Cpts 484: Software Requirements

WRS Evolution

Requirements Elicitation

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Revision History

Date	Version	Changes	Editor
10/12/2019	1.0	Introduction, first half of all tables, prototype ideas	All team
10/13/2019	1.1	Second half of the tables, added to Introduction, various improvements	All team

[1] Introduction

1.1. Purpose

The purpose of this project is to build a mobile app to aid the blind or otherwise visually impaired with internal navigation of buildings and complexes. There is no doubt that navigating the interiors of large buildings provides a challenge in the blind that sighted people need not worry about. This project aims to provide an easy-to-use, voice-activated solution to overcome the challenge of indoor navigation.

1.2. Scope

For this project we will be creating an Android smartphone application that will assist visually impaired users in navigating indoors. The project needs to be easily accessible to the visually impaired, safely and efficiently guide users through a given municipal building, and have a simple user interface that can be used by caretakers and the visually impaired. We are creating this product to give visually impaired people another way to navigate through buildings that can be used as an alternative or alongside other methods of navigation (guide dog, cane, etc.). The product is limited to the computational power and input capacity of a modern smartphone. The user interface will be simple and clutter-free for maximum ease of use.

1.3. Objectives and Success Criteria

1. *Complete Phase I*
    a. Preliminary Project Plan document describing the project overview, client deliverables and project milestones
    b. WRS document in which issues with the Preliminary Definition are explored, functional and non-functional requirements are defined, and a simple prototype is drawn up.
    c. Presentation depicting the AS-IS and TO-BE scenarios in which we describe fundamental scenarios our app will attempt to solve. Estimate scope creep.
2. *Complete Phase II*
    a. Document objectives will be later determined. The final app will be the end product of this phase.
    b. Implement code based on project documents.

Short-term success will be evaluated on the completion of the project documents and how closely they reflect the client's needs.

Long-term success will be largely evaluated on how well the final product reflects our project documents. This especially applies to the AS-IS and TO-BE presentation scenarios.

1.4. Definitions, Acronyms, and Abbreviations

WRS: World, Requirement, Specification document. Current document.

Functional Requirement: Defines a function of the system, where a function is described as an output for a given set of inputs.

Non-Functional Requirement: Specifies criteria that can be used to gauge the performance of the system.

Domain: Describes the users that will interact with the application in some way.

1.5. Overview

This document outlines the preliminary domain, functional and non-functional requirements, ambiguities with the preliminary project definition, and depict a simple prototype.

[2] Preliminary Definition

2.1. Preliminary Domain

PD_ID	Preliminary Domain Description
PD1	Individuals with impaired vision
PD2	Caretakers of individuals with impaired vision
PD3	Staff members of accessibility departments
PD4	Law enforcement
PD5	Elderly individuals
PD6	Elderly individuals with impaired vision

2.2. Preliminary Functional Requirements

P FR_ ID	Preliminary FR Description
PFR1	Accepting from the user the destination location to go
PFR2	Figuring out the routes to reach each destination
PFR3	Informing the user of the routes to reach the destination
PFR4	Informing the user to walk a certain distance
PFR5	Informing the user to stop at the right place to turn
PFR6	Detecting obstacles and informing the user how to avoid them
PFR7	Placing emergency calls and messages
PFR8	Detecting when the user falls
PFR9	Predict the user's next actions based on the user's schedule and habits

2.3. Preliminary Non-Functional Requirements

PNFR_ ID	Preliminary NFR Description
PNFR1	The system shall help the user safely navigate indoors
PNFR2	The system shall lead the user through the fastest route
PNFR3	The system shall lead the user through the route that the user has defined as most comfortable
PNFR4	The system shall be usable for blind people
PNFR5	The system shall be ubiquitous
PNFR6	The system shall be customizable to every user
PNFR7	The system shall be easily extensible to accommodate for variations in interface, language, definitive needs of the user, new features, new sensors, hardware, etc.

