COS301
Mini Project
Functional Requirements Specification

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https://github.com/MarnoH/YellowTeamRoundOne

Contents

1 Introduction

1.1 Purpose

The purpose of this document is to provide a detailed description of the requirements for the NavUP application. It will explain the purpose and features of the system, as well as system constraints. This document is intended to be proposed to University of Pretoria lecturers and software development companies in mind, as well as a reference for developing the first version of the NavUP system.

1.2 Scope

NavUP is a mobile application that provides personnel on the University of Pretorias Hatfield campus the ability to conveniently navigate around the campus through the use of a range of features, technologies, and gamification principles.

NavUP will allow users to create optimal routes from their current location to a desired location. They will also be able to save previous routes and locations for easy access. NavUP will have the ability to send notifications to appropriate parties to inform them of achievements, events, and activities around campus. Login and register option will be available for students and staff to which their personal data will be saved.

NavUP will also include ClickUP integration, class schedule management, and integration allowing users to ensure they can get to campus in a timely fashion. The real time nature of the crowdsourcing concept behind NavUP will make it accurate, responsive, and beneficial. Users will be allowed to contribute to the crowdsourcing nature of NavUP by being able to report events such as protest action, and long queues at entrance gates or restaurants.

1.3 Definitions, Acronyms, and Abbreviations

Crowdsourcing - The practice of obtaining information or input into a task or project by enlisting the services of a large number of people, either paid or unpaid, typically via the Internet.

Gamification - The application of typical elements of game playing (e.g. point scoring, competition with others, rules of play) to other areas of activity, typically as an online marketing technique to encourage engagement

with a product or service.

ClickUP - A Blackboard Learn division dedicated to the University of Pretoria. It is a virtual learning environment and course management system developed by Blackboard Inc. It is Web-based server software which features course management, customizable open architecture, and scalable design that allows integration with student information systems and authentication protocols.

User - Someone who interacts with the NavUP application.

UP - University of Pretoria

Student - A student enrolled at the University of Pretoria

Staff - A staff member of the University of Pretoria

Admin - System Administrator who is given specific permission to manage and control the application.

1.4 References

Kung, D. (n.d.). Object-oriented software engineering. 1st ed.

1.5 Overview

Describe the rest of the SRS and its structure/layout

2 Overall Description

- The following section will provide an overview of the whole NavUp application. The explanation of the application will inaugurate the basic functionality of it, as well as exhibiting how the application communicates with other systems. It will also describe the different types of collaborators that will make use of the application and also specify the different functionality that is available for each collaborator. At the end of this section we also present the constraints and assumptions that we've identified for the application.

2.1 Product Functions

2.2 User Characteristics

There are four types of users that will interact with the application namely: Visitors, Students, Staff and Admin. Each of these users have their own

requirements and they all have different use for the application. A Visitor can only search for a venue. He/She will most probably be using their mobile device. They must be able to search, select their desired locating from the resultant search and navigate to it. If perhaps the Visitor knows more about his/her desired destination advanced searches could also be allowed where the Visitor can then enter multiple criteria in order for the results to be more refined.

The UP Staff will typically use the Web application where they'll manage information about consultation times, availability etc. They could for example provide their contact information and other details they see fit.

The Administrators are assumed to only interact with the Web application for the are responsible for managing the overall application ensuring that the information the application retrieve for the user is always correct and up to date.

2.3   Constraints

- A connection to campus WI-FI is a constraint for NavUP. Since the application needs to locate the position of the user with enough accuracy to navigate through buildings and locate individual lecture halls, a constant internet connection (specifically campus WI-Fi) is required during the duration of the users walk between venues. - NavUP is also constrained by the level of accuracy required to navigate between locations within close proximity. Hence a comination of technologies needs to be implemented to meet this constraint.

2.4   Assumptions and Dependencies

One assumption about the application is that it will mostly be used on mobile phones that are Wifi compatible and have enough performance power to be able to use the application effectively. If your device does not have enough resources available for the application, it might not work as intended or might not work at all. It is assumed that the application will be opened with all other applications being closed. It is also assumed that the Wifi connection will be steady and consistent but off-line functionality could also be provided. It is also assumed that the GPS components in all devices work in a similar way.

3 Specific Requirements

3.1 Functional requirements

- Using NavUP, users will be able to search for a desired location. Depending on search criteria , the application will display the desired location on a map of campus, or generate an optimal route between the user's current and desired location. - Students and Staff will be able to create custom timetables that will generate optimal routes between locations automatically. - Based on user interests, users can be notified of events (created by students and staff) happening on campus. - Users will be able to view leaderboards and earn achievements through the use of NavUP.

