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Requirements Specification

Human Decision Making when boarding public transportation

Meher Singh 27983633

FINAL YEAR ECSE PROJECT 2021

1.0 Table of Contents

2.0 Document Control

2.1 Revision Control

Version	Date	Details
1.0	27-Mar-21	Initial version
2.0	30-Mar-21	Updates based on review with Wynita

2.2 Contributors

Name	Position	Company
Meher Singh	Project Owner	Monash University
Wynita Griggs	Project Supervisor	Monash University

2.3 Approvals

…….. Date: ……..

Project Supervisor

3.0 Introduction

3.1 Objectives

The purpose of this document is to store and record the requirements for the components of the final year project on human decision making when taking public transportation.

3.2 Context

The purpose of this project is to design a tool to gather data on human decision making in regard to boarding public transportation. The capabilities of the tool involve an application that has the ability to display bus times at a given stop, allows the user to view specific details regarding the buses arriving at the bus stop, select the bus that they prefer to board, and provide a short explanation behind the decision.

Work into the human decision making when boarding public transportation is currently being conducted around the world. Currently there is a project being conducted by a team from the Massachusetts Institute of Technology and Singapore-MIT Alliance for Research and Technology. This project's goal is to create a methodology to study commuters' preferences when travelling. This is done through the use of GPS enabled devices such as mobile devices, followed by a survey [1]. Furthermore, a journal paper discussing the travel experiences for 10 regular bus users focused on the positive user experiences and focused on the travel needs of the 10 individuals [2]. Another article by Yannis Tyrinopoulos and Constantinos Antoniou looks into the key factors that affect the choices of commuters and the reasons behind the avoidance of use of public transportation and the factors that didn't affect commuters' choices [3].

3.3 Document Scope

The areas that requirements are specified include:

- Financial component
- Functional specifications
- Communications component
- Position determination components

3.4 Types of Requirements

There are two types of requirements present in this document:

1. Requirements. Standard requirements that are necessary to meet the project expectations. These are listed in the form of "R.xxx"
2. Optional. Standard requirements that are completed if time permits. These are listed in the form of "O.xxx"

3.5 References

Ref	Document
[1]	"Urban Mobility Behaviors & Preferences Test Bed | INTELLIGENT TRANSPORTATION SYSTEMS LAB", Its.mit.edu, 2021. https://its.mit.edu/urban-mobility-behaviors-preferences-test-bed.
[2]	"Modeling Bus Travel Experience to Guide the Design of Digital Services for the Bus Context | Proceedings of the 22nd International Academic Mindtrek Conference", Dl.acm.org, 2021. https://dl.acm.org/doi/10.1145/3275116.3275120
[3]	Tyrinopoulos, Y., Antoniou, C. Factors affecting modal choice in urban mobility. Eur. Transp. Res. Rev. 5, 27–39 (2013). https://doi.org/10.1007/s12544-012-0088-3

4.0 Requirements

4.1 Project Overview

The final year project has several goals that needs to be completed. Details of these goals can be found in the section below.

4.2 Requirements

4.2.1 High Level Requirements

At a high level the device should meet the following requirements:

Requirement ID	Requirement Description
[R.001]	The application shall communicate with the SUMO urban mobility simulator
[R.002]	The SUMO urban mobility simulator will emulate data pertaining to busses travelling along route
[R.003]	The application shall allow the user to view details of each bus arriving to the bus stop
[R.004]	The application shall use the device's GPS system to determine user location
[R.005]	The application shall allow the user to record their reasoning for their decision

4.2.2 Financial Requirements

Requirement ID	Requirement Description
[R.006]	A budget of AU$200 is provided to purchase equipment for the project

4.2.3 Functionality Requirements

Requirement ID	Requirement Description
[R.007]	The application shall use the GPS system to determine when the user has arrived at a bus stop
[R.008]	The application shall display all available bus routes arriving to the bus stop
[R.009]	The application shall provide information of each bus involving passengers, estimated time of arrival, whether the bus will be early/on-time/late
[R.010]	The application shall allow the user to give feedback on which bus they will take and provide a description stating the reasoning behind their decision
[R.011]	A "Refresh" button, when triggered, will allow the user to update the information about each bus
[R.012]	A "Select" button to select the bus that the user will take. When triggered, it will provide the user with a text box to input the reasoning behind the decision
[R.013]	Each bus option will be a button. When the button is pressed, it will display information about that bus

4.2.4 Communications Requirements

Requirement ID	Requirement Description
[R.014]	The application shall use 3G/4G cellular network technology to communicate with the SUMO urban mobility simulator
[R.015]	The bus details transmitted from SUMO shall include time stamps to provide accurate details to the user
[R.016]	The application shall monitor the server to push new updated information to the user
[R.017]	Information sent to and from the application and server shall be encrypted to ensure privacy of user

4.2.5 Position Determination Requirements

Requirement ID	Requirement Description
[R.018]	The application shall use GPS to determine when the user's position is at a bus stop

4.2.6 Optional Requirements

Requirement ID	Requirement Description
[O.001]	Field testing of the application to ensure it can work at a bus stop

5.0 Non-Functional Requirements

5.1 Regulatory Requirements

Requirement ID	Requirement Description
O.002	Obtaining ethics approval for testing done with a human using the application

5.2 Security and Privacy Requirements

Requirement ID	Requirement Description
O.003	Data sent from application to the server during human testing will be done securely and stored on a computer with a password

6.0 Use Case Scenarios

6.1 GPS Operation

Condition	Description
Pre-conditions	The user walks to a pre-positioned bus stop
Trigger	The location of the user is determined to be within a radius of a bus stop
Action	Application requests bus information from the server for the bus stop
Post-Conditions	Application displays the bus details

6.2 View bus details

Condition	Description
Pre-conditions	Application has displayed all buses coming to the bus stop
Trigger	User selects a bus to view information regarding the bus
Action	Application should display all information about that particular bus
Post-Conditions	Application waits for user to select that bus or view information regarding a different bus

6.3 Selecting a bus

Condition	Description
Pre-conditions	User has seen all information available regarding the buses arriving at the bus stop
Trigger	User selects the bus they will take
Action	Application will require the user to input reasoning behind the decision
Post-Conditions	Application will send the information provided by the user to a database

6.4 Refreshing bus details

Condition	Description
Pre-conditions	Application has displayed bus details for the bus stop
Trigger	User selects the refresh button
Action	Application sends request to the server for the latest details
Post-Conditions	Application displays the data