CS 4351: Requirements Engineering

WRS Evolution

Requirements Elicitation

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YouSee 

Contents

Revision History

Date	Version	Changes	Editor
11/04/21	1.0	Creation, Prototype	Jerry, Nebil, Zack
11/04/21	1.1	Preliminary Requirements, Issues	Nasif, Samuel
11/12/21	1.2	WRS, Traceability Matrix	Jerry
11/ 12/ 21	1.3	Graphs, Diagrams	Jacob
11/13/21	1.4	Mockup, Prototype	Nasif

[1] Introduction

1.1 Purpose

This document is meant to record the effects of our team in defining the problem domains, goals, requirements, and specifications for the YouSee app. By recording all this information in one document, all stakeholders will share the same understanding of why and how we are developing the YouSee application.

1.2 Scope

Blind people should be able to navigate indoors, from one location in a building to another location in the same building or a different building. For example, a blind student or a blind visitor may need to go from one classroom to another classroom, from one office to a lab, from a lab to a classroom or a washroom, etc. To reach the destination location, a blind person may need to figure out what the source (starting) location is, walk in the hallway, turn at the right place, continue to walk, and stop at the destination location. Safety would be an important concern, which implies, for example, detecting obstacles and avoiding collisions. The time that it takes to reach the destination might also be a concern, especially if there isn't much time available to reach the destination. Familiarity with the route to be taken may also be a concern, among other things.

Blind people traditionally have used a dog, a cane, possibly with the help of braille indicators on the wall – oftentimes beside doors. These aids may be used together since they could be complementary to each other. There seems to be a great need for blind people to have some aid that can think, see, hear, and speak.

Our team will build a smartphone app called YouSee. The app will be a way for volunteers to assist blind people navigate indoors using video calls. Users will be able to choose if they are a blind person or willing to volunteer. This will lead to a volunteer and blind person pair being matched to allow the volunteer to help the blind person by acting as their eyes and ears using the phone's camera.

1.3 Objective and Success Criteria

1. Navigate around the campus using a smartphone application which assist visually impaired people while providing reliable partners.
2. Provide contact information for Office of Accessibility from within the application and campus police or emergency hotline.

1.4 Definitions, Acronyms, and Abbreviations

- Android OS: An operating system for mobile phones developed by Google.
- iOS: Apple mobile operating system created and developed by Apple Inc.
- App: Application, typically referring to mobile applications.
- UTD: University of Texas
- PIG: Problem Interdependency Graph
- SIG: Softgoal Interdependency Graph
- UML Class Diagram: Unified modeling language, used to structure a software system's classes, attributes, and relationships among objects.
- Sequence Diagram: Depicts the scenario of how objects interact between each other while

carrying out their functionality.

- FR: Functional Requirement, a description of the service that the software must offer.
- NFR: Non-Functional Requirements, a description of behaviors that the software must uphold.
- DI: Domain Issues, problem areas that are addressed in the software system.

1.5 Overview

This document includes an introduction to the YouSee app, followed by preliminary definitions of the domain, functional, and non-functional requirements. It then contains a list of issues with each element of these three defined fields. Afterwards is a section stating the world surrounding the application and then a section which includes the formal requirements and specifications. There is a short section containing a link to a prototype and then a section of the application mockups. The final section lists the references used in the creation of this document.

[2]. Preliminary Definition

For this smartphone app, the *domain* will be indoors, which can consist of ground floor, this floor should have classrooms, offices, washrooms, lounges, etc.
The primary stakeholder would be a blind person who needs to navigate indoors. Secondary stakeholders will involve a caretaker (an assistive person) – e.g., a family member - who sets the configuration of the smartphone app and comes to aid the blind person in case the blind person is lost or injured. Secondary stakeholders might also include people at the accessibility department and the police, this especially in an emergency. Another secondary stakeholder would be the volunteer users.