1. Navigation

   - Create route to valid location
     - Use a valid location as well as the users current location to find the fastest path to said location. Needs to consider valid traversable paths, shortest path, and traffic congestion as variables.
     - Preconditions
       * User must be connected to the Wi-Fi
       * User must be higher than guest status
     - Postconditions
       * A route will be generated and displayed graphically
       * Directions will be supplied
   - Save routes
     - Save the routes to the users collection for convenience and easy access.
     - Preconditions
       * User must be logged in
       * Route must be generated
     - Postconditions
       * A new entry in the users saved route collection will be made
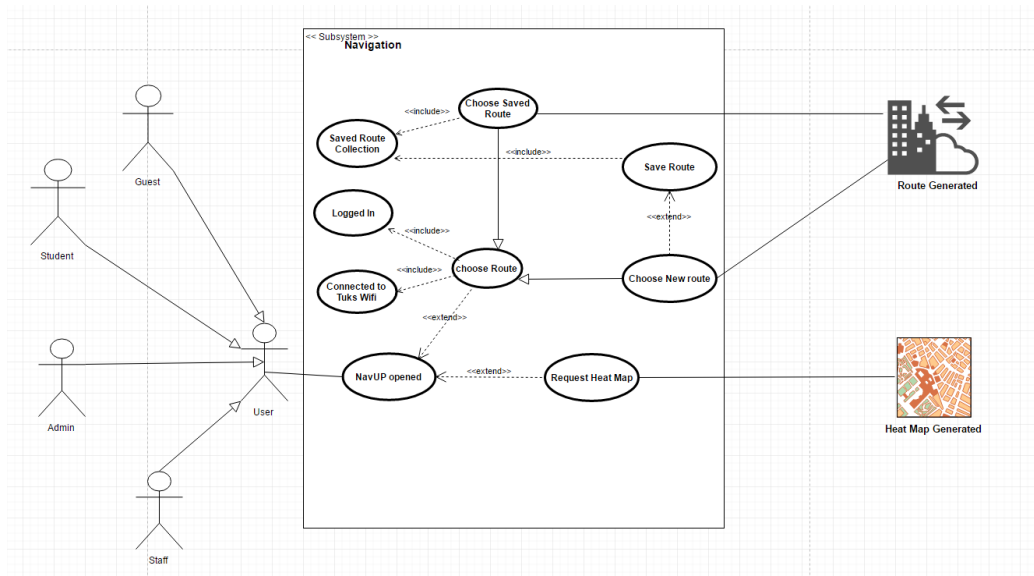
Figure 1: use case Navigation.

- Heat maps
    - Use statistics and analytical data to generate heat maps of traffic concentration overtime to help users make navigational decisions.
    - Preconditions
        * Locations of users must be sent to the system to determine density of crowds
    - Postconditions
        * A heat map indicating the amount of congestion on Hatfield campus will be returned to the user.

2. Location management

- Current user location
    - An accurate representation of the users current position must be displayed on the map. It should include the building and lecture hall said user is currently in. The users location should be accurate in order for crowd sourcing calculations to be accurate.

- Preconditions
  * User must be logged in and registered
  * User must be connected to the Wi-Fi
- Postconditions
  * The location of the user is saved to the system
  * Users location is displayed on the users map.

- Save locations
  - To allow quick access to frequently visited locations the user must be allowed to save these locations to a collection.
  - Preconditions
    * The location must be valid and selected
  - Postconditions
    * The location will be added to the users collection of saved locations

- Search for locations
  - The user must be able to search for a building or lecture hall and be presented with an accurate result. The user must also be able to request a path be traced from his current location to the searched location
  - Preconditions
    * Must be logged in and have queried the database
  - Postconditions
    * The location is returned to the user or a message indicating that it couldnt found.

