MIDDLE EAST TECHNICAL UNIVERSTIY

DEPARTMENT OF COMPUTER ENGINEERING

SOFTWARE DESIGN DESCRIPTION

prepared by

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for project SINCAP

METU - Department of Computer Engineering

CENG 492 Senior Design Project

1.Overview

This design report includes a complete description of Sincap project. This document includes features, functionalities, specifications and explanations about the project which is a design project for the Computer Engineering Design course of the Department of Computer Engineering, Middle East Technical University.

1.1. Scope

The document holds the structural overview of all modules, interfaces, data and module design in order to support design and development process. In the implementation of the process, this document will be a direction for developers.

1.2. Purpose

This document is prepared to describe and visualize the basic architecture of Sincap project. The main purpose of this document is to identify the software system which is designed to meet the requirements of the Software Requirements Specification document.

1.3. Intended Audience

The expected audience for this document is the development team of the software. The team can use the document for reviewing and implementing purposes.

2.Definitions

3.Conceptual Model for Software Design Descriptions

This section includes basic project terms, concepts and context of SDD in which the documentation is prepared. The conceptual model aims to give a better understanding of the project terminology, software life cycle and modules that the project resides on.

3.1. Software Design in Context

This project will be built in two parts, server side and Android application.

In server side, “Sincap” is created in MVT pattern. Model Template View pattern is widely used in our products because of the fact that Django is the framework which meets our needs and requirements in our project. This software product is designed by using object oriented design . We have used Django Web Framework to develop robust and dynamic backed service on our server.

In Android application, Java programming language is used while implementing our Sincap app on mobile phones.OpenGL/ES 2.0 library is used to render an image on the top of preview of camera.Android Studio is used as IDE.

3.2. Software Design Descriptions within Life Cycle

3.2.1. Influences on SDD Preparationc

This document is prepared by considering the opinions of the stakeholders and the SRS document is an important reference to this document.

3.2.2. Influences on Software Life Cycle Products

The agile method is adopted for software development process and the product will reach to final stage after a series of iterations. After each iteration a demo will be performed.

3.2.3. Design Verification and Design Role in Validation

This software design description document is the primary reference for verification and validation of specified requirements indicated in SRS document of Sincap: An Augmented Reality Game. The requirements foe each specific intended use of the product are modeled in the design views part of the document. The verification and validation of the design view models are carried out based on this document. SDD influences test plans and test cases in further stages. The testing process will be handled after the code development.

4.Design

4.1.Introduction

This SDD is written to provide architectural design identification of Sincap: An Augmented Reality Game. This document defines stakeholders, design concerns and viewpoints which specifies different system properties. Additionally, the document consists of design views, overlay and design rationale.

4.2. SDD Identification

Design specifications stated in this document is used in architectural design, system implementation and development phases. This design will be used through the project; in other words, system model defined in this document will be used in each iteration of implementation and development periods. All system and implementation changes will be reflected as an iteration on this document. After initial iterations, the final product will be demonstrated on June 18, 2016.

UML design language will be used for visualising the viewpoints.

4.3. Design Stakeholders and Their Concerns

Flaming Swallow team members and users are main stakeholders of the project. Other stakeholders are project supervisor Assoc. Prof. Dr. Tolga Can, course assistant Dilek Önal.

Targeted end users are young and METU society. The end product will cover all main concerns of end users.

4.4. Design Views

This project will be implemented as two components. These are web server and Android application. Each of these components have their own viewpoints and each viewpoint corresponds to a design view.

In this document; contextual, composition, interface, logical, interaction and state dynamics view will be explained in next sections. Detailed description and diagrams about these views will clarify them. Each view is given with its corresponding viewpoint.

4.5. Design Viewpoints

Context viewpoint

Roles of users and stakeholders are explained in this viewpoint. This viewpoint helps for verification and validation tests when specifying the context of product. Information will flow between its entities and system.

Composition viewpoint

This viewpoint describes interactions between high level modules of system.

Interaction viewpoint

Interaction viewpoint gives the sequence of events in the system.

4.6. Design Elements

All design elements in related viewpoints will be defined and explained inside their subsection in section “5. Design Viewpoints”.

4.7. Design Rationale

This project is planned to be a mobile platform game. There are some games on market that are similar to Sincap they do not offer all the augmented reality aspects Sincap offers.

