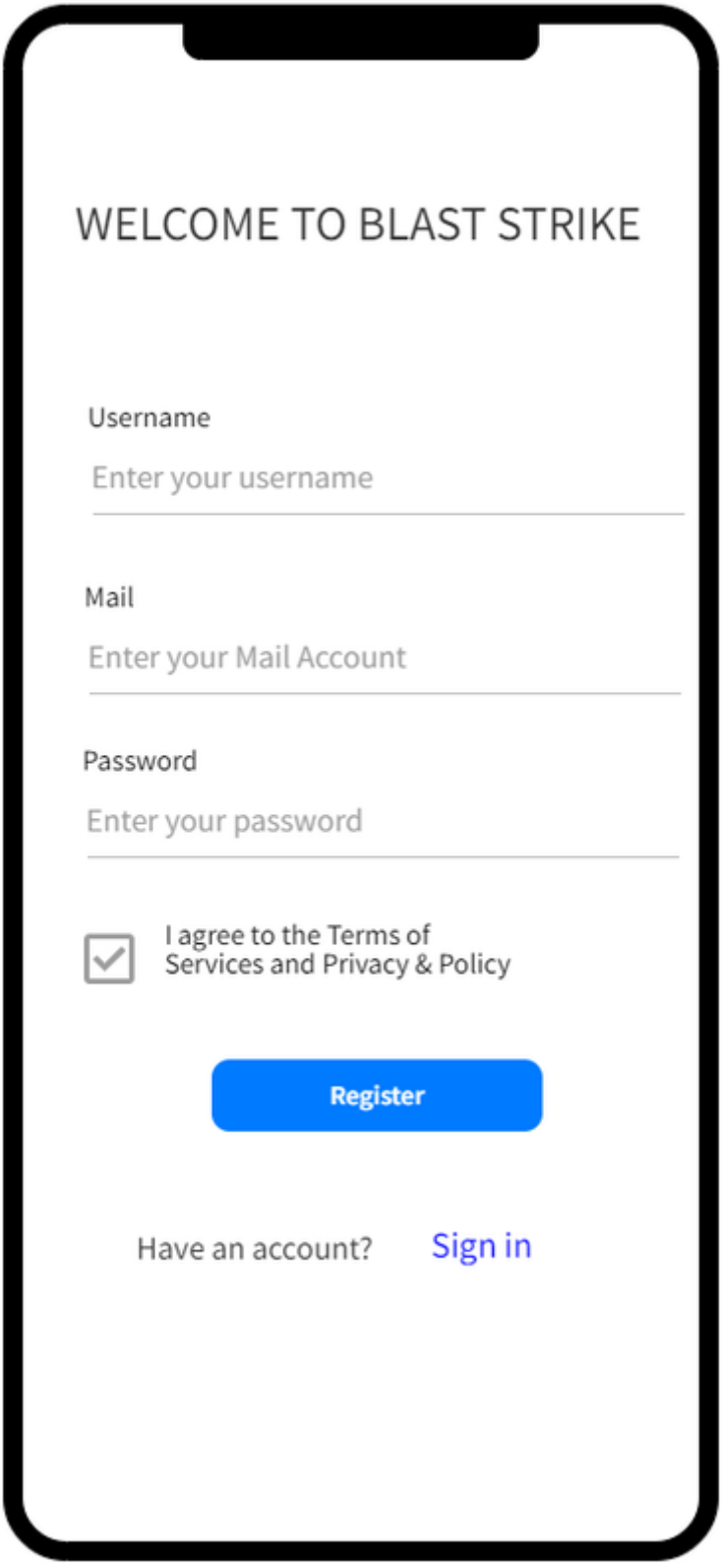

User
System
Database
Voting pop-up shows up
User votes Yes/No
Sends User's vote information to Database
Sends game's current vote status
Checks if surrender accepted or not
alt
[Team Surrenders]
Sends Surrender information pop-up
Ends Game
Sends Surrender information pop-up
[Team does not Surrender]

