

CptS 484: Software Requirements

WRS Evolution

Requirements Elicitation

By Young&Simple

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Revision History

Date	Version	Changes	Editor
09/08/2018	1.0	added the overall structure	Google docs
09/20/2018	1.1	added World	Google docs
09/25/2018	1.2	added Improved Understanding	Google docs
10/08	2.0	corrected previous typos	Google docs
11/29/2018	2.1	check and update all sections	Google docs

[1] Introduction

1.1.Purpose

Blind people can use the app to locate their position and know the route to their destination; Protect blind users from accidental injury (Give them some voice prompts)

1.2.Scope

This app only supports indoor navigation for blind people.

1.3.Objectives and Success Criteria

1. Blind people can know their location; When blind people choose a destination, the app can give them a route.
2. The app can give blind people some voice prompts(how long is the distance, how many steps are ahead, how long to turn left.....)

1.4.Definitions, Acronyms, and Abbreviations

functional requirement:In software engineering and systems engineering, a functional requirement defines a function of a system or its component, where a function is described as a specification of behavior between outputs and inputs[1]

nonfunctional requirement: In systems engineering and requirements engineering, a non-functional requirement (NFR) is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors.[2]

1.5.Overview

a.In current society, there are various of navigation applications for people to direct the road from one place to other site, but many disabled people do not have access to these convenient softwares in their daily lives, especially blind people.

b.the software is designed for the blind

c.It can identify the structure inside the building; pinpoint the location of the blind inside the building, and advice them how to safely move from a room to another room, even can able to tell users to stop at the right place to turn.

d.It can protect the blind people's safety. preparing emergency calls and contact information after detecting a fall when the software lost people's locations.

e.The other version of the software is designed for building managers to ensure that blind people can get specific changes to the building's interior, such as classroom repairs and damage to stairs, to protect their safety.

f. There are a lot of blind people in the world who need help. Currently there are a lot of access techniques to help them. However, an automated system is more helpful than other access techniques because the blind can use this application to direct way by themselves.

[2] Preliminary Definition

2.1. Preliminary Domain

PD_ID	Preliminary Domain Description
PD1	the application shall work in an indoor environment only
PD2	The primary stakeholder is a blind person. Secondary stakeholders might involve a caretaker (an assistive person) – for example, a family member – who sets the configuration of the app and comes to aid the blind person in case of emergency (getting lost or injured), as well as Staff member in the accessibility department and the police.

2.2. Preliminary Functional Requirements

P FR_ID	Preliminary FR Description
PFR1	Accepting from the user the destination location to go. It might even be able to suggest or confirm a possible destination location, utilizing the user's routine schedule or habit.
PFR2	Figuring out the routes to reach the destination, and informing the user of the options (if there are more than one), and accepting user's preference.
PFR3	Telling the user to walk a distance (e.g., 2 minutes before turning, or walk for 30 steps, etc.)
PFR4	Telling the user to stop at the right place to turn. (GPS signal)
PFR5	Detecting obstacles and telling the user what to do in order to avoid collision.
PFR6	Placing emergency calls and messages, possibly after detecting a fall or when the system has lost its current location.

PFR7	Figuring out what the next action(s) would be, based on the user's schedule or habit, and suggesting/accepting the user's choice.
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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 would feel the most comfortable with.
PNFR4	The system shall be usable for blind people.
PNFR5	The system shall be ubiquitous.
PNFR6	The system shall be customizable to every user: e.g. volume, the interval of instructions, etc.
PNFR7	The system shall be easily extensible to accommodate the following typical variations: variations in interface, language, definitive needs of the user, new features, new sensors and hardware, etc.

[3] Issues with the Preliminary Definition Given

3.1.Domain Issues

Domain Issue ID	Domain Issue Description	
DI1	PD_ID	PD1. the domain is assumed to be indoors, which can consist of multiple floors, each of which possibly hosts multiple classrooms, offices, bathrooms, lounges, elevators, etc.
	1. Ambiguous or incomplete: the domain should also include stairways because there are always emergency exits in a building and our system should consider staircases.	
	Choice	Add staircases
D 2	PD_ID	PD2. The primary stakeholder is a blind person.Secondary stakeholders might involve a caretaker (an assistive person) – for example, a family member – who sets the configuration of the app and

		comes to aid the blind person in case of emergency (getting lost or injured), as well as Staff member in the accessibility department and the police.
	1. Ambiguous or incomplete: The administrators are responsible for the facilities of the building and all the people in the building. Thus the administrators should also be included as a secondary stakeholder. Staff of the console of our system should also be considered as secondary stakeholders because the staff of the console manage data for the system and ensure the smooth functioning of the system.	