Important aspects such as maintainability, availability and robustness play crucial role to determine design choices. There is a well defined interface between web server and Android application. This allows these two components to be developed and improved individually. The server is powered by a cloud server to reduce down times to minimum. Android platform is chosen since it is one of the most avaliable mobile platforms in the world. However there are various issues to consider such as different OS versions, phone memory and processing power, different screen sizes, etc. The mobile application design is shaped around these issues.

4.8. Design Languages

In this document, Unified Modeling Language (UML) is used to model system design.

5. Design Viewpoints

5.1. Introduction

With the help of the architectural models, notations, and languages, design viewpoints are used to specify the methods for a system. The design viewpoints and constraints of “Sincap: An Augmented Reality Game” are being realized by using these design viewpoints. Different design viewpoints are given in the following subsections. The design language is UML.

5.2. Context Viewpoint

Actor interactions of “Sincap: An Augmented Reality Game” and boundaries of the system are represented in this section. The relationship between “Sincap: An

Augmented Reality Game" and external systms is shown within the system environment. UML Use Case diagram is used in order to provide the roles of actors.

5.2.1. Design Concerns

"Sincap: An Augmented Reality Game" offers two services to two actors which are user and admin. A user can register and log into the application. User can choose region and mode which are RPG, Treasure Hunt and Time Attack. User can see the scoreboard and also share the scores. User can change application settings.

Admin can log into the system and log out from the system. Admin an also execute SQL queries for database management.

The next two diagrams are Use Case diagrams to show actor interactions.