Functional objectives would include foremost navigating indoors, primarily going from one location to another location in the same or different buildings that are connected to each other. This is done by interacting with the user interface to have video calls between blind people and volunteers.

Non-functional objectives would include safe navigation, fast navigation, and comfortable navigation. Since the app is for blind people, usability or user-friendliness would also be an important objective, since a blind person cannot read the screen of a smartphone app, especially concerning the capability of voice recognition.

2.1 Preliminary Domain

PD_ID	Preliminary Domain Description
PD1	Elderly vision likely deteriorates which means they need special lens.
PD2	The lower floor of the UTD ECS buildings which comprises of many classrooms, restroom, and offices.
PD3	There are many furniture’s and other misc. obstacles in the building which could cause safety concerns.
PD4	There is no vision impairment aid in navigating UTD campus when the user is paired with their cane or service pet.
PD5	The visual impaired community require the use of canes or service dog to assist them of their surroundings.

2.2 Preliminary Functional Requirements

P FR_ ID	Preliminary FR Description
PFR1	The application shall start searching for partner when the user taps the green button that says "search".
PFR2	The application shall make a distinct noise and vibration when the user closes it.
PFR3	The application shall make a phone ringing sound while it is searching for a suitable partner.
PFR4	The application shall cancel the search and make a distinct sound if the user taps the red button that says "cancel".
PFR5	The application shall state out loud "connected" and vibrate the phone once a suitable partner has been connected.
PFR6	The outward facing camera shall turn on once the user is connected to a volunteer and the application shall state out loud "camera on".
PFR7	The application shall go back to searching if the time taken to connect exceeds 3 minutes after finding a suitable partner.
PFR8	The application shall display the user's connection status.
PFR9	The application shall change the language of the interface depending on the user's choice from a list.
PFR10	The application shall display the user's connection status.
PFR11	The application theme will change when the user selects a different option.
PFR12	The application shall call 911 if the user presses the button labeled "emergency".
PFR13	The input and out of the application shall change based on the connected devices.
PFR14	The application will import contacts if the user allows it.
PFR15	The application will use GPS to track the user's location.
PFR16	The application will notify the user if the camera is not detected with a voice prompt "Camera not detected".

2.3 Preliminary Non-Functional Requirements

PNFR_ ID	Preliminary NFR Description

PNFR1	The user shall have a solid internet connection on their phone to connect with a volunteer.
PNFR2	The application shall have access to language repositories in varieties of languages such as English, Mandarin, Japanese, German, French, Spanish, etc.
PNFR3	The application shall have a customizable user interface, with large/ bold font by default for the visually impaired.
PNFR4	The application shall be able to contact EMS if the user has an emergency.
PNFR5	The application shall be able to connect to Bluetooth devices for audio input/output.
PNFR6	The application shall be able to detect camera damage if the damage makes the app unusable.
PNFR7	The application shall merge user contacts and set emergency contacts for the user.
PNFR8	The application shall cache the last known GPS location in the event of disconnection.

[3]. Issues with the Preliminary Definition Given

3.1 Domain Issues

Domain Issue ID	Domain Issue Description	
DI1	PD_ID	PD1. The visual impaired community require the use of canes or service dog to assist them of their surroundings.
	1. Ambiguous or incomplete. Each category can cover a wide range of disabilities resulting in widely varying levels of impairment. 2. Unsound: issues of visual impairment are unlikely to be helped via a phone app so we need to mention the use of the how the app can be helpful.	
	Option 1	Consider which categories do the blind user need assistance with along with the mobile application. This would assist the partner in obstacles they cannot see as the camera is always projecting forward.
	Option 2	Consider which categories of disability have the most sufferers and prioritize the requirements that target those first.
	Choice	Option 1

	Rationale	Option one provides the most complete domain knowledge of the listed options. It also provides greater security when conducting traceability of requirements to problems within the domain.