- Report protest action or emergency
  - Use the notification system to create an event which concerns a specific group of users. For instance, informing all students who are registered for a specific module that a lecture is cancelled.
  - Preconditions
    * Have to be either an admin or a staff user.
    * Have to be logged in
    * Access to a group of users information

- Postconditions
  * Notifications are received by all concerned parties
- Create public event
  - Create an event on the map concerning a specific group of users. This event could be a day house event. competition , or sale at a bookshop.
  - Preconditions
    * Be authorized to create these events. Therefore be a staff or admin user.
    * Have to be logged in
    * Access to a group of users information
  - Postconditions
    * A new waypoint is added to the system.
    * This event is displayed on users maps.
    * Notifications are sent to the users
- View all locations
  - Users must be able to accurately locate points of interests on the map such as restaurants, buildings, lecture halls, bathrooms.
  - Preconditions
    * Have access to campus wi-fi
  - Postconditions
    * Locations are loaded onto the users mobile application
- Request addition, removal, or modification of locations
  - Update the system database with location modification.
  - Preconditions
    * Have to be a staff or admin account
  - Postconditions
    * Location is updated on all users applications

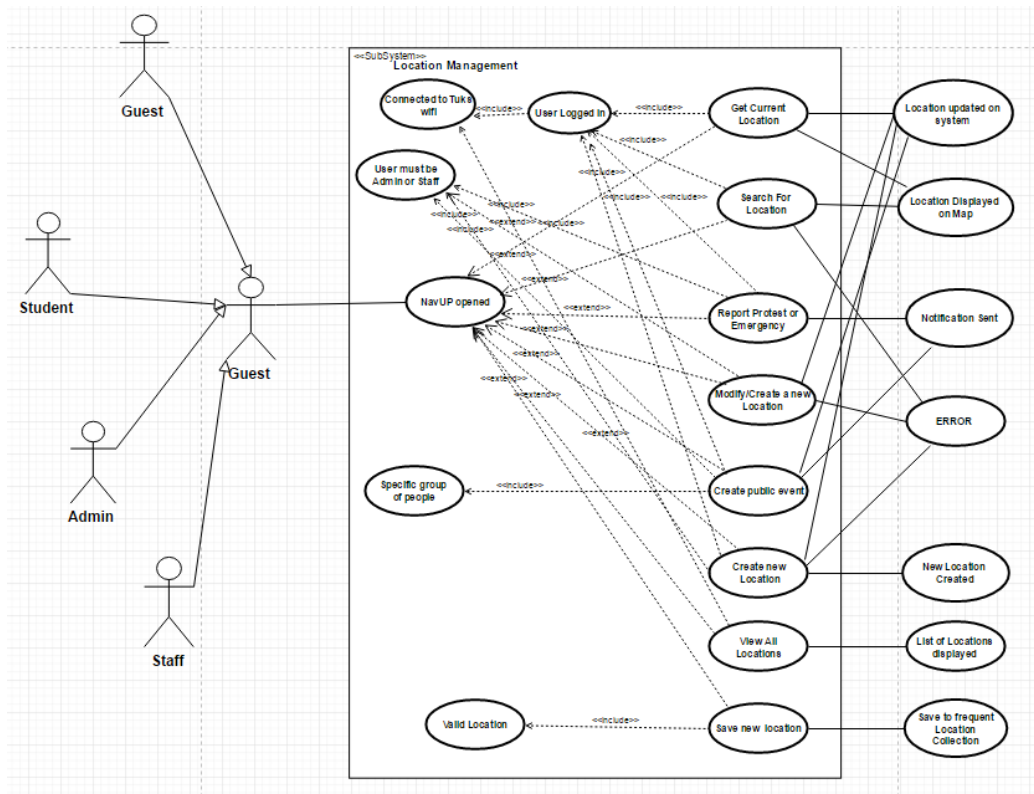3. User management

- Link with ClickUP Modules

Figure 2: use case Location.

- Lecture, practical, and tutorial schedules are synchronised with NavUP to help students with their timetable creation and ensure they are at venues on time.
- Preconditions
  * Have to be registered on NavUP
  * Have to be registered on ClickUP
  * Must be registered on ClickUP for specific modules
- Postconditions
  * Venues have a list of lectures, practicals, and tutorials listed at specific times.

- Create and personalise class timetable to integrate into map
  - Allow users to create a timetable in NavUP which notifies them when a class is starting, where it is, and a efficient route to travel.
  - Preconditions
    * Enter modules, times and venues into the timetable manager
  - Postconditions
    * Generated weekly timetable and schedule

- Register as student, staff, or admin
  - Use your University of Pretoria details to register on system in order to gain access to more of the applications features. Guest have limited access.
  - Preconditions
    * Be a student/staff of UP. I.E. Have an account
    * Submit details on registration form
  - Postconditions
    * A personal account and profile is created for the user on the system