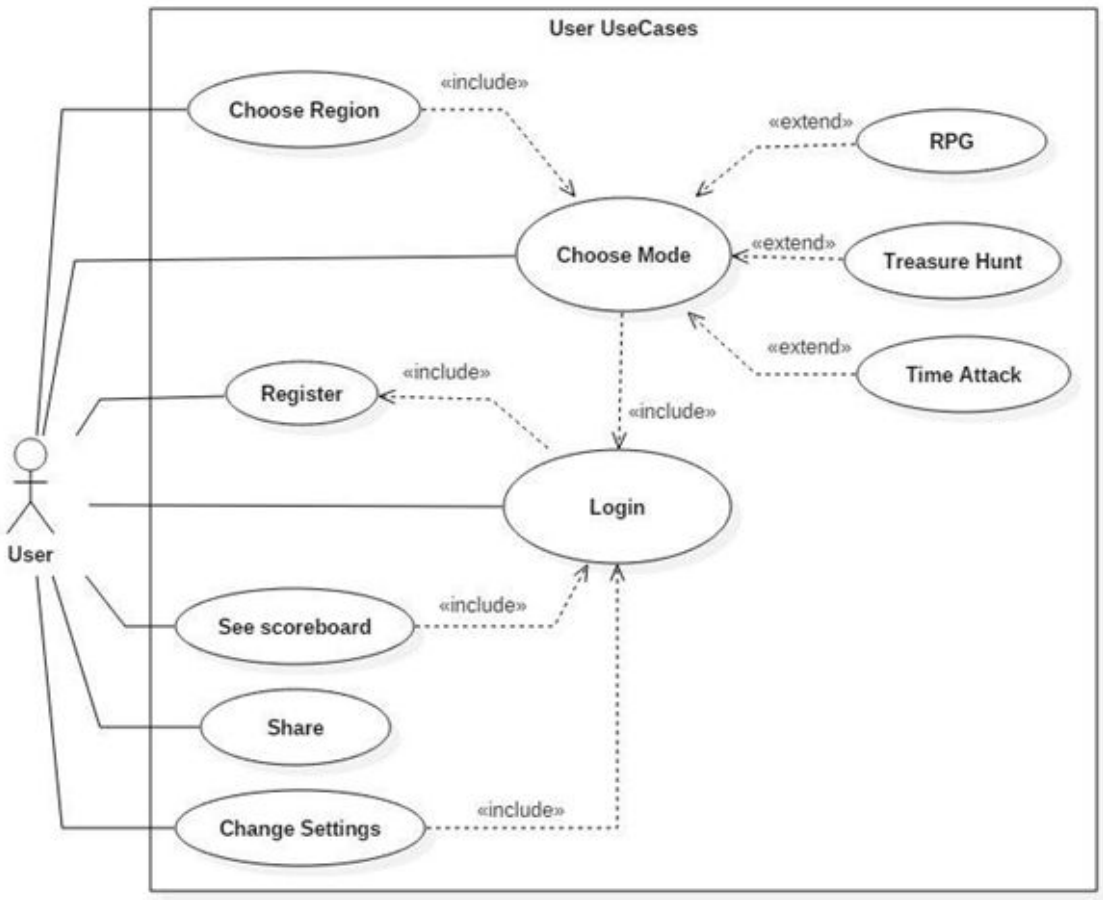


Figure 1. User Use Case Diagram

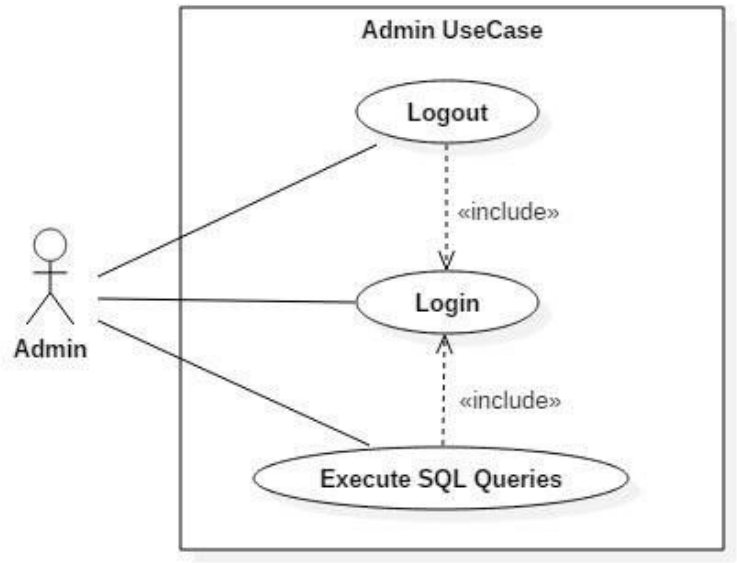


Figure 2. Admin Use Case Diagram

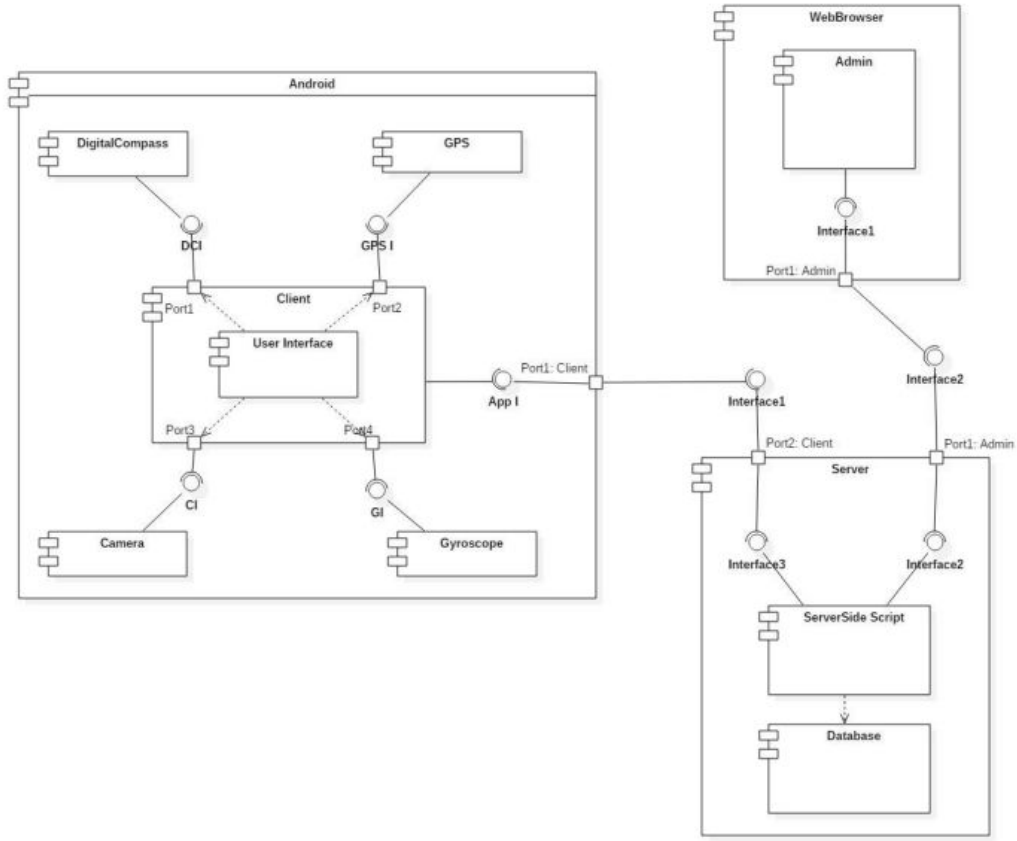
5.3. Composition Viewpoint

In this section, project components and connections between these components are explained in detail. Explanations are enriched with diagrams.