3. User Interface Design

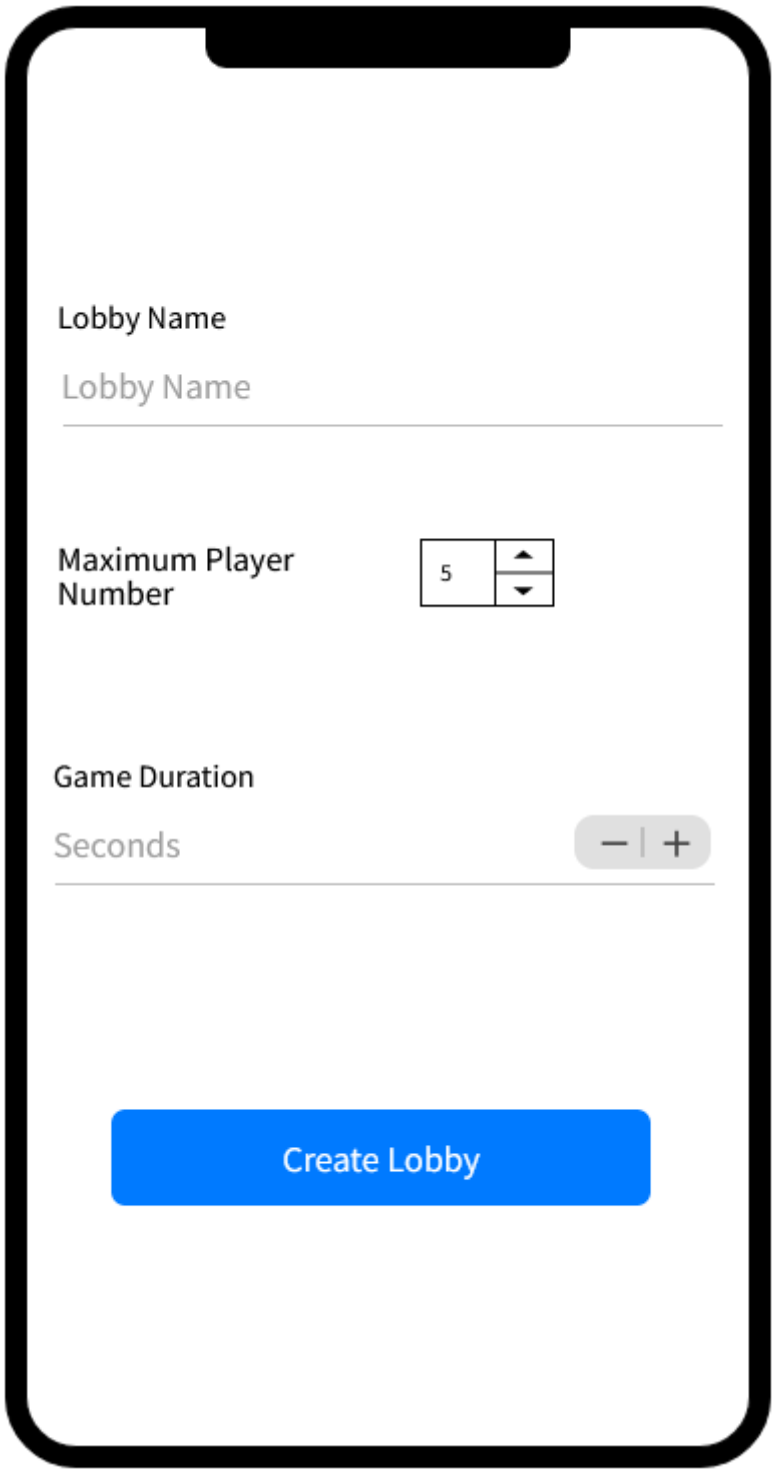
3.1 Login Page



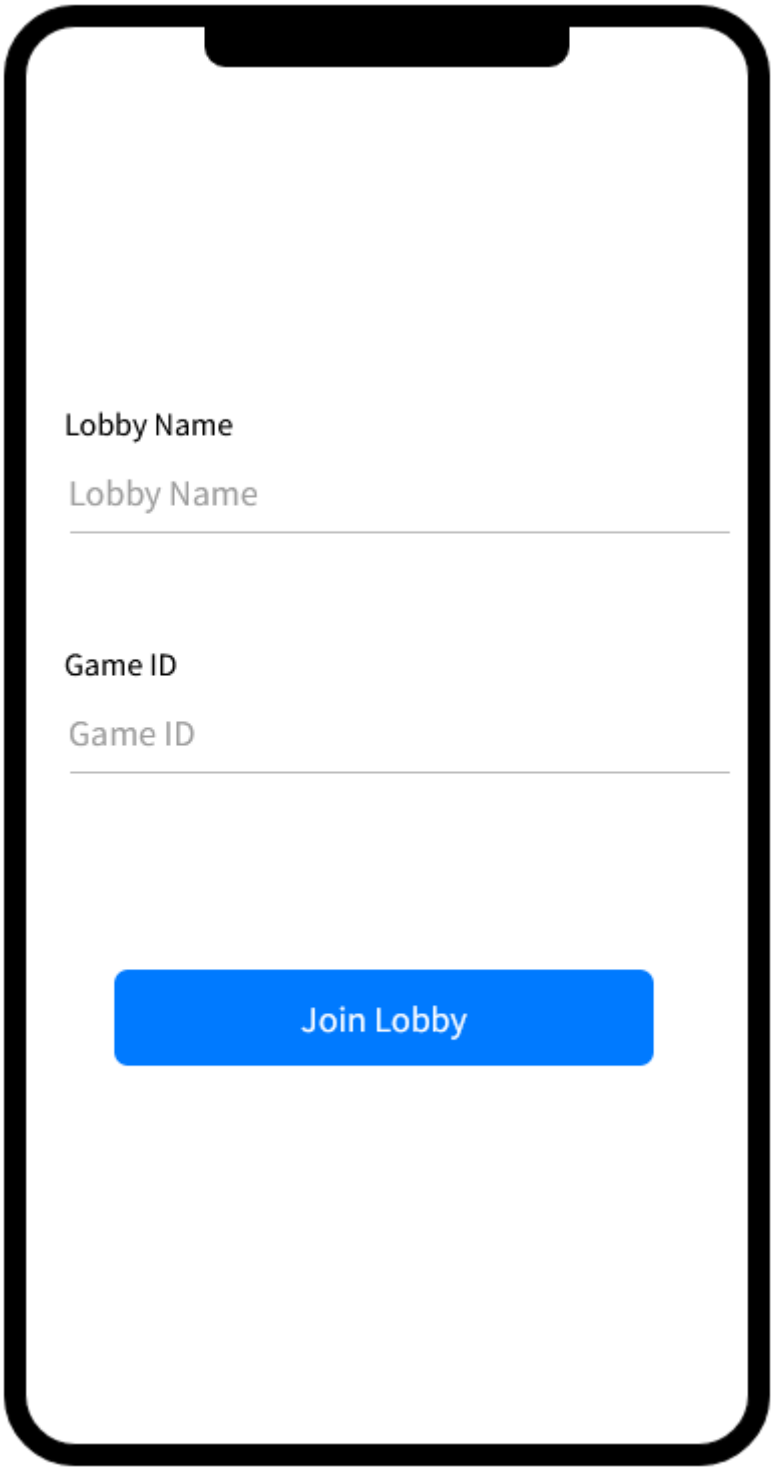
3.2 Register Page



3.3 Create Lobby Page



3.4 Join Lobby



3.5 Lobby Page

Team RED	Team Blue
User 1 #ID1234	User 1 #ID1234
User 2 #ID1234	User 2 #ID1234
User 3 #ID1234	User 3 #ID1234
User 4 #ID1234	User 4 #ID1234

3.6 In-Game Page

3.7 In-Game Options Pop-Up

4. Conclusion

This game project is developed with the goal of bringing the real-world experience and excitement of laser tag/paintball to the mobile gaming platform. At its core, the project aims to provide a laser tag/paintball experience and enhance interaction among players. The minimum feature set of the project includes real-time body segmentation using TensorFlow Lite for instant scene hit detection, player identification based on GPS location and phone orientation, the ability for players to shoot using Bluetooth controllers, and an AMQP-based message queue structure. These features will form the foundational dynamics of the game, integrating real-world interaction into the mobile gaming experience. The project can be expanded during development by adding more features. For example, additional features such as purchasing skins for the on-screen weapon model, using different weapon models, and introducing features to alter in-game dynamics could be considered. This could enhance the long-term appeal of the game and provide players with various options. Flutter are considered as development platforms due to their support for tflite. This ensures that the game can be published on different mobile platforms. This project aims to deliver an innovative experience by combining both physical interaction and mobile gaming, offering players a unique and engaging experience.