COS301 Phase 1

COS 301 EGGSHELL

PHASE ONE

NavUP Proposal

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1 Introduction

In this document we will discuss a solution for the concept of the navUP system. Which will allow students to be able to navigate through campus to any lecture hall as fast as possible while taking the least congested route.

1.1 Purpose

The sole purpose of this document is to define the requirements of the system as well as the technologies that may (or may not be used) to develop this product, as well as different ideas that may be plausible to implement based on difficulty as well as time efficiency. We will try and do an in-depth analysis of the concept of navUP as well as technologies already available for us on campus and technologies we can utilize to implement this product. We will attempt to find the best solution for the product as well as iron out issues that may arise later during the course of the project.

1.2 Scope

Design and implement a mobile application that uses the University of Pretoria's campus wi-fi that will deliver a navigational service to users via their smart devices. The application will be named NavUp. The application should contain all the basic functionalities that are already found in common navigation systems.Other functionality required includes searching, saving and providing directions to a location. A UI(User-Interface) is also required to allow users to interact with the application. It should be usable by different types of users allowing them to enter different kinds of information into the system regarding venues, points of interest, events and activities using multiple types of devices and services. (See References Page)

1.3 References

References Pertaining the scope: COS 301 Software Engineering specification found at www.cs.up.ac.za/courses/COS301

1.4 Overview

An in detail overview will be given within the rest of the sections. Including ideas, technologies, charateristics etc.

2 Overall Description

2.1 System Environment

The NavUP system will have 4 basic mediums in which communication will be spread:
1.Students(Users)
2.Mobile Application User Interface(UI)
3.Campus Wi-Fi Hot Spots
4.GPS

2.1.1 Users

The users will connect to the mobile application through the campus wi-fi, every user will be connected to a particular hotspot. Every connection from a user to a hotspot will be tracked in real time and that information will be used accordingly to monitor how many people are in a certain location.

2.1.2 Mobile Application User Interface(UI)

Users will use the UI to select where they want to go as well as selecting the shortest route or the fastest route based on hot-spot connections. The mobile application will then use GPS to locate the user and provide an optimal route.

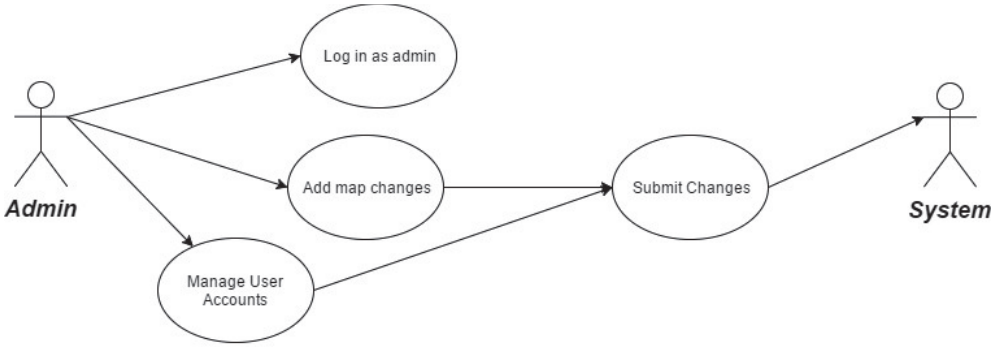
2.1.3 Campus Wi-Fi Hot Spots

The mobile application will keep track as to how many people are logged in and then use GPS to determine how many people are in the vicinity of an area which will also be done using the Wi-Fi hotspot using real time tracking. This will enable users to keep track as to how many people are in a certain location and will allow use to avoid highly congested routes.

2.1.4 GPS-needs checking-

GPS will be used to keep track of users through the mobile application. This will allow users to see where they are currently(even when wi-fi is not available) and allow us to determine what will be the best route for the user to their venue. Every user will also be able to see how many people are in a certain location(hotspots) as well as choose the shortest route or fastest route based on the location of the hotspots.