3.2 Functional Requirements Issues

FR Issue ID	Description	
FRI10	PFR_10	PFR10. The application shall display the user's connection status
	1. The connection display could be for the partner if the user is having connection issues?	
	Option 1	Speak Wi-Fi connection status to the user every time and tell the user immediate if their cell service is not reachable then the partner should navigate the user with a different route.
	Option 2	The application will timeout and try to reconnect with their partner or provide them an alternative Wi-Fi. The Wi-Fi needs to check for vulnerabilities and ask the user for a VPN or some encryption firewall as it will enable hackers to steal personal information.
	Choice	Option 1
	Rationale	This is practical as it provides status with the connection to their partner. If the user is not in a reachable state, then it should speak their internet status/ping connectivity so he/she could be re-routed and stay connected.
Satisfied by	FR10	

3.3 Non-Functional Requirements(NFR) Issues

NFR Issues ID	Description	
NFRI4	PNFR_4	PNFR1. The application shall be able to contact EMS if the user has an emergency.
	What constitutes "emergency", this is ambiguous.	
	Option1	Emergency as in the user is lost and doesn't know their location and need to sync with a partner to get help.

	Option2	Emergency as in the user is not feeling well, had an accident, or is physically hurt
	Choice	2
	Rationale	We want the user to know that the emergency button is there for them for accidents that are bodily harmful or misc. occurrences are there for the user.
Satisfied by	NFR4	

[4]. WRS

4.1 W

4.1.1 Problem

Problem ID	Problem Description	Corresponding Goals
P1	The issue is that syncing our users with an unknown user that doesn't have good intentions.	G1
P2	The object detection should provide distance for the partner to understand the depth from the blind users' surroundings.	G2
P3	The application should not be very functional as the user experience could be very complex to handle.	G2
P4	The user may have a hard time getting necessary information that is provided by UTD campus, so we are syncing those necessities for the user such as getting the campus police.	G3

4.1.2 Goals

Goal ID	Goal Description	Backward Traceability	Forward Traceability
G1	The application will provide a background check and rating system filter to provide support or partner that you could rely on.	P1	FO1
G2	The application should be use friendly even for those who are visual paired. The visually paired assistance who configures the application for your needs.	P2, P3	FO2

G3	Provide necessary data from the user such as getting contact, services, and general campus location.	P4	FO3

4.2 RS

4.2.1 Improved Functional Requirements

FR ID	Description
FR1	The application shall make a phone ringing sound while it is searching for a suitable partner.
Satisfies Functional Requirement Issue	FRI1
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Fig 6.2

4.2.2 Improved Non-Functional Requirements

NFR ID	Nonfunctional Requirement 1	
NFR1	The system shall merge user contacts and set emergency contacts for the user.	
Operationalized Functional Requirements	OFR1 OFR2	The system shall provide login function with password The system shall read contact information and sync.
Satisfies Nonfunctional Requirement Issue	NFRI1	
Satisfies Non-functional Objective	NFO2	
Constrains	N/A, no constraints in our requirements	
Satisfied by prototype feature	Fig. 6.1	

[5]. Preliminary Prototype and User Manual

An interactive prototype, this mockup will demonstrate how the app is used: https://tinyurl.com/4yu26t5s