5.3.1. Design Concerns

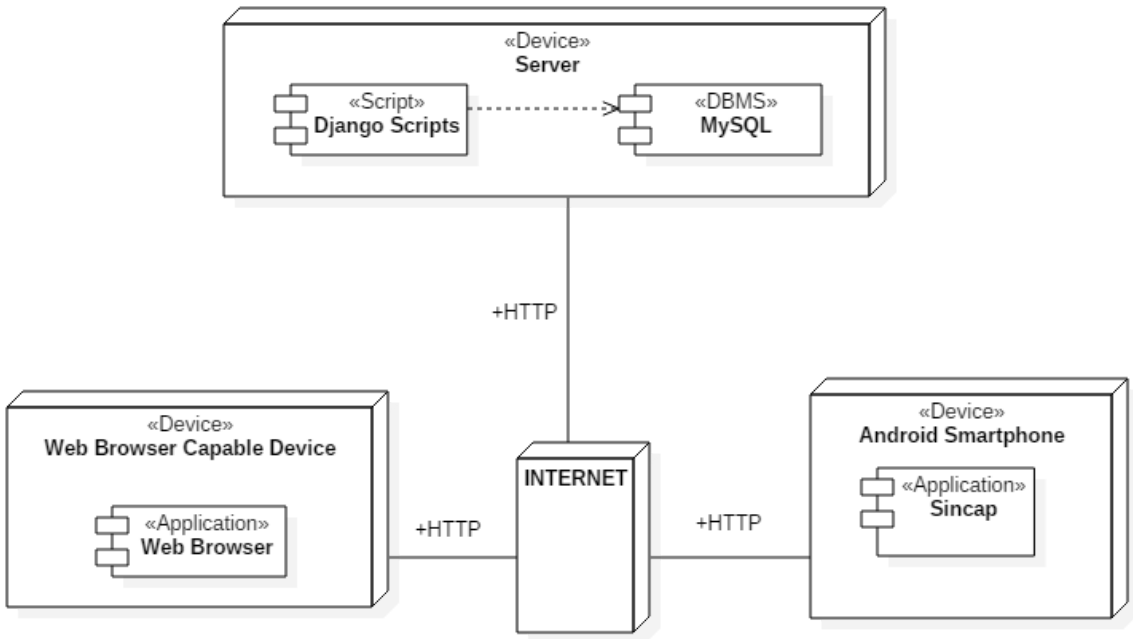
This viewpoint aims to inform both programmers and stakeholders.

Logical system components and connections between these are illustrated in the component diagram below.



Component Diagram

The hardware components and their relations with software components are shown in the deployment diagram below.



Deployment Diagram

5.3.2. Design Elements

Server:

Server will handle the requests coming from mobile application. The server scripts are written with python django framework and data is stored with MySQL database management system in the same server. The requests and responses are received and sent over HTTP.

Android application:

The Android application will be where users log in and play the game. Users download the required files from the server to play the scenario. Therefore the users should have a continuous internet connection to play the game.

Browser:

Admins will log in to an admin control panel. From here admins can perform operations on database tables.