3.2.Functional Requirements Issues

FR Issue ID	Description	
FRI1	PFR_ID	Accepting from the user the destination location to go. It might even be able to suggest or confirm a possible destination location, utilizing the user's routine schedule or habit.
	Unsound: " suggest or confirm a possible destination location " is not necessarily going to benefit users in that different people have different preference: although some people can form habit(s)/preference(s) when they intend to move to somewhere, others probably just make random/arbitrary decisions, i.e. they might make different decision each time and thus it would be impossible to learn (in the sense of supervised learning in machine learning) their preference and thus make accurate predictions.	
	Option 1	high frequency destination
	Option 2	predicted destination
	Choice	1
	Rationale	through high frequency destination, can predict user's destination with a higher probability.
Satisfied by	FR1	

3.3.Non-Functional Requirements(NFR) Issues

NFR Issues ID	Description	
NFR1	PNFR_ID	PNFR1. The system shall help the user safely navigate indoors.
	Ambiguous or incomplete: this app should give the users choices of routes, such as a route with shortest distance, a route may spend least time, a way is safe(few steps) and a route which possess few visitors flow rate.	
	Option1	shortest
	Option2	fastest
	Option3	safest
	Option4	less visitors flow rate
	Choice	1+2+3+4
	Rationale	we give the users different choices so that they can use the app conveniently in different cases.
Satisfied by		

NFR Issues ID	Description	
NFR12	PNFR_ID	PNFR2. The system shall be ubiquitous
	Incomplete: The system should be used ubiquitously for blind people, which means we should reduce the cost and expand the use area around the world.	
	Option1	optimize the software
	Choice	1

	Rationale	Using ubiquitously for blind is the main point for a successful application.
Satisfied by		

NFR Issues ID	Description	
NFR13	PNFR_ID	PNFR3: The system shall lead the user through the route that the user would feel the most comfortable with.
	<p>Incomplete: the preliminary requirement didn't concern which routes should be offered to users</p> <p>The app should possess a simple interface which can help users operate it easily. It should also provide voice control and language choices so that people who come from different countries can use it conveniently.</p>	
	Option1	use ASR
	Option2	simplify the interface
	Choice	1+2
	Rationale	both of them are essential for blind people to control the app.
Satisfied by		