[6]. Prototype Interface Mockups

Fig 6.1 – Home menu

Fig 6.2 – Emergency menu

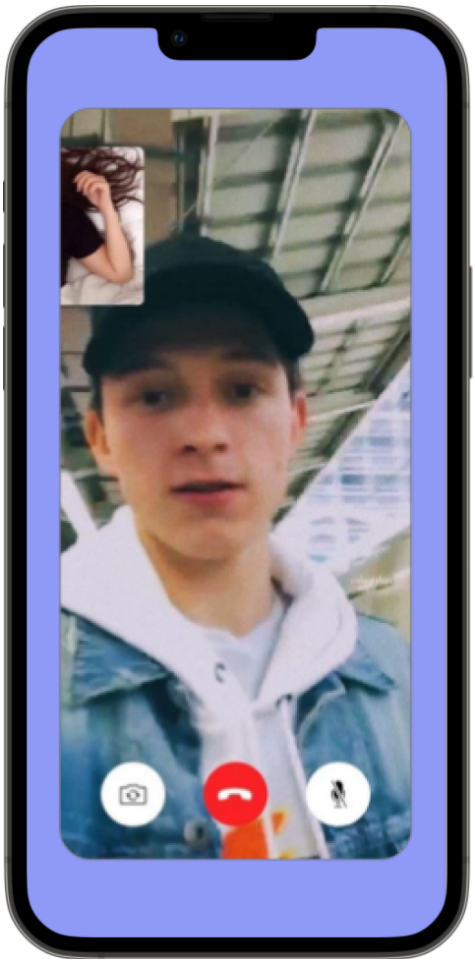


Fig 6.3 – Video feed

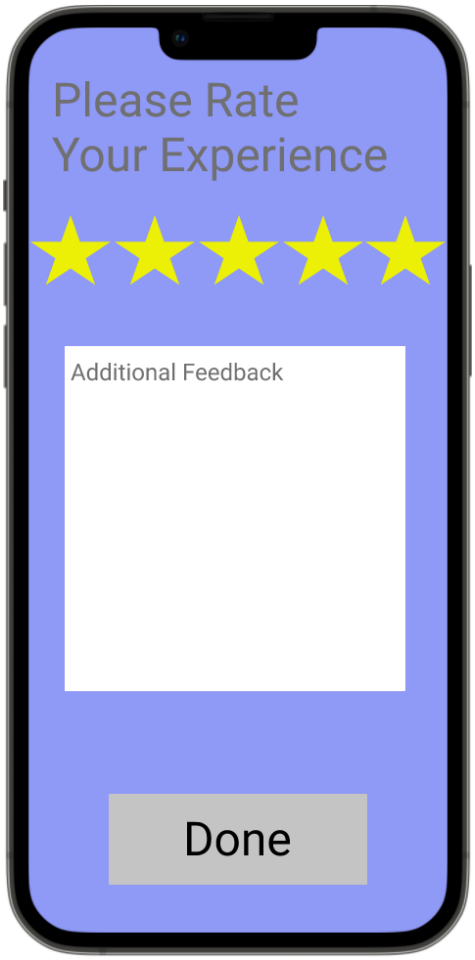


Fig 6.4 – Rating and Feedback

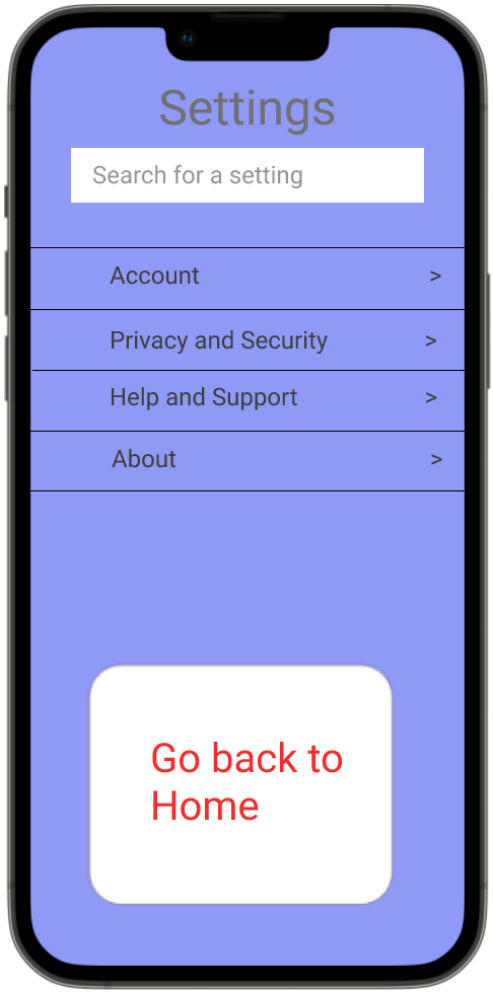


Fig 6.5 – Settings Menu