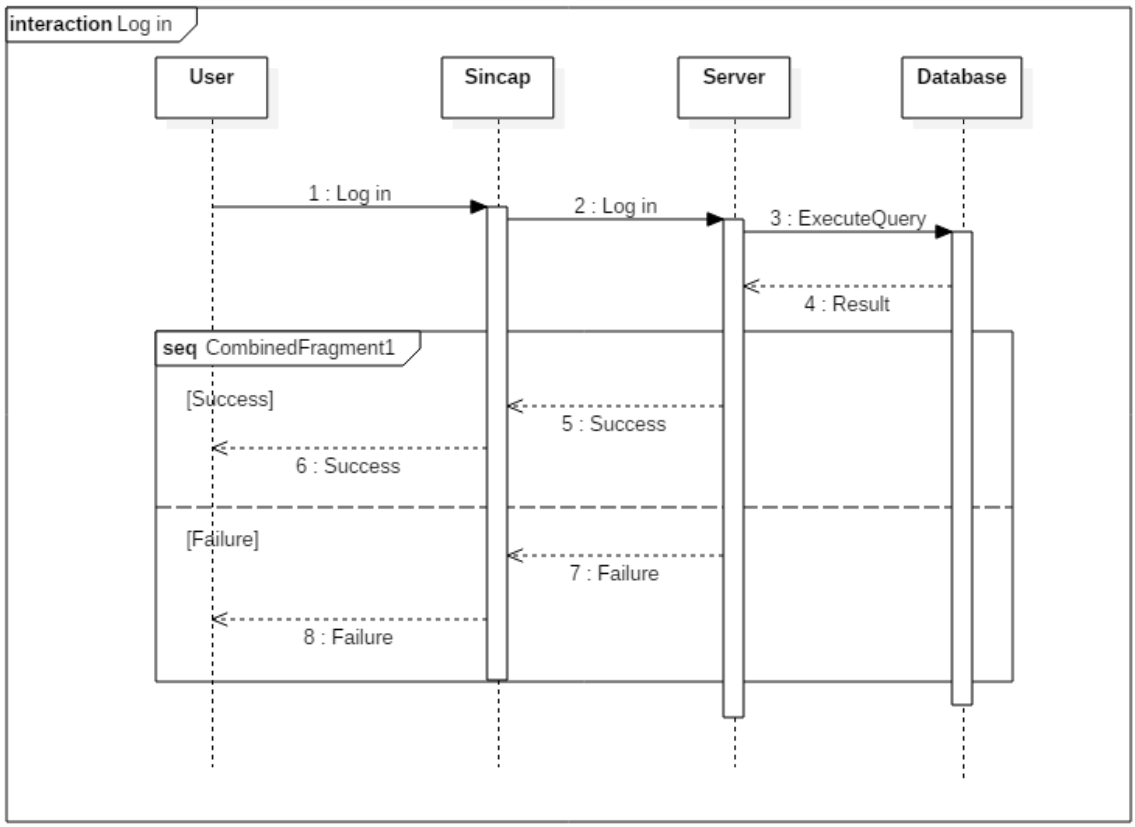
5.4. Interaction Viewpoint

Interaction viewpoint is provided through sequence diagrams to explain the main functionalities of modules of the project.

5.4.1. Design Concerns

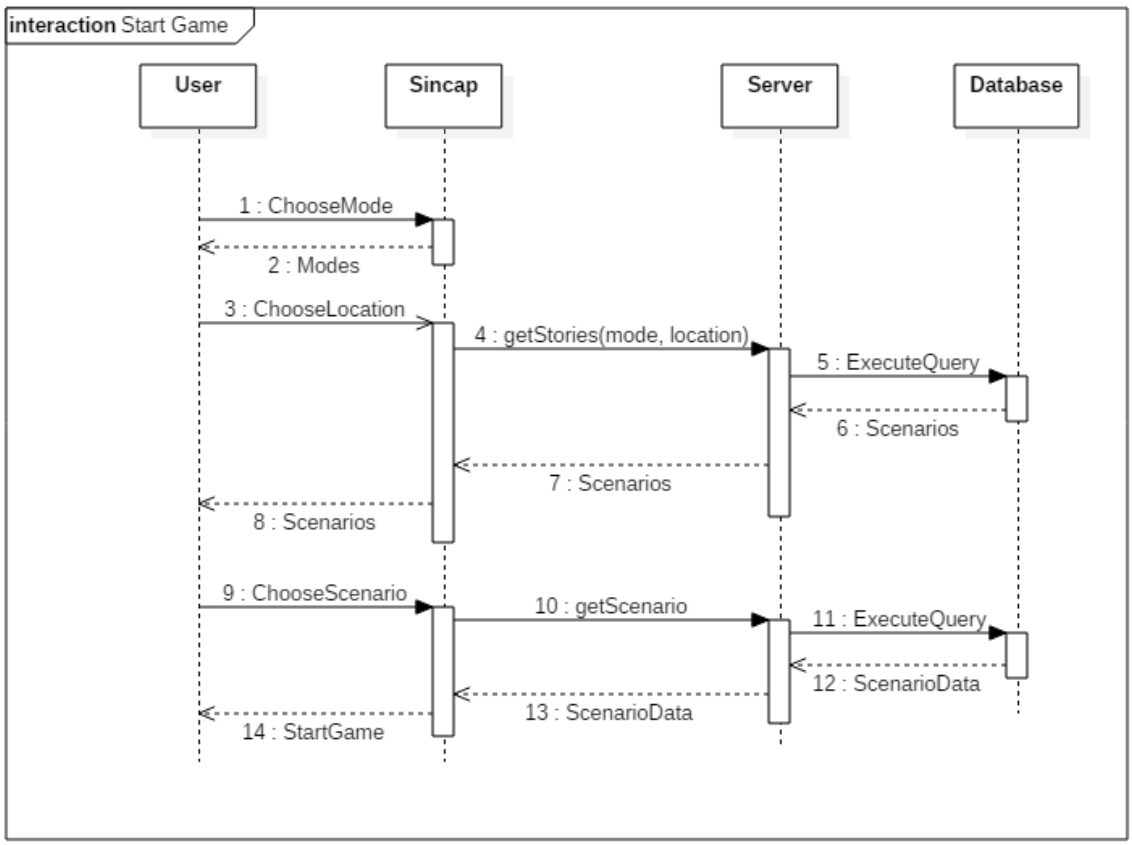
The purpose of this view is to show message flow in the system. The most important interactions are shown below as sequence diagrams.