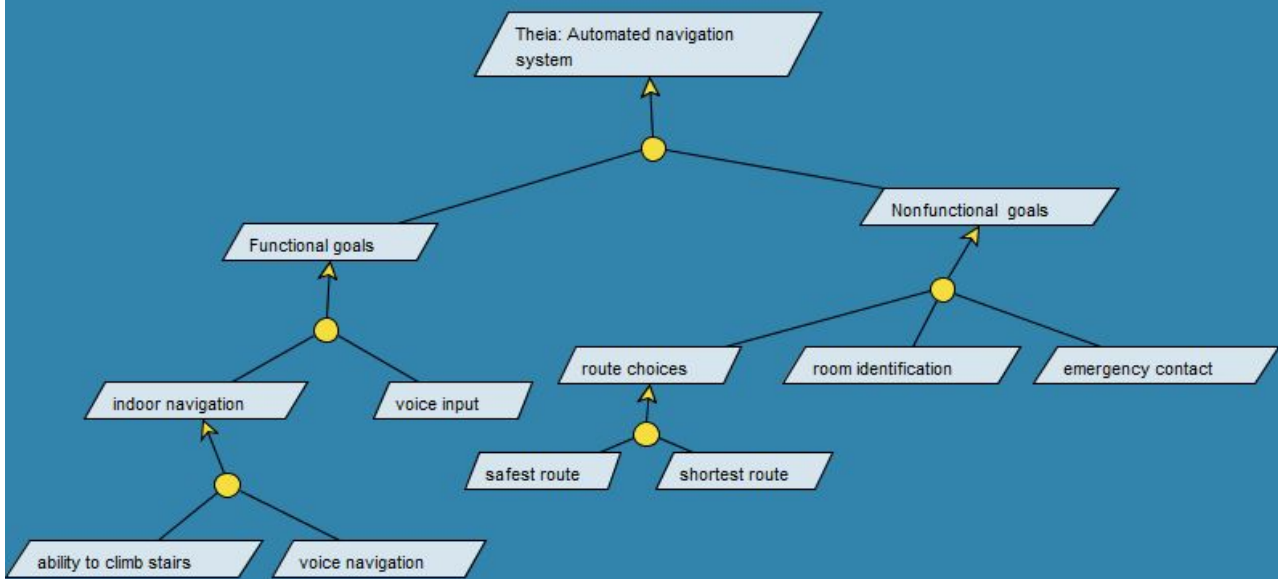
[4] WRS

4.1.W

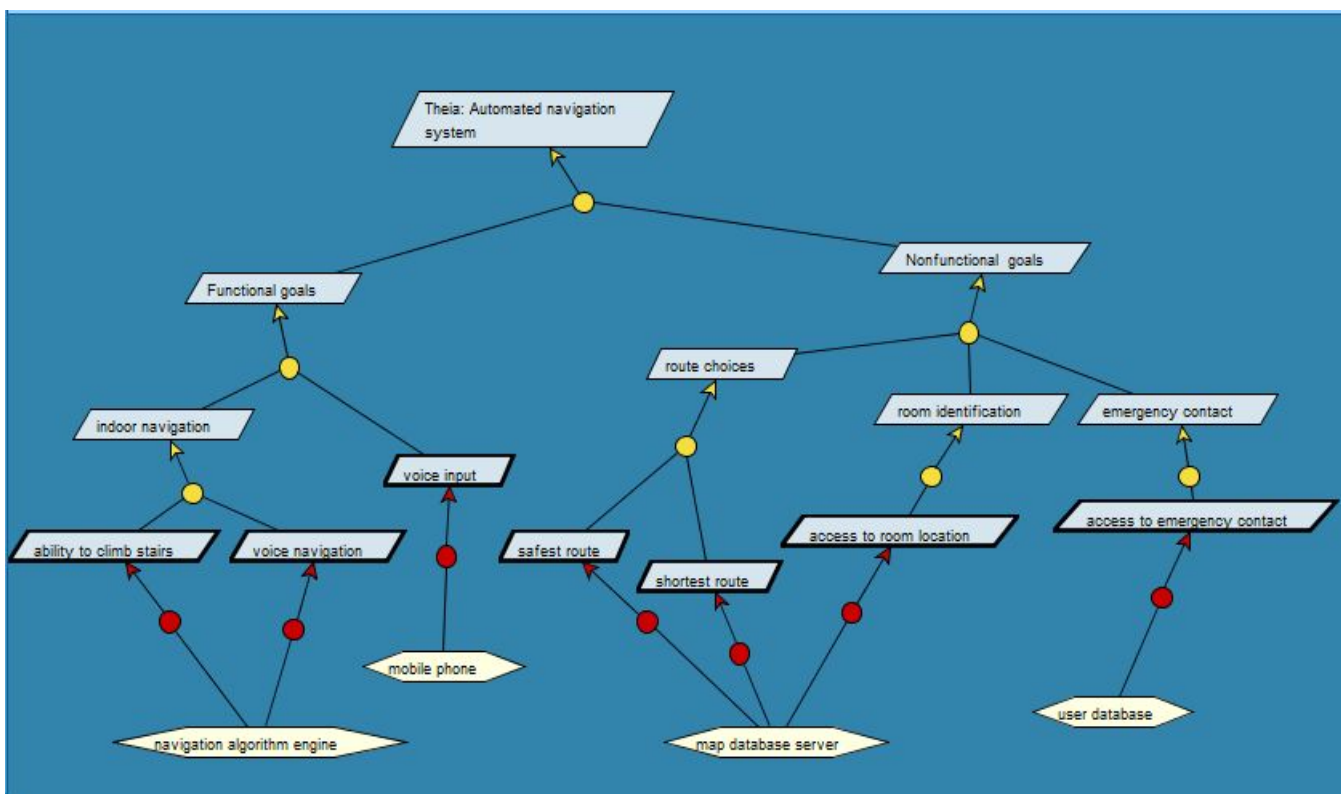
4.1.1. Problem

Problem ID	Problem Description	Corresponding Goals
P1	The site of obstacles always change in the building, so it is difficult to timely upload the accuracy of obstacles.	G1
P2	It is difficult to determine the position of moving obstacles and people.	G1
P3	The strength of sound, interference from surrounding sound, and the pronunciation all effect the accuracy of voice command.	G3
P4	How to determine if a accident has occurred, and how to contact related users and related institution, such as the nearest hospital, as soon as possible.	G5

4.1.2. Goals Model



Responsibility Model:



Goal ID	Goal Description
G1	Survey system should detect obstacles within 10 meters.
G2	Voice prompt should be 3~5s earlier.
G3	The app can accurately identify users' voice commands.
G4	When blind people use the app, their family members or guardians can know their location.
G5	When the users encounter some problems or accidents, they can contact their family members or guardians quickly.

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	The domain is indoors and it include stairways

4.1.3.2. Stakeholders

Primary stakeholder: the blind

Secondary stakeholder: caretakers who sets the configuration of the app and comes to aid the blind person in case of emergency (getting lost or injured); staff member in the accessibility department and the police; the administrators responsible for the facilities of the building and all the people in the building; staff of the console of the system.

