

# **Software Requirements Document**

## **FIT AR Navigation App (FITARNA)**

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## **1. Introduction**

### **1.1. Purpose**

The purpose of this document is to clearly define the requirements of the FIT AR Navigation App.

### **1.2. Scope**

The scope of the FIT AR Navigation app is to aid students and visitors with navigation and help them become familiar with the buildings of FIT using AR technology.

### **1.3. Definitions, Acronyms, and Abbreviations**

- AR - Augmented reality
- POI - Point of interest
- SDK - Software Development Kit

### **1.4. References**

This requirements document follows the guidelines set in the IEEE Standard for Software Requirement Specifications.

### **1.5. Overview**

This software requirements document serves to offer a comprehensive overview of FITARNA's features and functionality. Section 2 will cover general descriptions, and Section 3 will cover more specific requirements.

## **2. Overall Description**

### **2.1. Product Perspectives**

#### **2.1.1. System Interfaces**

The FITARNA app will run on both Android and iOS smartphones. The mobile device will run the Unity-based app, AR Foundation will handle the AR rendering, and ARKit/ ARCore will handle tracking and localization.

#### **2.1.2. User Interfaces**

Main Menu: The user will see three buttons: Navigation Mode, Tour Mode, and Settings.

Navigation Mode: Presents a dropdown and search bar for finding destinations. After, AR overlays will guide users.

Tour Mode: Will immediately start the AR tour of the Evans Library. Users can click the pause button to suspend the tour.

Pop-ups also act as a user interface. Within pop-ups, users can open links, continue tours, answer quiz questions, and vote in polls by clicking on their AR overlay.

### **2.1.3. Software Interfaces**

The major software interface developers will be interacting with is Unity, as its version control will automate continuous integration. AR Foundation, ARKit, and ARCore tools are made for Unity AR development.

### **2.1.4. Communication Interfaces**

To properly integrate AR features, the app will interact with the phone's camera, gyroscope, and accelerometer. This is to be as accurate as possible with AR overlays and reduce drift.

### **2.1.5. Memory**

The FITARNA is designed to be as lightweight as possible. The main constraint here is that raw AR scans are rather large. To avoid this, the app download will not include the raw maps but rather a couple of AR feature maps, along with JSON-based floor layouts.

### **2.1.6. Operation**

FITARNA supports two modes of operation. In Navigation mode, the user selects a destination, and the system will calculate their route and display it with AR overlays. As the user moves, the path is updated in real time. The route automatically ends at the destination.

In Tour mode, the user is guided towards the next destination of the tour, where they'll learn about the spots through interactive pop-ups. The path to each spot is updated in real time as the user moves. Users can pause tours, and their progress will be saved.

### **2.1.7. Site Adaptation Requirements**

The first site for FITARNA is the Evans Library. After the Evans Library is completed, additional buildings will require new scans, floor plans, written pop-ups, and choreographed tours. The scope of this project is currently limited to just the Evans Library.

## **2.2. Product Functions**

FITARNA is designed to help students and visitors become familiar with the buildings of FIT. We will do this through the following functions:

- AR Navigation: Users can select destinations and follow AR navigation to specific rooms or spaces.
- AR Tour (of Library): Users will be guided through a curated tour of the Evans Library's most important features, learning about their context and history through interactive pop-ups.
- Interactive pop-ups: During navigation and tours, users will come across interactive pop-ups. Users can open links, progress tours, answer quiz questions, and vote in polls by tapping on the AR overlay (on their screen).

## **2.3. User Characteristics**

FITARNA is designed primarily for the convenience of students and visitors.

Students will make up the vast majority of our user pool since the library is mainly used by students. Existing students already familiar with the library will likely use the navigation tool more than the tour mode, but new students will likely be more drawn to the tour than the navigation aspect.

Visitors are also part of the primary users. Visitors include parents of students, prospective students, and other campus guests. Typically, this group of people is at the library to view its features and resources; for this reason, tour mode will be particularly valuable. Though visitors attending events or meetings may still find use in the navigation mode.

A secondary group of users that may find use in FITARNA is staff and faculty. Staff members could find use in the tour mode during their onboarding to help them become familiar with the library. They may also benefit indirectly by recommending the app to students and visitors.

## **2.4. Constraints**

Users of FITARNA must have a smartphone that supports AR functionality. Since phones differ greatly in camera, gyroscope, and accelerometer quality, the app must be optimized to run reliably on mid-range phones.

For FITARNA to exist on mobile app stores, they must comply with app store requirements. For us, this means keeping the app under 200 MB of data.

If the FITARNA is officially deployed by Florida Tech, it would have to comply with the U.S. government Section 508. This means the app would have to be usable for those with certain disabilities.