2.2 Functional Requirements Specification



Admin

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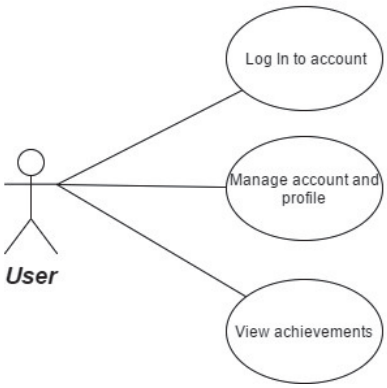
User account control



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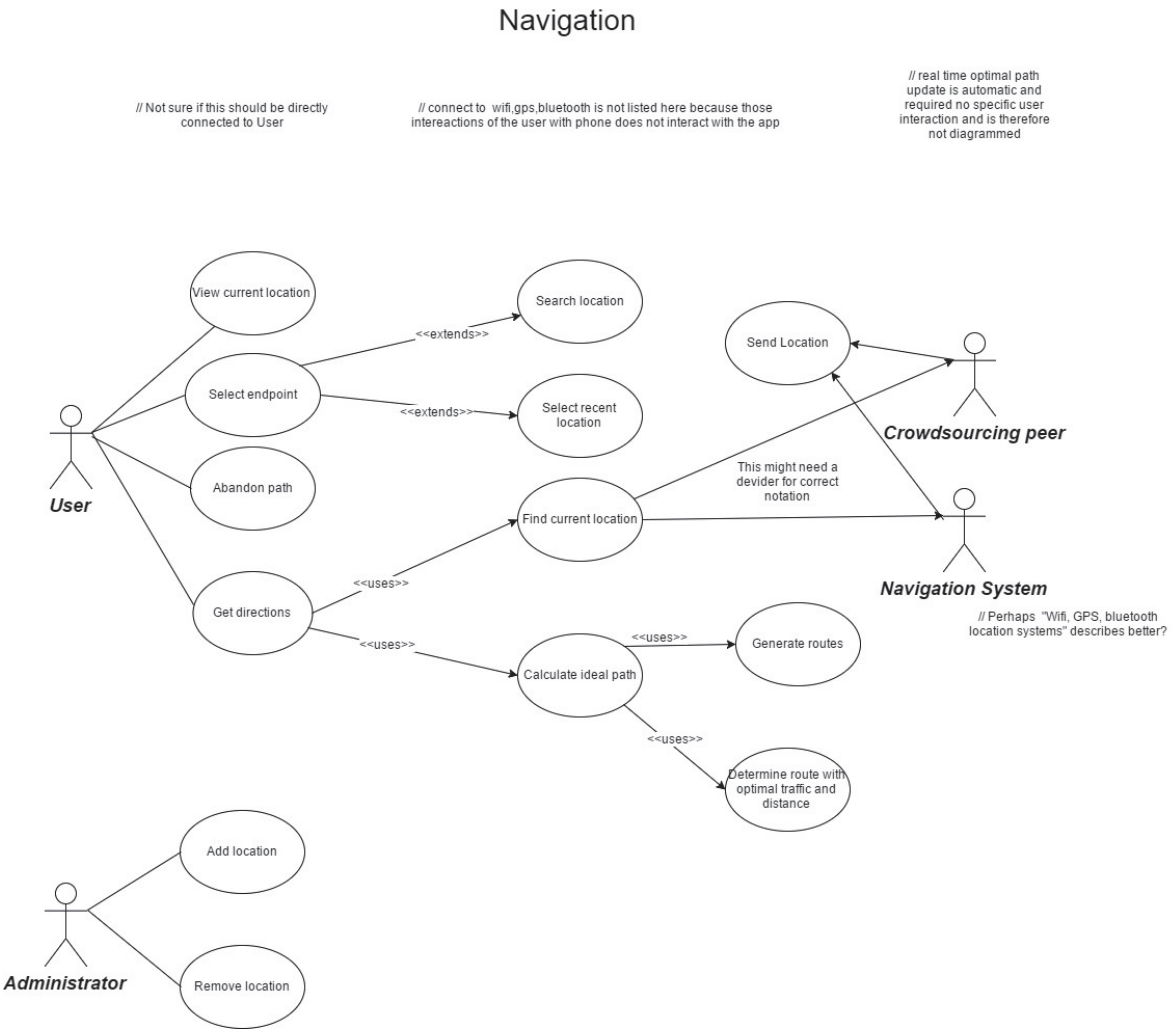