[3]   Issues with the Preliminary Definition Given

3.1. Domain Issues

Domain Issue ID	Domain Issue Description	
DI1	PD_ID	PD1. Individuals with impaired vision
	1. Ambiguous. Are individuals assumed to be completely blind or should the app also be oriented towards those who are also partially blind	
	Option 1	Consider a way to implement the user interface to be able to accommodate both the partially blind and the completely blind
	Option 2	Omit orienting the user interface towards the partially blind and focus on orienting the user interface towards the completely blind
	Choice	Option 2
	Rationale	Option 2 will provide an interface for the completely blind which will also provide a usable interface for the partially blind, though it may not be optimal
DI2	PD2	Caretakers of individuals with impaired vision
	1. Out of scope. Because the app should be oriented towards the visually impaired, assuming a large user base of individuals with good vision greatly expands the requirements for the user interface.	
	Option 1	Ignore the possible user base that would consist of individuals with good vision

	Option 2	Consider implementing a usable user interface for individuals with good vision to help facilitate setting up the app for visually impaired individuals
	Choice	Option 2
	Rationale	Option 2 will provide a small user interface for the assumed user base with good vision that should suffice for setting up the application for the visually impaired.
DI3	PD3	Staff members of Accessibility departments
	1. Out of scope. Like issue 2, the app should be oriented towards the visually impaired. Assuming that staff members of accessibility departments have good vision, accommodating for them greatly expands the requirements for the user interface.	
	Option 1	Ignore the possible user base that would consist of individuals with good vision.
	Option 2	Consider implementing a user interface for the staff members of accessibility departments that would facilitate the use of the app for visually impaired individuals
	Choice	Option 1
	Rationale	Because a smaller user interface will be implemented for individuals with good vision, accommodating staff of accessibility departments will not be included in the final product
DI4	PD4	Law enforcement
	1. Out of scope. Like issues 2 and 3, it is assumed that individuals in law enforcement have good vision and accommodating them greatly expands the requirements for the user interface. Law enforcement is also an inappropriate stakeholder for this project, as the purpose of the final product is simply to facilitate the visually impaired in navigating a given municipal building.	
	Choice	Omit stakeholder
	Rationale	Law enforcement will not be a stakeholder considered in this project.
DI5	PD5	The elderly
	1. Ambiguous. Are elderly individuals assumed to be visually impaired or do they have good vision?	
	Option 1	Consider a way to orient the app towards both the elderly and visually impaired
	Option 2	Omit considering the needs of the elderly and focus on the needs of the visually impaired.
	Choice	Option 2

	Rationale	Considering the elderly as a potential user base for this app greatly expand the requirements for the user interface and as a result the elderly will not be considered as a distinct stakeholder

3.2. Functional Requirements Issues

FR Issue ID	Description	
FRI1	PFR4	Inform the user to walk a certain distance
	1. How will we inform the user the correct distance to walk? Number of steps would be subjective, and estimating distance walked based on a metric such as feet or meters would be difficult	
	Option 1	Assume the distance of steps for each user is relatively the same.
	Option 2	Consider a way for the app to provide distance to the user in a way that has been tailored to each individual user.
	Choice	Option 1
	Rationale	Given the scope of the project, accommodating such a subjective metric would be difficult. Therefore, it is safe to assume that all user steps are roughly the same distance.
Satisfied by	World assumptions	
FRI2	PFR6	Inform the user of the presence of obstacles and how to avoid them
	1. How will the app be able to detect the existence of objects in the vicinity of the user?	
	Option 1	Consider a way, perhaps using a camera or sensor, to input to the app the locations of obstacles so that the app can find a way for the user to avoid them
	Option 2	Omit the requirement that the app must be able to detect and circumvent obstacles
	Choice	Option 3
	Rationale	If the user wants to see the sentence in the form of a picture (or) in the form of sound he/she will have an option at run-time to choose from. This should be able to be adjusted in options as needed (if a user enters a noisy room, they may want to switch from sounds to pictures, for instance).
Satisfied by	PFR6	
FRI3	PFR7	Placing emergency calls and messages
	1. For what need will the application have to perform such an action?	