The following diagram illustrates the log in process. User provides e-mail address and their password. The server checks the information and returns a “Success” or “Failure” message to Android application.



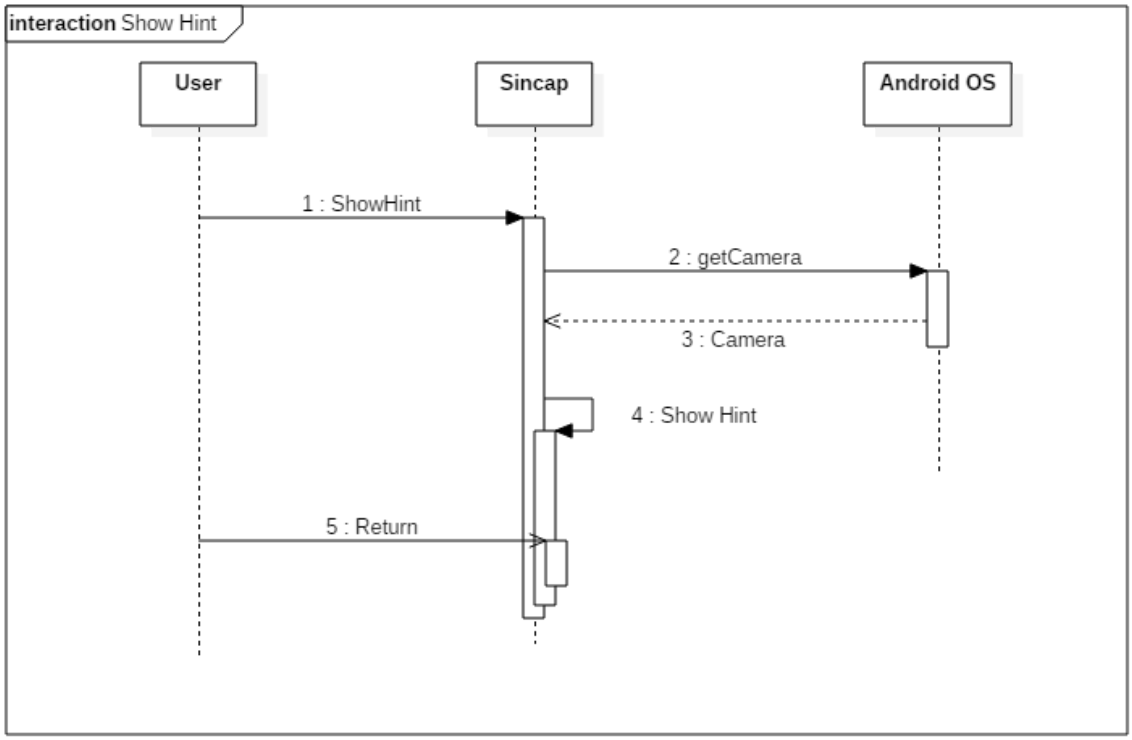
Sequence diagram: Log in

The following sequence diagram illustrates the process of starting a game. User first chooses which mode to play and then their location. The server then sends a list of the available games on that location. User chooses which scenario to play and then the game starts.