4.1.3.3. Improved Functional Objectives

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

Improved FR Objective ID	Objective Description	Alleviates Problems	Achieves Goals
IFRO1	Accepting from the user the destination location to go. It might even be able to suggest or confirm a possible destination location, utilizing the user's routine schedule or habit. However, users' safety are prioritized first and the choices should be acceptable.	P1	G1, G4

4.1.3.4. Improved Non-Functional Objectives

Improved NFR Objective ID	Objective Description	Alleviates Problem	Achieve s Goal
INFRO1	In order to safely navigate the users, this app should give the users choices of routes, such as a route with shortest distance,a route may spend least time, a way is safe(few steps) and a route which possess few visitors flow rate.	P1,P4	G2
INFRO2	The system should be used ubiquitously for blind people in the sense that reduced cost and expanded use area of use around the world are achievable.	P2,P3	G1,G3
INFRO3	The app should possess a simple interface which can help users operate it easily. It should also provide voice control and language choices so that people who come from different countries can use it conveniently.	P1,P2,	G1

4.2.RS

4.2.1. Functional Requirements

FR ID	Description
FR1	Effective input of the destination from the user
Satisfies Functional Requirement Issue	FRI1
Satisfies Objectives	FO1, FO2, FO3

FR ID	Description
FR2	Figuring out the routes to reach the destination, and informing the user of the options by sound (if there are more than one), and accepting user's preference under the condition that user's safety is ensured first..
Satisfies Functional Requirement Issue	FRI2
Satisfies Objectives	FO1, FO2, FO3

FR ID	Description
FR3	Telling the user to walk a distance (e.g., 2 minutes before turning, or walk for 30 steps, etc.)
Satisfies Functional Requirement Issue	FR 3
Satisfies Objectives	FO3

FR ID	Description
FR4	Telling the user to stop at the right place to turn. (GPS

	signal)
Satisfies Functional Requirement Issue	FR 2
Satisfies Objectives	FO2

FR ID	Description
FR5	Detecting obstacles and telling the user what to do in order to avoid collision.
Satisfies Functional Requirement Issue	FR2
Satisfies Objectives	FO3

FR ID	Description
FR6	Placing emergency calls and messages, possibly after detecting a fall or when the system has lost its current location.
Satisfies Functional Requirement Issue	FR1
Satisfies Objectives	FO3

FR ID	Description
FR7	Figuring out what the next action(s) would be, based on the user's schedule or habit, and suggesting/accepting the user's choice.
Satisfies Functional Requirement Issue	FR2
Satisfies Objectives	FO3

4.2.2. Non-Functional Requirements

NFR ID	Nonfunctional Requirement 1
NFR1	The system shall provide choices of routes, such as shortest route, fastest route, and etc, for users to help users safely navigate indoors .
Satisfies Nonfunctional Requirement Issue	NFRI1
Satisfies Non-functional Objective	NFO2

NFR ID	Nonfunctional Requirement 2
NFR2	The system shall be usable for blind people.
Satisfies Nonfunctional Requirement Issue	NFRI1
Satisfies Non-functional Objective	NFO2