	Option 1	Implement this requirement anyway as it has been outlined in the given project specification
	Option 2	Omit this feature
	Choice	Option 2
	Rationale	The app will have no way to establish a reason to make an emergency call. If it is assumed that a blind person can use the app, then it should be also assumed that a blind person is capable of making a call themselves, and implementing this feature would make the app more cumbersome to the system than it needs to be
Satisfied by	PFR7	
FRI4	PFR8	Detecting if the user falls
	1. How will the app be able to detect if the user falls?	
	Option 1	Consider a way utilizing smartphone technologies to detect when a user has fallen
	Option 2	Omit this feature
	Choice	Option 2
	Rationale	Gyroscopic features from smartphones could be utilized to accomplish such a thing, but extra steps would need to be taken to distinguish a fall from, for example, the user simply dropping his/her device. This would expand the needs of the user interface and make the application much more cumbersome
Satisfied by	PFR8	
FRI5	PFR9	Predict the user's actions based on habits and schedules
	1. How will this feature be implemented in a project in the duration that has been given?	
	Option 1	Explore ways on using things such as artificial intelligence to create a subsystem in the app that predicts what routes the user may need given their schedules and habits
	Option 2	Omit this feature
	Choice	Option 2
	Rationale	Given the scope of the project, implementing a prediction-based system on selecting apps is not feasible, and will therefore be omitted.
Satisfied by	PFR9	

3.3.   Non-Functional Requirements(NFR) Issues

NFR Issues ID	Description	
NFRI1	PNFR3	The system shall lead the user through the route that the user has defined as most comfortable
	Ambiguous. How will the system quantify how comfortable a route is?	
	Option1	Assume the path to be chosen is the path that will require the lowest number of steps to provide a consistent baseline on choosing routes
	Option2	Consider a way to accept enough input from the user to distinguish what routes are more comfortable than other
	Choice	1
	Rationale	Given the scope of the project, it would be advantageous to first establish a base for how to choose a route, and then perhaps add route preferences in the future
Satisfied by	World assumptions	
NFRI2	PNFR5	The system shall be ubiquitous
	Ambiguous. Ubiquitous is defined as present, appearing, or found everywhere. It would be difficult if not impossible to gauge how 'ubiquitous' a program is.	
	Option1	Omit this non-functional requirement
	Choice	1
	Rationale	Requirements that are difficult/impossible to quantify should not be included as there is no way to know whether the requirement has been fulfilled.
Satisfied by	Omission	

[4]   WRS

4.1. W (World)

4.1.1. Problem

Problem ID	Problem Description	Corresponding Goals
P1	It is difficult for the visually impaired to efficiently navigate municipal buildings	G1
P2	It is difficult for the visually impaired to use visual-based smartphone applications in general	G2, G3
P3	Technology is constantly evolving and may lead to incompatibilities with the app in the future	G4
P4	Some users may not be able to understand English	G5

4.1.2. Goals

Goal ID	Goal Description	Backward Traceability	Forward Traceability
G1	Our app will help the visually impaired navigate municipal buildings	P1	FO1
G2	Our app will inform the user auditorily when to turn to proceed with the route	P2	FO2
G3	Our app will inform the user auditorily how far to travel to proceed with the route	P2	FO3
G4	Our app will be expandable and modular to help alleviate any compatibility issues that may arise in the future	P3	FO4
G5	Our app will be expandable with respects to language.	P4	FO5

4.1.3. Improved Understanding of Domain, Stakeholders, Functional, and Non-Functional Objectives

4.1.3.1.   Improved Domain

Improved Domain ID	Improved Domain Description
ID1	Our app shall provide a useable interface for the visually impaired. All other sub-demographics (Elderly, physically impaired, etc.) will not be considered as individual stakeholder demographics.
ID2	Our app shall also provide a useable interface for caretakers of the visually impaired to help facilitate setup processes. This expands our domain to certain individuals who are not visually impaired but is still small enough to be easily quantified and accommodated for.