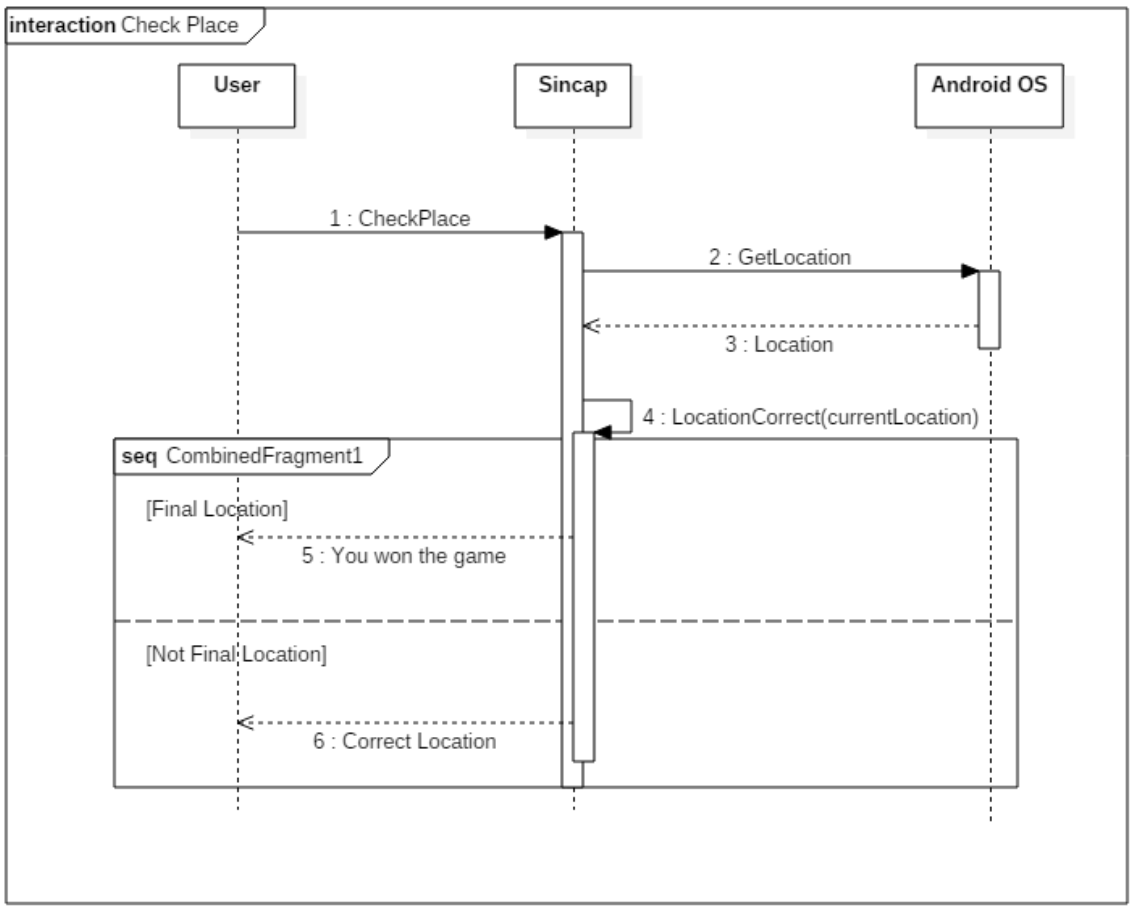
Sequence diagram: Start Game

The following diagram shows the show hint process. User click to “Show Hint” button. The camera comes up and user tries to find the clue. User can exit from this screen by using return button on Android devices.



Sequence diagram: Show Hint

The following sequence diagram shows the process of checking the location. User clicks the “Check Place” button. If the user is in the correct place or an incorrect place, an alert pops up informing user of this. If the loaction is correct and is the last location, a game win alert pops up.



Sequence diagram: Check Place

6. Conclusion

The implementation details, system architecture and design patterns for Sincap: An Augmented Reality Game are explained in this Software Design Description document. Fundamentals of data design, modules, and viewpoints are also included in this document. For illustration purposes UML diagrams are frequently used in the preparation of this document. Finally, with the help of the design viewpoints, design issues are described in a detailed manner.