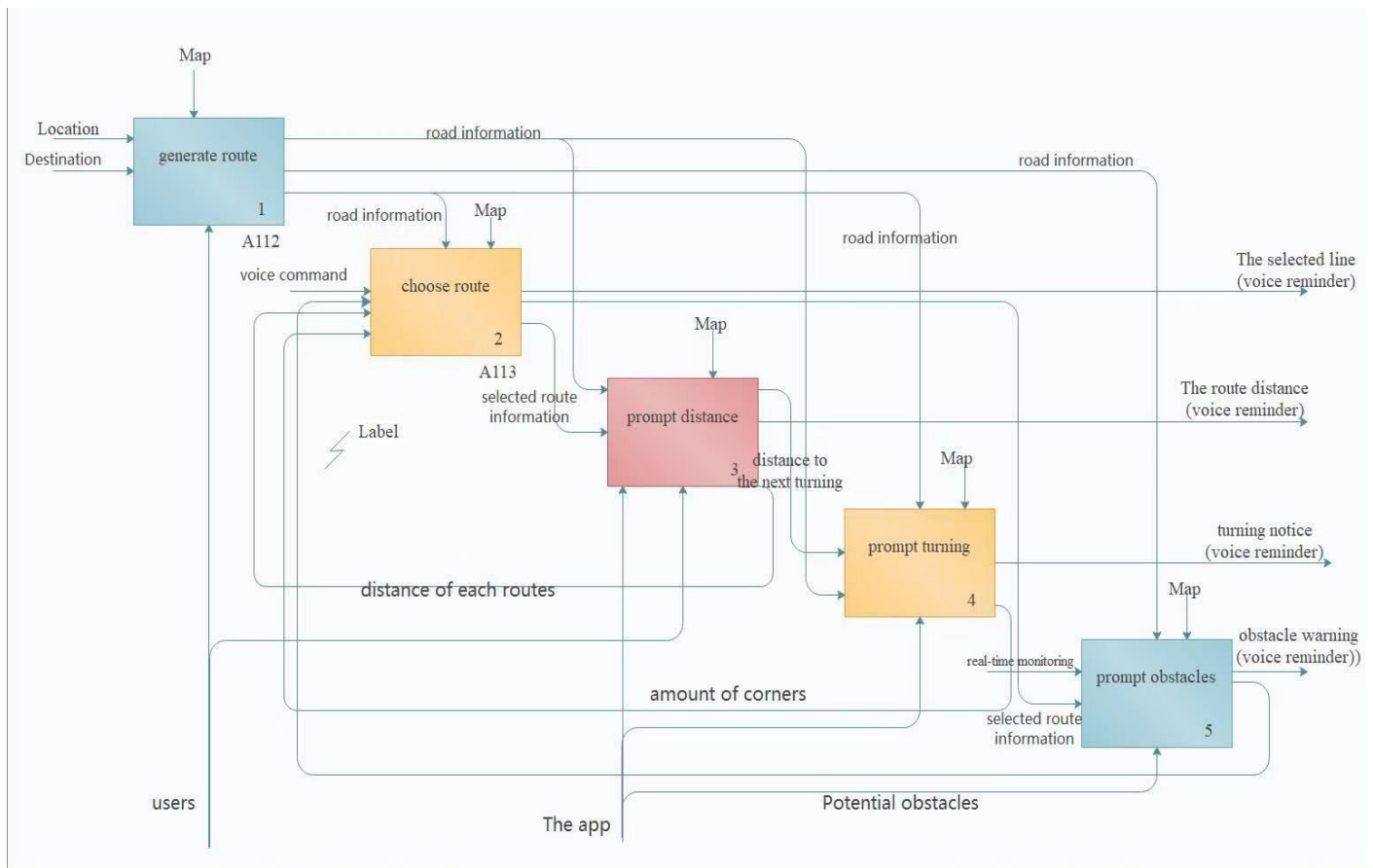
NFR ID	Nonfunctional Requirement 3
NFR3	The system should be used ubiquitously for blind people, reducing the cost and expanding the usable area around the world.
Satisfies Nonfunctional Requirement Issue	NFRI1
Satisfies Non-functional Objective	NFO2

NFR ID	Nonfunctional Requirement 1
NFR4	The system shall be customizable to every user: e.g. volume, the interval of instructions, etc.
Satisfies Nonfunctional Requirement Issue	NFRI1
Satisfies Non-functional Objective	NFO2

NFR ID	Nonfunctional Requirement 1
NFR5	The system shall be easily extensible to accommodate the following typical variations: variations in interface, language, definitive needs of the user, new features, new sensors and hardware, etc.
Satisfies Nonfunctional Requirement Issue	NFRI1
Satisfies Non-functional Objective	NFO2
Constrains	FO1, FO2, FO3, FO4

4.2.3. Specifications

The idef0 diagram is shown below:



Functional Specification ID	Functional Requirement
FS1	Users input their destination to the system via voice. The system will provide choices of routes if there are more than one choices.
Satisfies Functional Requirement	FR1
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Front page of the app