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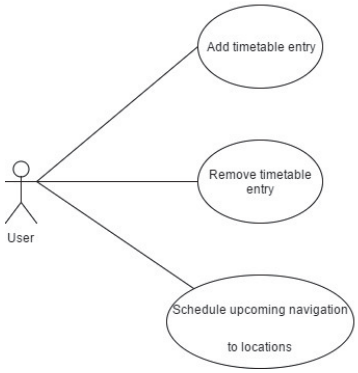
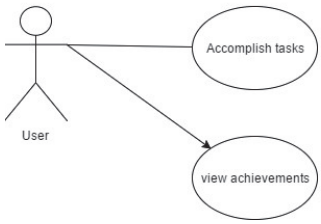
Route Scheduling



Rewarding Activities



3 Specific Requirements

3.1 Functional Requirements

3.1.1 Find Location

The user accesses the mobile application and searches for the location he desires to go too. Pre-Condition: The user needs to be connected to wi-fi and will require the GPS to be activated on the smartphone. Path to locating: Login to app, enable wi-fi, enable GPS, Search location using UI, confirm destination and go to the given location.

use case name	Find Location
trigger	User Accesses mobile application
Precondition	User has to be connected to Wi-Fi GPS has to be activated
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Application determines user location
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4**, if location cannot be determined a message is displayed alerting user that location could not be determined
Post condition	UsersâĂŹ current location displayed
Exception Paths	None

3.1.2 Update Location

The users current location is updated whilst moving via real time tracking through the GPS. Pre-Condition: The user needs to be connected to wi-fi and have their GPS activated. Path to locating: Login in to app,enable wi-fi,enable GPS, search location and confirm location.

use case name	Update Location
trigger	User location changes
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Find Location 5. Confirm Location 6. As user walks to destination, their current location is updated
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4** ,if location cannot be determined a message is displayed alerting user that location could not be determined
Post condition	User location updates
Exception Paths	User may abandon path at any time

3.1.3 Add Recently Visited Locations

When the useer is logged into the application they will have an option to add recently visited locations to their favourite locations. Path to locating: Login to mobile application, go to favourites tab and click on add recent locations.

use case name	Add Recent Locations
trigger	User selects option to add location to favourite locations
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Go to Favourites tab 5. Click on add recent location
Alternative Path	If user does not add new locations, system tracks all locations user has navigated to and adds those locations to the ”Favourites” list if it is not already in the list
Post condition	New recent location added
Exception Paths	User can abort creation of new recent location

3.1.4 Remove Locations

The user when logged into the mobile application will have an option to remove recently visited locations from their favourite locations. Path to locating: Login to mobile application. go to favourites tab, click on remove locations.

use case name	Remove Location
trigger	User selects delete option from the Favorites tab
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. ”Go to âĂŸFavourites” tab 5. Click on ”Delete Recent Location”
Alternative Path	None
Post condition	Recent location is removed from âĂŸFavouritesâĂŹ list
Exception Paths	None

3.1.5 Track Time to location

The user will be able to see an estimate time to destination using a timer on the application. Path to locating: Login to mobile application, enable wi-fi, enable GPS, search location, confirm location and time to destination will be visible on the UI.

use case name	Time to location
trigger	User selects location to navigate to
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open User has to select location to navigate to
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Search for location 5. Confirm Location
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4**, if location cannot be found a message is displayed alerting the user that the destination location could not be determined In **step 5**, if user does not confirm location, estimated time is not displayed
Post condition	Estimated time to destination displayed on user interface
Exception Paths	User can abort path at any time