4.1.3.2.   Stakeholders

- Visually impaired users
- Caretakers of the visually impaired

4.1.3.3.   Improved Functional Objectives

Based on the above information and our goals, the functional objectives of Blind Buddy are:

Improved FR Objective ID	Objective Description	Alleviates Problems	Achieves Goals
IFRO1	Our app shall provide a solution to help the visually impaired safely navigate a municipal building.	P1	G1
IFRO2	Our app shall be modular and expandable to accommodate future technologies and user bases	P3, P4	G4, G5
IFRO3	Our app shall provide output in auditory form	P2	G2, G3

4.1.3.4.   Improved Non-Functional Objectives

Improved NFR Objective ID	Objective Description	Alleviates Problem	Achieves Goal
INFRO1	The app shall not fail on a regular basis	P1	G1, G2, G3
INFRO2	The output of the app shall be auditorily based	P2	G1, G2, G3
INFRO3	The app shall be expandable	P4	G4
INFRO4	The app shall be modular	P3	G5

4.2. RS (Requirements, Specification)

4.2.1. Functional Requirements

FR ID	Description
FR1	The system will accept from the user the destination location to go
Satisfies Functional Requirement Issue	P1
Satisfies Objectives	IFRO1
FR2	The system shall figure out the routes to reach each destination
Satisfies Functional Requirement Issue	P1
Satisfies Objectives	IFRO1, IFRO2
FR3	The system shall inform the user of the routes to reach the destination
Satisfies Functional Requirement Issue	P2
Satisfies Objectives	IFRO1, IFRO2
FR4	The system shall inform the user to walk a certain distance
Satisfies Functional Requirement Issue	P2
Satisfies Objectives	IFRO1, IFRO2

4.2.2. Non-Functional Requirements

| NFR ID	Nonfunctional Requirement 1
NFR1	The system shall not fail and be usable on a regular basis
NFR2	The system shall output information auditorily
NFR3	The system shall be expandable to accommodate future user bases.
NFR4	The system shall be modular to accommodate future technologies.

4.2.3. Specifications

Functional Specification ID	Functional Requirement	Satisfies requirement
FS1	Accepting from the user the destination location to go	PFR1
FS2	Figuring out the routes to reach each destination	PFR2
FS3	Informing the user of the routes to reach the destination	PFR3
FS4	Informing the user to walk a certain distance	PFR4
FS5	Informing the user to stop at the right place to turn	PFR5

[5]   Preliminary Prototype & User Manual

Simple mockup of the GUI. The GUI will be very basic, as the user only needs to access a few options. We may want to exchange buttons for a navbar at the top of the screen later if that proves to work better.

The user will first input the map of the building. From there he will press the Listen button, where the preprogrammed voice activator already in the phone will listen to the user for a room number. It will speak it aloud to make sure it heard the correct room. The user will press the OK button to confirm. The next screen will display instructions to the screen and read them aloud to the user. There will be a button to go back to the previous screen to enter a new map or room.
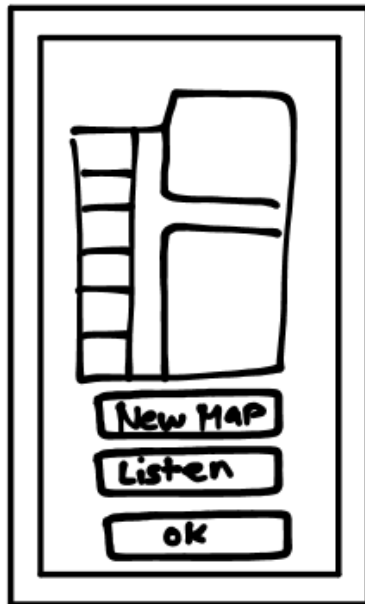
New Map button to insert a new map into app.

Listen button to access voice recorder of phone to listen to the user. User will say the desired room number.

OK button to confirm desired map and room. This button will progress to the next screen below.

App displays instructions to screen. Instructions read aloud to user.

Button in corner of screen that allows user to go back to the previous screen to change the map if desired.

[6]   References

Textbook: K.E. Wiegers and J. Beatty, Software Requirements, 3rd ed., Microsoft Press, 2013. ISBN-13: 978-0735679665.

Team GitLab: https://gitlab.eecs.wsu.edu/cpts484-fall19/484teamrssf