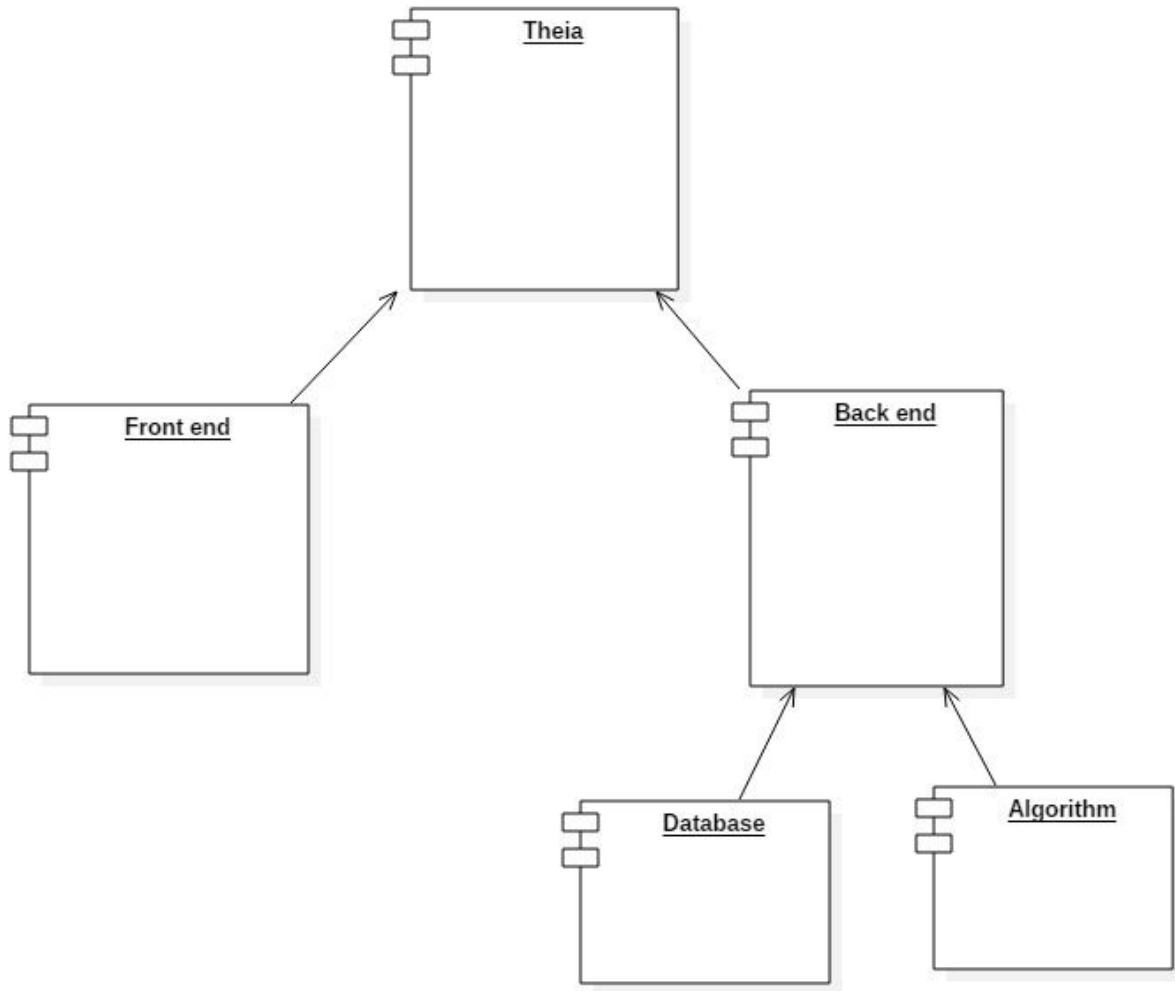
Functional Specification ID	Functional Requirement
FS2	Figuring out the routes to reach the destination, and informing the user of the options by sound.
Satisfies Functional Requirement	FR2
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Front page of the app

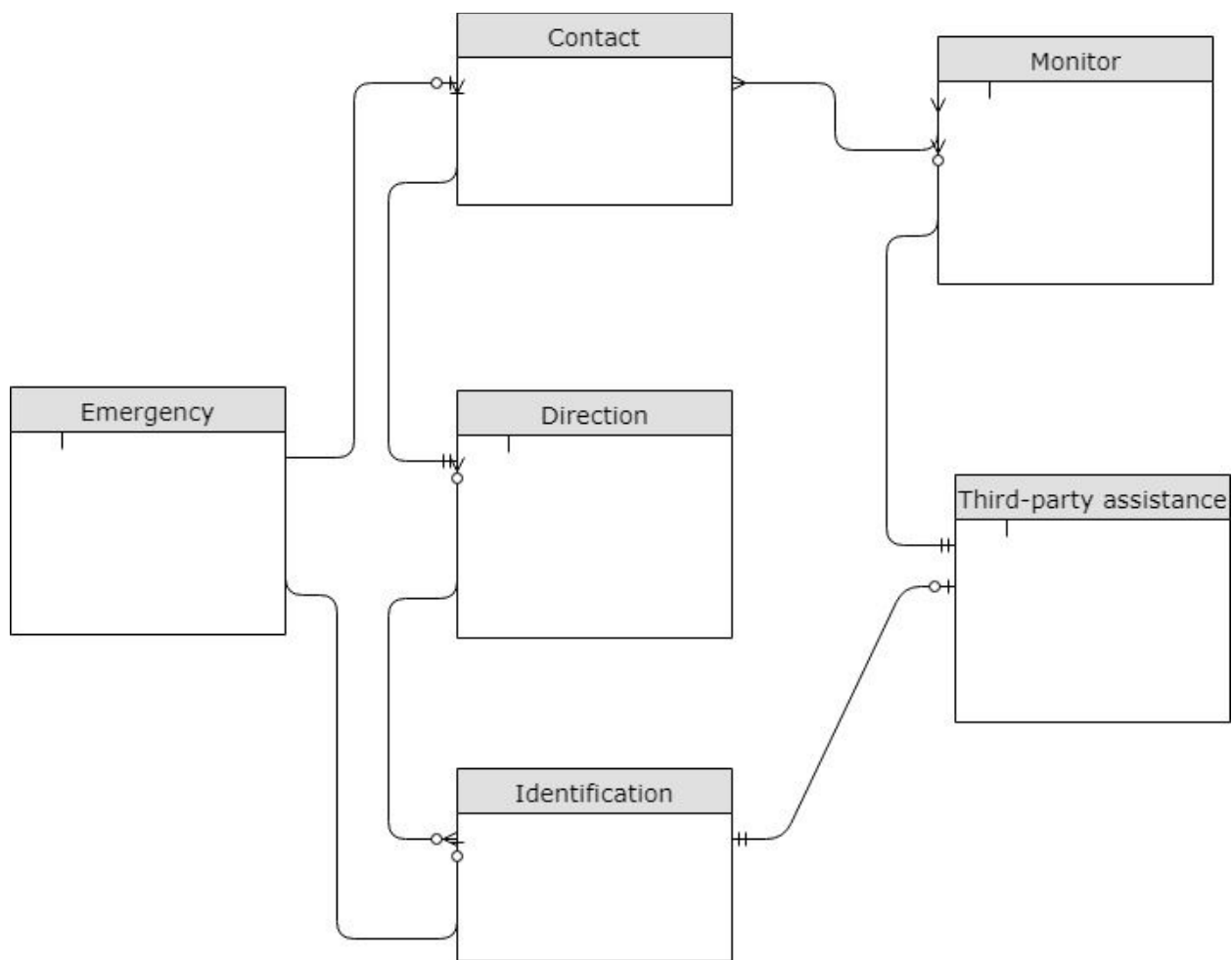
Functional Specification ID	Functional Requirement
FS3	Telling the user to walk a distance (e.g., 2 minutes before turning, or walk for 30 steps, etc.)
Satisfies Functional Requirement	FR3
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Front page of the app