3.1.6 Real time tracking of people connected to a wi-fi hotspot-needs checking

The user will be able to see what path will be the best option based on the tracking of currently connected devices to a certain hot-spot.Path to locating: Login to mobile application, enable wi-fi, enable GPS, search location, confirm route based on hotspot information.

use case name	Traffic Tracking
trigger	User selects location to navigate to
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open User has to select location to navigate to
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Search for location 5. Hotspot information retrieved and displayed on routes 6. User confirms route based on hotspot information
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4**, if location cannot be found a message is displayed alerting the user that the destination location could not be determined In **step 5**, if hotspot information cannot be retrieved, application displays message alerting user that the hotspot information could not be retrieved and possible routes are shown
Post condition	Hotspot information displayed to user on all possible routes
Exception Paths	User may abort location confirmation User may abort navigation at any time

3.1.7 Suggest Locations

The mobile application will be able to suggest Locations based by tracking your daily movements.Path to locating: login to mobile application, visible on home screen

use case name	Suggest Location
trigger	User enters application
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Select Time Tables tab 5. Suggestions for destinations are displayed to the user
Alternative Path	None
Post condition	Suggested locations displayed to user
Exception Paths	None

3.1.8 Update path based on traffic of students

The wi-fi tracking may change whilst a path has already been generated, it will then automatically update the path whilst you are walking.

use case name	Update path
trigger	Better alternate route is calculated while navigating to destination
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open User has to select location to navigate to User has to confirm destination User has to be busy navigating to destination
Basic Path	While navigating the application measured hotspot traffic on route and redirects user if better path is found with less traffic
Alternative Path	If not better path is found route remains unchanged
Post condition	Path is updated and user is redirected
Exception Paths	None

3.1.9 Generate path to location

The GPS will acquire the users current location and destination and will generate a path between the two.

use case name	Generate Path
trigger	User selects destination
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open User has to select location to navigate to
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Search for location 5. Select location
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4**, if location cannot be found a message is displayed alerting the user that the destination location could not be determined
Post condition	Path is generated between users current location and destination and path is displayed to the user
Exception Paths	Select location process can be aborted at any time

3.1.10 Add timetable to mobile application

The mobile application will have a timetable feature which will enable the app to automatically generate paths from certain locations based on the users individual timetable.

use case name	Add Time Table
trigger	User selects option to add time table
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Select Time Tables tab 5. Select Add Time Table 6. User adds classes to Time Table
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location
Post condition	User adds time table and user interface is updated
Exception Paths	User can abort the add time table process at any time User can abort add class process at any time

3.1.11 Remove timetable to mobile application

The mobile application will let the user remove their own individual timetable based on each semester, or a mistake made.

use case name	Remove Time Table
trigger	User selects option to remove time table
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open A Time Table has to exist
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Select Time Tables tab 5. Select Remove Time Table 6. User Removes Time Table
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 5**, if there are no Time Tables a message will notify user that no Time Tables exist
Post condition	Time Table is removed and user interface is updated
Exception Paths	User can abort the remove time table process at any time

3.1.12 Voice Input for location

Users will be able to use voice input when trying to access a certain location.

use case name	Voice Input for location
trigger	User select option to input location by means of voice recognition
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Select âĂIJSay Destination NameâĂİ button 5. User says the name of destination 6. Destination location is retrieved
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 5**,if user says location name and no results are found, a message displaying an error will alert user to try again
Post condition	User destination selected
Exception Paths	None

3.1.13 Voice output confirming location

The mobile application will have a voice response confirming your location.

use case name	Voice Confirmation of Location
trigger	User selects destination by means of voice recognition
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Application has to be open User selected destination by using voice recognition
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Select âĂIJSay Destination NameâĂİ button 5. User says the name of destination 6. Destination location is retrieved 7. Application responds by confirming name of destination
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 7**, if user says location name and no results are found, a message displaying an error will alert user to try again
Post condition	User destination selected
Exception Paths	None