## **2.5. Assumptions and Dependencies**

For the development of the app, it is assumed that the Evans Library staff will permit scanning of the library, as well as provide accurate floor plans.

For use of the app, it is dependent on the users having a modern smartphone that supports AR functionality.

## **3. Specific Requirements**

### **3.1. External Interface Requirements**

#### **3.1.1. User Interfaces**

On launch, the system shall present users with 3 options: Navigation Mode, Tour Mode, and Settings.

In navigation mode, the app shall present the user with a dropdown and search bar for destination selection. After a selection, the system shall display AR overlays directing the user to their destination.

In tour mode, the system shall immediately begin the AR tour with AR navigation to the first stop. The app shall display AR interactive pop-ups at each stop in the tour, presenting users with historical or contextual information on the stop. Users shall be able to pause and resume tours at their discretion.

Pop-ups shall allow users to open links, continue tours, answer quiz questions, and vote in polls by tapping on them.

#### **3.1.2. Hardware Interfaces**

No external hardware will be required. The app will run on smartphones compatible with AR and use the phone's camera, gyroscope, and accelerometer for tracking and localization.

### **3.1.3. Software Interfaces**

The app will rely on Unity for main development and running. The app will also use AR Foundation for the AR Framework and ARKit and ARCore for the SDKs. FITARNA will also use JSON files for floor layouts.

### **3.1.4. Communication Interfaces**

To properly use AR technology, the FITARNA app must communicate with external services and the phone's sensors.

The system shall communicate with the device's camera, gyroscope, and accelerometer for the AR background, localization, and tracking.

The system shall receive updated map and floor data from cloud storage.

## **3.2. Functional Requirements**

### **3.2.1. Mode 1 - Navigation**

#### **3.2.1.1. Functional Requirement 1.1**

The system shall allow users to select a destination by typing into a search bar or selecting it from a dropdown menu.

#### **3.2.1.2. Functional Requirement 1.2**

The system shall display AR overlays, guiding users to their destination.

#### **3.2.1.3. Functional Requirement 1.3**

The system shall calculate the user's route to the destination and update the route as the user moves in real time.

#### **3.2.1.4. Functional Requirement 1.4**

The system shall allow users to end navigation at any time.

#### **3.2.1.5. Functional Requirement 1.5**

The system shall end navigation automatically when the user reaches the destination.

#### **3.2.1.6. Functional Requirement 1.6**

The system shall allow users to start navigation to any destination from anywhere within the library.

### **3.2.2. Mode 2 - Tours**

#### **3.2.2.1. Functional Requirement 2.1**

The system shall immediately start the tour of the Evans Library when tour mode is selected from the main menu.

#### **3.2.2.2. Functional Requirement 2.2**

The system shall guide the user to each stop of the tour using AR overlays

#### **3.2.2.3. Functional Requirement 2.3**

The system shall update the routes to each stop of the tour in real time as the user moves.

#### **3.2.2.4. Functional Requirement 2.4**

The system shall display AR interactive pop-ups at each stop, requiring users to click through and interact with them to progress tours.

#### **3.2.2.5. Functional Requirement 2.5**

The system shall present users with a quiz question in a pop-up at the end of each stop of the tour. Pop-ups must give immediate feedback.

#### **3.2.2.6. Functional Requirement 2.6**

The system shall allow users to pause and resume tours at their discretion.

### **3.2.3. Mode 3 - Interactive Pop-ups**

#### **3.2.3.1. Functional Requirement 3.1**

The system shall display AR pop-ups around points of interest during both navigation mode and tour mode.

#### **3.2.3.2. Functional Requirement 3.2**

The system shall allow users to tap on pop-ups during tour mode to continue the tour.

#### **3.2.3.3. Functional Requirement 3.3**



The system shall allow users to open links found in pop-ups by tapping on the link.

#### **3.2.3.4. Functional requirement 3.4**

The system shall allow users to answer quiz questions and vote in polls by tapping on their selection. Immediate feedback must be given afterwards.

### **3.3. Performance requirements**

The system shall calculate and display the route to their destination within 4 seconds of the user selecting their destination.

The system shall maintain AR anchor accuracy within 2 feet (under normal conditions).

### **3.4. Design constraints**

Due to a lack of budget, all development and deployment tools must be free.

The system must stay under 200 MB of data.

App must comply with the U.S. government Section 508 if it is to be officially released by FIT.

### **3.5. Software system attributes**

#### **3.5.1. Usability**

The system shall provide an intuitive user interface that requires no external help to understand.

#### **3.5.2. Reliability**

The system shall handle errors gracefully, keep AR overlays within an acceptable range, and keep calculated routes updated consistently.

#### **3.5.3. Maintainability**

The system shall be designed to be easily updated and maintained for future use.