Functional Specification ID	Functional Requirement
FS4	Telling the user to stop at the right place to turn. (GPS signal)
Satisfies Functional Requirement	FR4
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Front page of the app

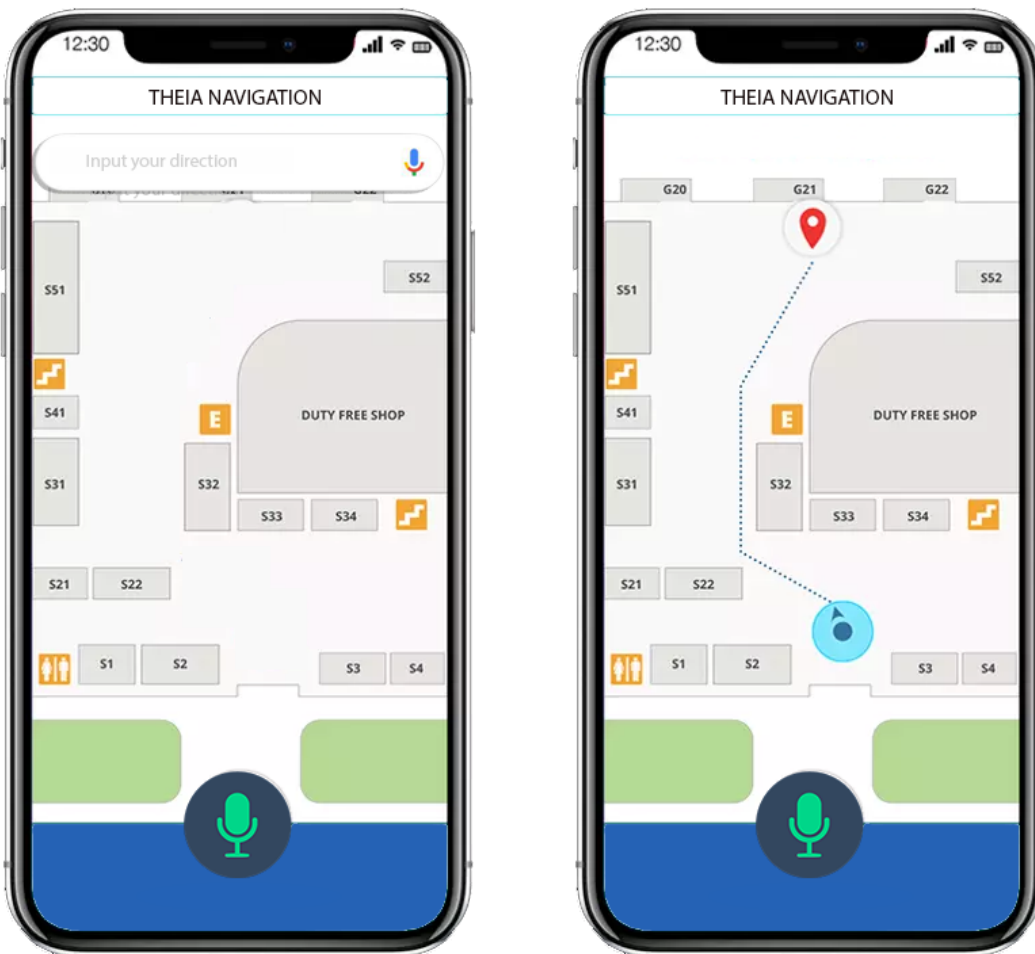
Functional Specification ID	Functional Requirement
FS5	Detecting obstacles and telling the user what to do in order to avoid collision.
Satisfies Functional Requirement	FR5
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Front page of the app