3.1.14 Visual Representation of path to location

The mobile application will generate a moving map which the user will be able to visually see as they walk, and will be updated based on the users needs.

use case name	Visual Representation of path
trigger	User confirms location
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile Application has to be open User selected location to navigate to User has confirmed destination
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Find Location 5. Confirm Location 6. Application calculates path to destination 7. Path is displayed on graph to indicate which route the user will follow to destination
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4**, if location cannot be determined a message is displayed alerting user that location could not be determined
Post condition	Path to destination visually represented to user
Exception Paths	User may abandon path at any time

3.1.15 Search Location

The mobile application will enable a feature where the users will be able to search locations.

use case name	Search Location
trigger	User selects option to search for a location
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile app has to be open
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Select Search Location tab 5. User selects location
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 5**, if location does not exist user will be notified that their currently selected location does not exist
Post condition	User selected location to navigate to, path to location from the users current location is calculated
Exception Paths	User can abort the search for a location at any time

3.1.16 Bluetooth connection for buildings

Need to have bluietooth connected in order to locate paths within buildings, as well as buildings with multiple floor levels.

use case name	Find Class In Building
trigger	User enters building
Precondition	User has to be connected to the Wi-Fi network GPS has to activated on the device Mobile Application has to be open User selected location to navigate to User has confirmed destination User is navigating to building User enters building
Basic Path	1. Connect to Wi-Fi network 2. Activate GPS 3. Open mobile app 4. Find Location 5. Confirm Location 6. Application calculates path to destination 7. User navigates to destination 8. When user enters destination building, Bluetooth beacons are used to calculate floor of user well as exact location and floor of destination and calculates path to class
Alternative Path	In **step 1**, if the user cannot connect to a Wi-Fi network, GPS must be used to determine location In **step 2**, if satellite is down or GPS cannot obtain location, Wi-Fi triangulation is used to determine user location In **step 4**,if location cannot be determined a message is displayed alerting user that location could not be determined
Post condition	Path to destination in building displayed to user
Exception Paths	User may abandon path at any time

4 Non-Functional Requirements

4.0.1 Campus/ Location

By this we mean all the buldings and venues (lecture halls, labs, sports fields etc..) on campus that has to be incoparated in the system.

4.0.2 Wifi access points

As there is over 1000 wi-fi connection points it will play a major role for the application.

4.0.3 Reliability of NavUP

As students will use the application find venues, the application has to be reliable in such a way students reach to their desired destination.

4.0.4 Performance of NavUP

Performance will come into play with the wifi signal strengh in and out the buildings and crowd sourcing which shows the congestion on the routes you taking.

4.0.5 Usability of NavUP

Interfaces needs to be designed for different levels of user. The application should be usable for different types of users that will be using the system.

4.0.6 Maintainance

Access will be provided to the network team and the development team for the maintainace of the application.

4.0.7 Data Integrity of the NavUP

Data of provided by the application should be correct as there will be a lot of push notification of activities and gamification (reward systems)

5 Tracability Matrix

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Requirements Tracability Matrix													
Requirement		Find Location	Update Location	Add RV Locations	Remove Location	Track Time to Location	RT Tracking	Suggest Locations	Update path based on Traffic	Generate Path to Location	Search Location	Visual Representation of Path	Add Timetable to Mobile App
Test Cases	Totals	1	2	3	1	1	3	1	1	1	1	1	1
Verify Location	3	X		X				X					
Display Valid Path	1											X	
Update Location	1		X				X						
Store RV Locations	1			X							X		
Update Path	1								X				
Generate Valid Path	1						X			X			
Estimate Time to Location	1		X										
Track Daily Movement	1			X									
Remove Location	1				X								
Detect Traffic Congestion	3					X	X		X				
Add Timetable	1												X
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1.5

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