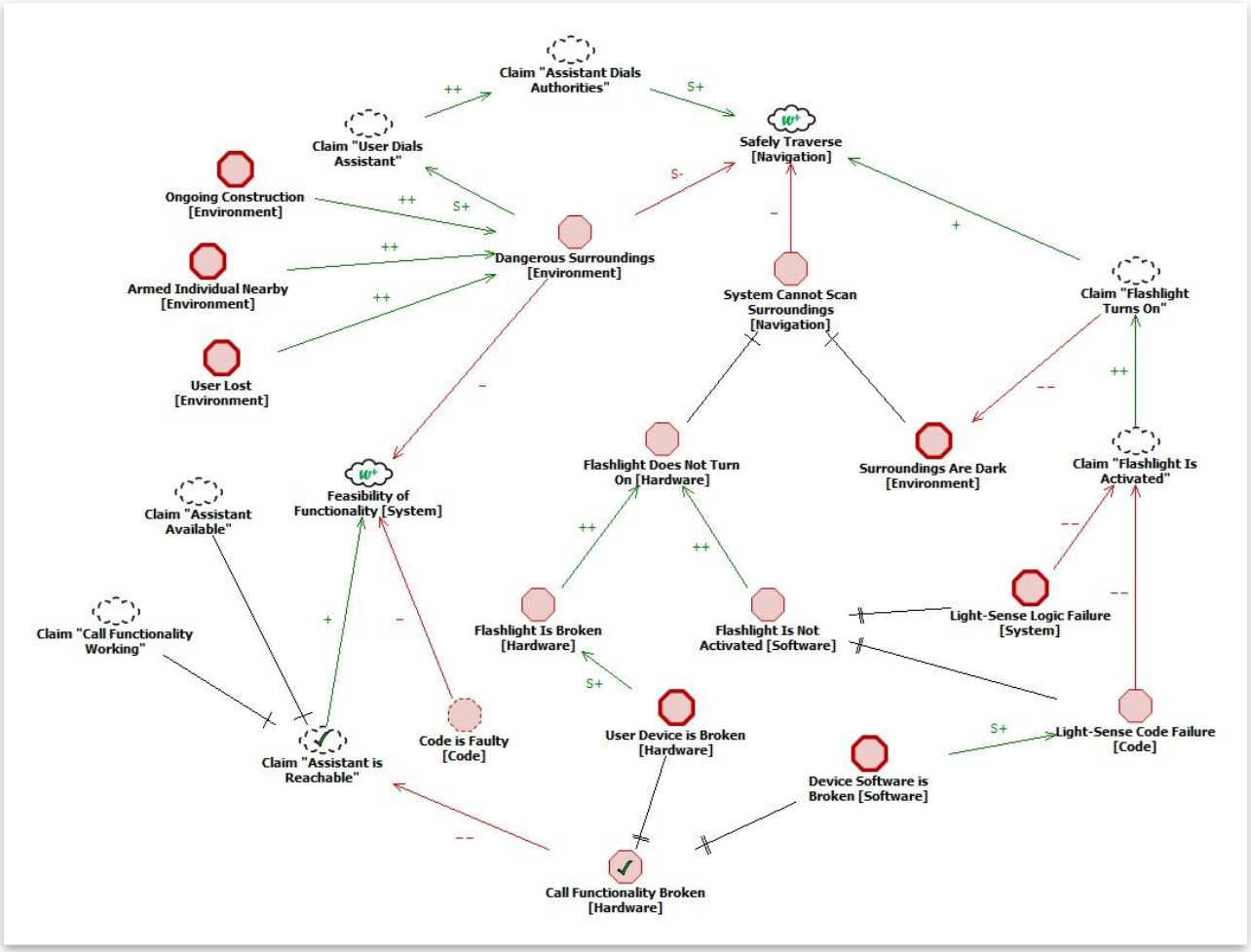
[7]. Traceability

Objectives to Requirements Traceability Matrix									
Objectives to Requirements Traceability Matrix	**Non-Functional Requirements**	**NFR1**	**NFR2**	**NFR3**	**NFR4**	**NFR5**	**NFR6**	**NFR7**	**NFR8**