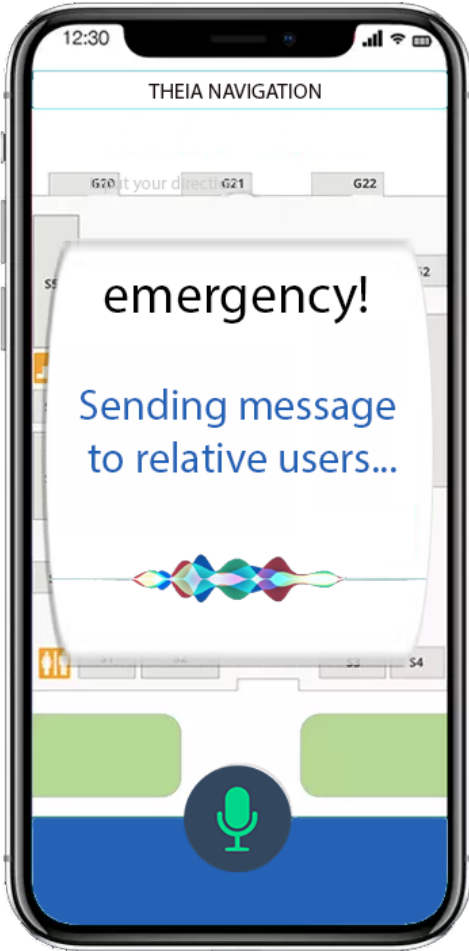
[5] Preliminary Prototype





[6] Prototype Interface Mock-ups





[7] User Manual

Input voice for the destination

Users input their choice via voice command

Select the preferred route

Users input their choice via voice command

Follow the direction

Users follow the voice direction to reach their destination

[8] References

[1] "Functional Requirement." Wikipedia, Wikimedia Foundation, 19 Sept. 2018, en.wikipedia.org/wiki/Functional_requirement.

[2] "Non-Functional Requirement." Wikipedia, Wikimedia Foundation, 5 Oct. 2018, en.wikipedia.org/wiki/Non-functional_requirement.

[3] Erickson, W., Lee, C., & von Schrader, S. (2012). 2011 Disability Status Report: United States. Ithaca, NY: Cornell University Employment and Disability Institute(EDI).

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Appendix I: Process Details

9.1 Phase 1 Roles

Name	Role
Yuzhu Feng	Manage the teamwork
Tianyu Miao	Provide the ideas
Lei Shang	Synthesize the work

9.2 Meeting Records

Date of Meeting	Topic
09/01/2018	Set up the overall plan. Check course information on the BlackBoard.
09/07/2018	Describe the overview, introduction, background, and more general info about team project. Add some functional and nonfunctional requirement. Based on requirements, write part of WRS project proposal document.
09/20/2018	Discuss navigate system functions and nonfunctions and scenarios possibly happen. Continue to write WRS document.
10/05/2018	refine the WRS document. Discuss the problems in the online class. Based on requirement, design PPT

	and edit interface images.
10/11/2018	preparation for the incoming presentation. design the PPT, and talk about the team project functions and requirements.
11/10/2018	Discuss the team project features, and write the "Vision and Scope Document." Redetermine the business requirements, objectives, risks, and limitations. discuss the business context - stakeholder profiles and project priorities. Based on professor's advice, check PPT again, and discuss what we need to rewrite in our PPT. Talk the different scenarios that the app might be used by users in their daily lives.
11/15/2018	Draw KAOS diagram. Discuss the functions for team project. Design the functions based on its requirements. Discuss how to coding functions.
11/20/2018	Discuss the process and activities for team project. Draw IDEFO diagram and rewrite WRS Evolution. Try to use Android studio to apply google map in our team project.
11/25/2018	Discuss the specification documents, and finish the "Process Specification." Redraw the IDEFO and KAOS diagrams. Discuss the activities and functions in diagram whether acceptable or not. Check "Vision and Scope Document" and "WRS Evolution," and upload more detail in these documents.
11/29/2018	Continue to code the app, discuss the real location problem by using Google API. Check all documents required to post next week: WRS project proposal, Vision and Scope, Process and Specification, and Final Presentation PPT.