- Login
  - Query users valid details on the systems database through the login page to gain access to the account
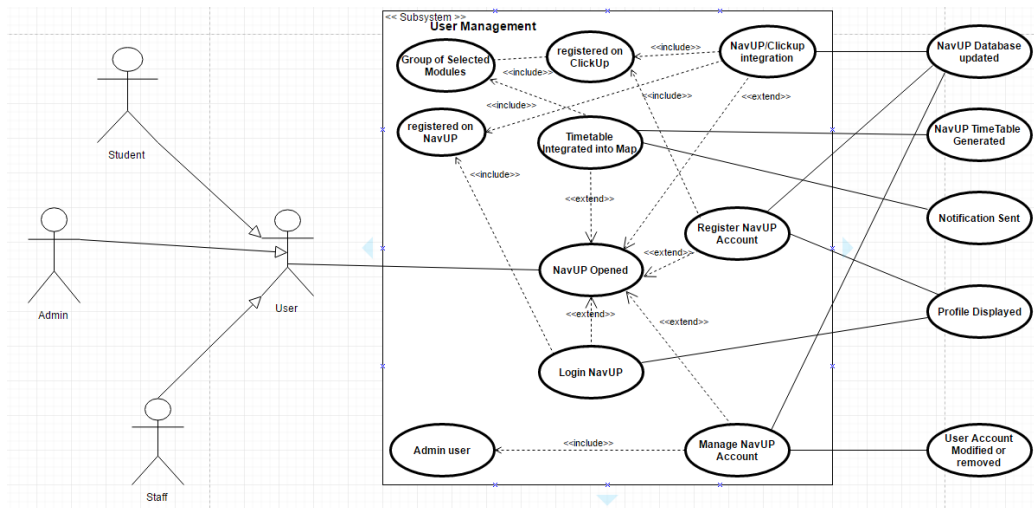 - Preconditions

Figure 3: use case User Management.

* Have to be registered on NavUP
* Have to submit details on the login page
- Postconditions
  * The user is redirected to their profile
  * Have access to registered user features

• Manage user accounts
  - User management is necessary if a user experiences problems with their password or any account related issues. Additionally deregistered and graduated students as well users who abuse the system must be removed from the system.
  - Preconditions
    * Have admin account and therefore rights
    * Have internet access
    * A management system in place
  - Postconditions
    * Users account related problems can be solved
    * Users can be removed from the system

4. Gamification

- Challenges, badges, awards
  - Give users challenges to complete and award them with points using an arbitrary points system. E.g. Overachiever: spent over 100 in the library.
  - Preconditions
    * Track user behaviour
    * Have a step counter feature
    * Be logged in to link activity to profile
  - Postconditions
    * Profile gains points
    * Position in leaderboard shifts
- Step counter
  - Measure the distance a user has travelled. Use wi-fi hotspots and crowdsourcing to determine the distance travelled by the user.
  - Preconditions
    * Be connected to the campus wi-fi
    * Be logged in
  - Postconditions
    * Distance travelled on users account will update accordingly
- View and contribute to leaderboards
  - All users other than admins and guests should be on a leaderboard representing users with the most achievements or distance travelled. For anonymity users should be represented by usernames on the leaderboard.
  - Preconditions
    * Users are registered
    * Users are logged
    * Connected to campus wi-fi
  - Postconditions
    * The system generates a universal leaderboard from all users
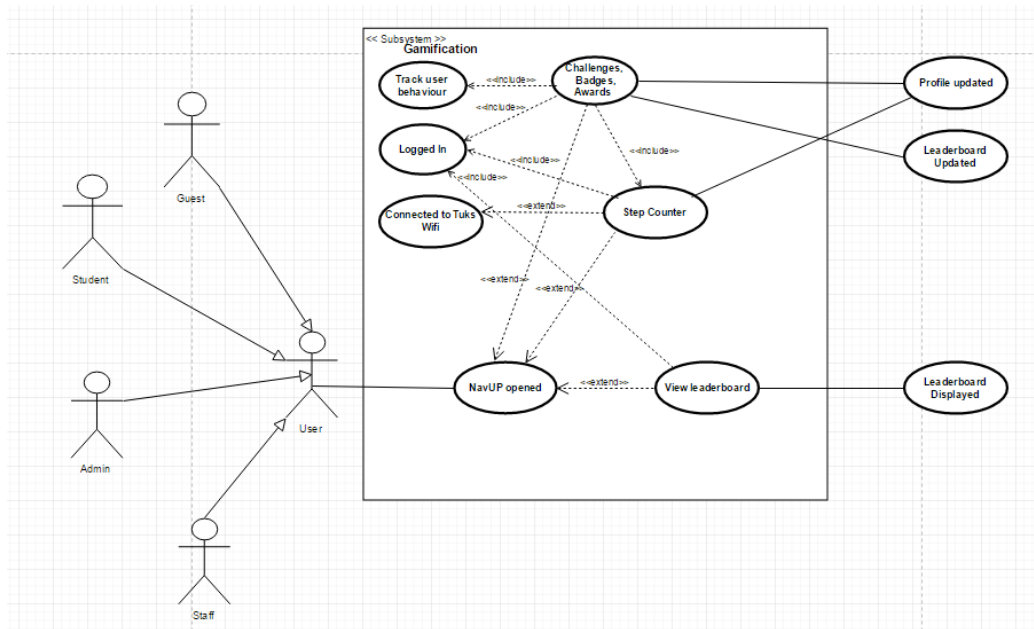
Figure 4: use case Gamification.