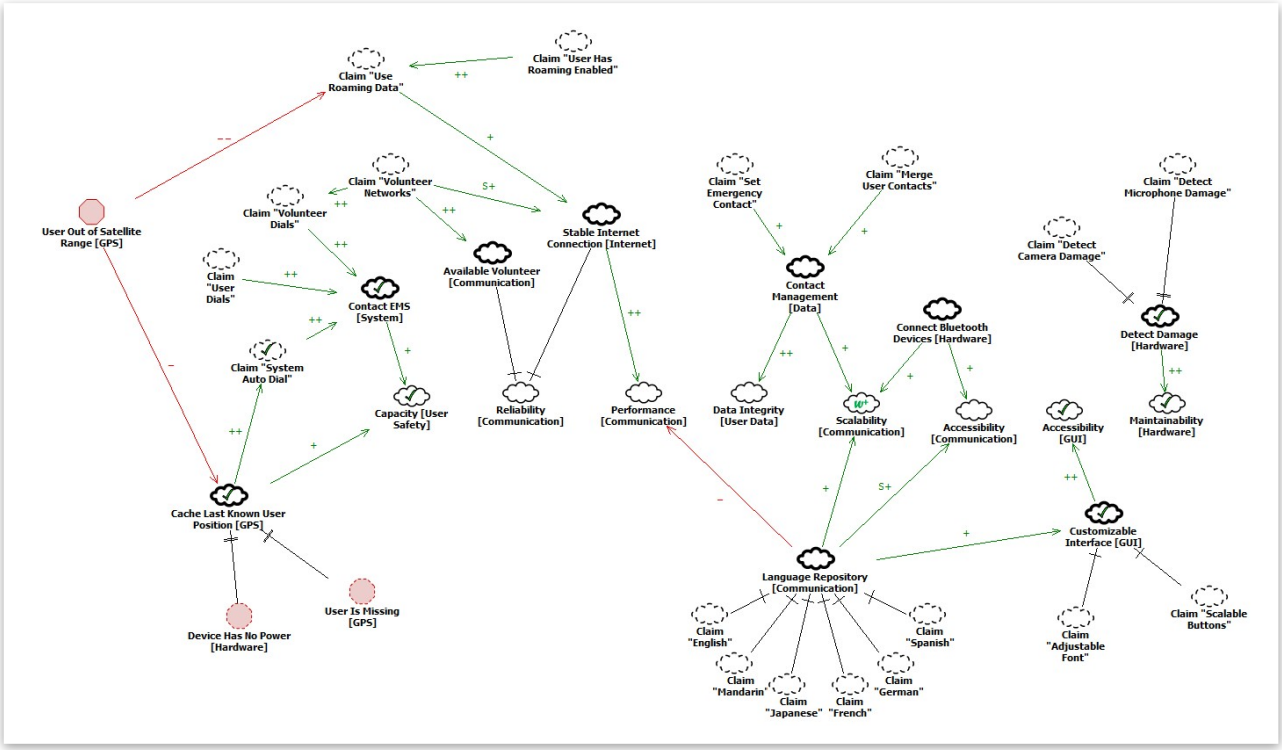
Functional Requirements									
FR1		x							
FR2									
FR3									
FR4									
FR5									
FR6							x		
FR7		x							
FR8									
FR9			x						
FR10		x							
FR11				x					
FR12					x				
FR13			x			x			
FR14								x	
FR15									x
FR16							x		

[8]. Diagrams

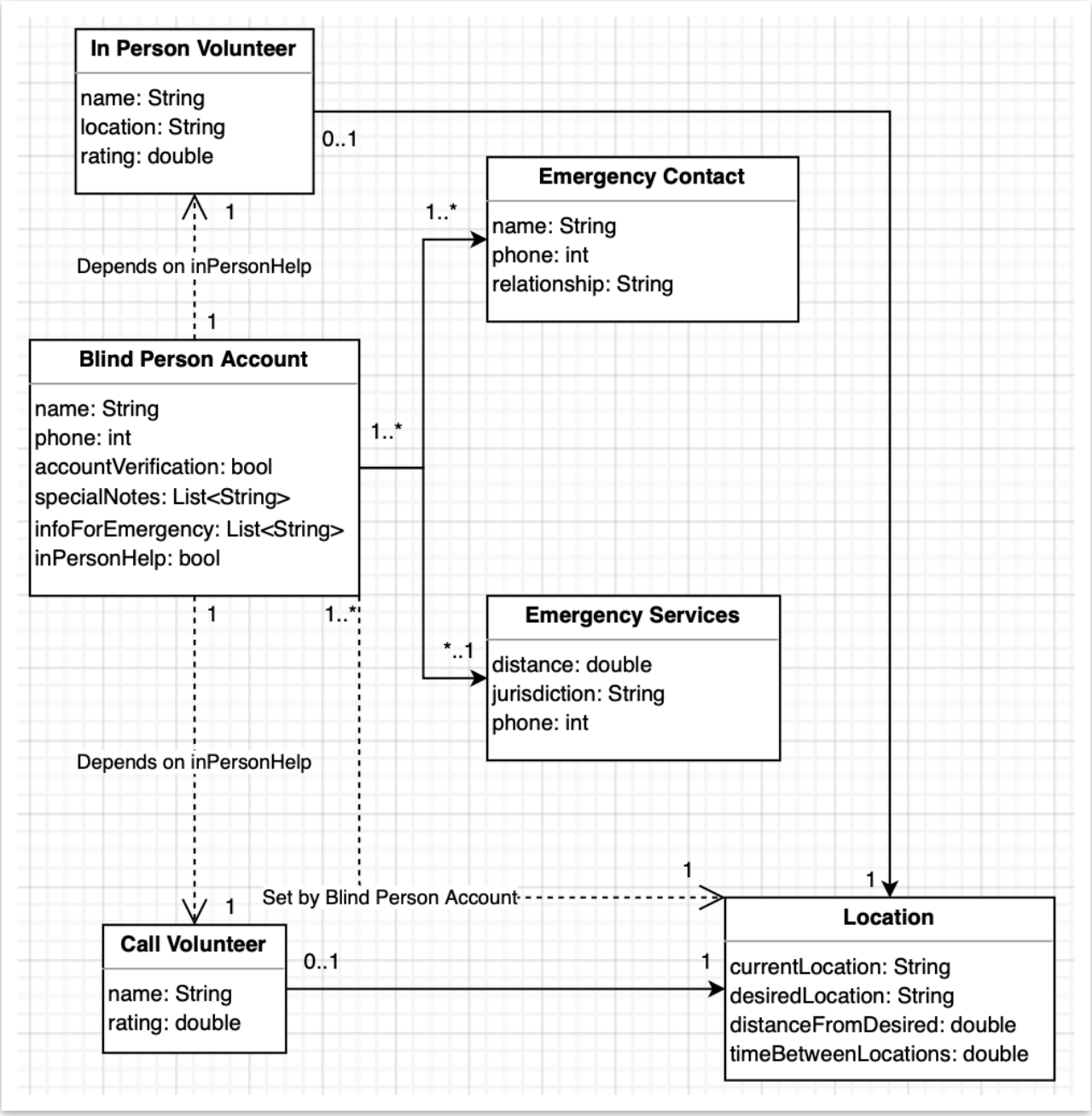
8.1 Problem Interdependency Graph



8.2 Softgoal Interdependency Graph

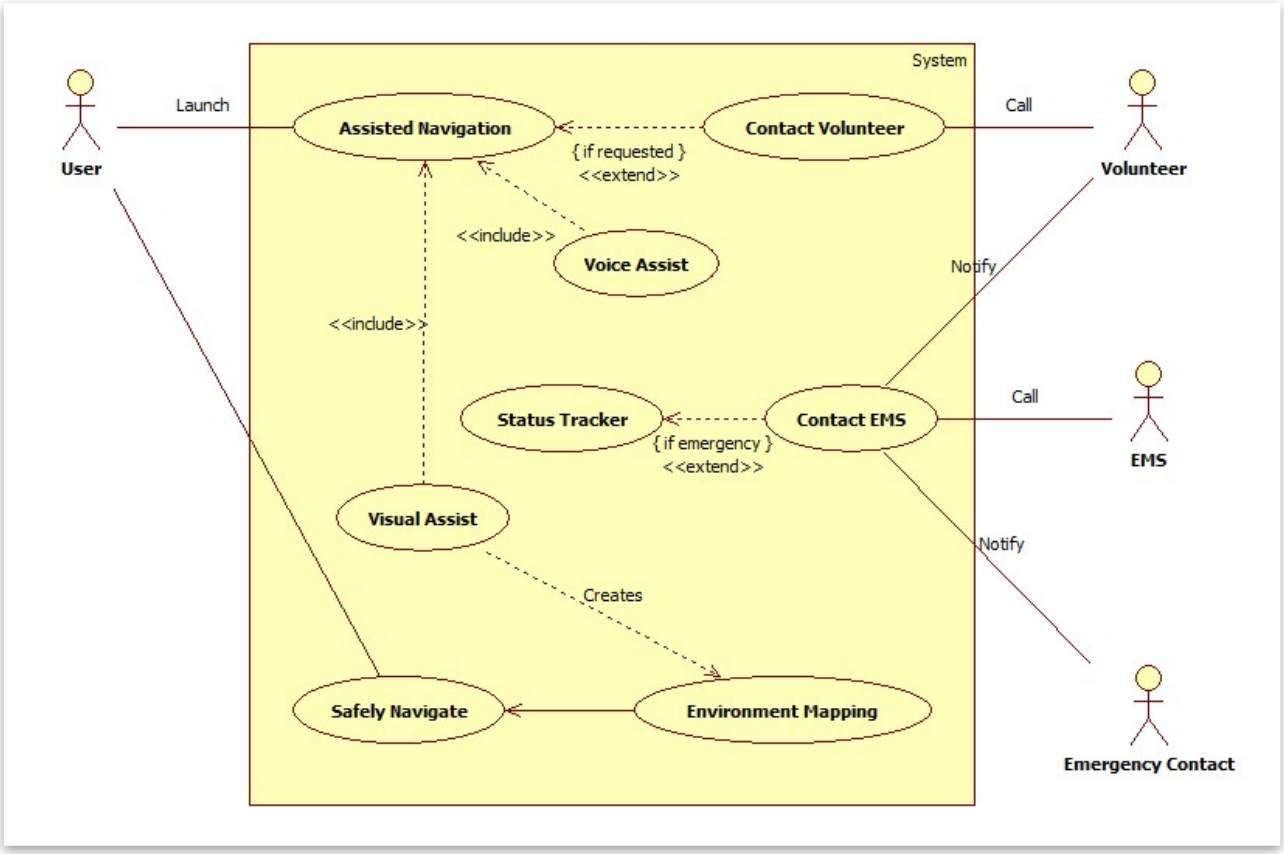


8.3 UML Class Diagram



8.4 Sequence Diagram

8.5 Use Case Diagram



[9]. References

[1] Dr. Chung's website: http://www.utdallas.edu/~chung/CS4351/syllabus.htm

[2] UTD Campus Map: http://www.utdallas.edu/maps/

[3] UTD Office of Accessibility: http://www.utdallas.edu/studentaccess/