5. Personalisation

- Add profile information
  - Allow users to add a summary and personal information. Also create provision for the use of a username for anonymity.
  - Preconditions
    * Submit information to the server
  - Postconditions
    * Profile details will change as viewed by other users.
- Send friend requests
  - Request to add another user to his/her friends list in order to view their profile.
  - Preconditions
    * Send a request to the server which sends it to a user
  - Postconditions
    * A user receives a request to add another user to their friend list.

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- Accept/deny friend request
  - Allow users to accept or deny friend requests from other users
  - Preconditions
    * Receive a friend request
    * Accept it or deny it
  - Postconditions
    * Other user will be notified if the user accepts the friend request
    * Both users friend list will be updated
- View friends profile
  - Allow two users who are on each others friend list to view each others profiles
  - Preconditions
    * Be on each others friend list
    * Send a request to the system to view the profile
  - Postconditions
    * The user is redirected to the other users profile if he has permission

3.2 Performance Requirements

- The system will be used by the students, guests and staff of up. If everyone uses the system then it should be able to handle +/- 50 000 users.
- The application should provide accurate locations in a constantly changing environment. Heat maps, user preferences and suggestions should have a response time of a few seconds.
- Maps of campus should be updated, to ensure accurate location estimation.
- It should be able to handle +/- 50 000 users concurrently (simultaneously) when implemented into a suitable production environment.
- Offline activities should have a response time of +/- 0.1 seconds (instantaneous), while online activities such as calculating routes should have a response time of +/- 5.0 second so that the users have an uninterrupted experience.
- The application should be reliable, in that it will provide the fastest route every time without fail and complete all other computations successfully.
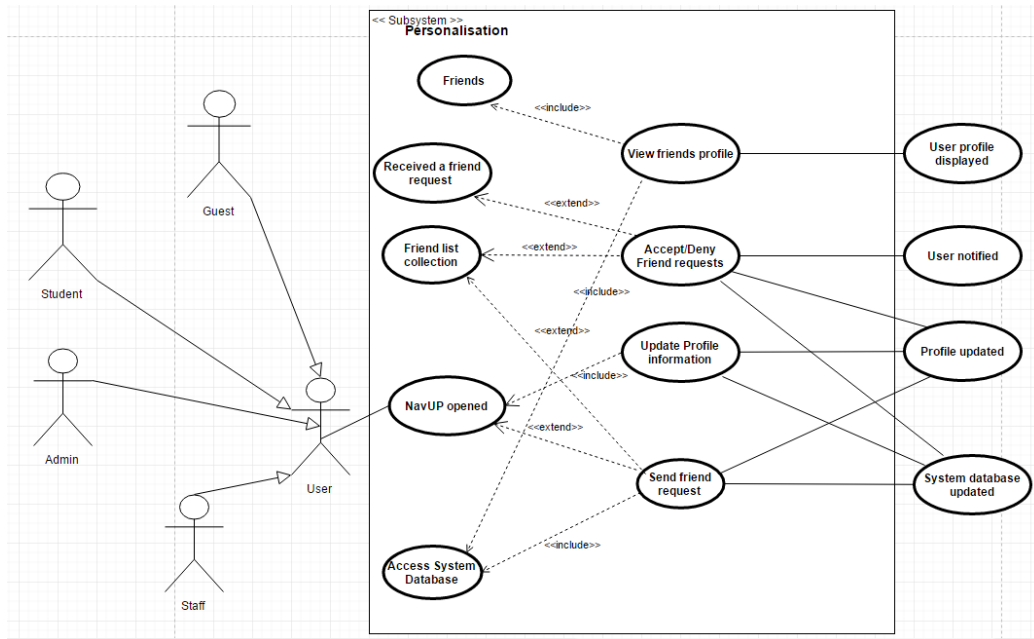
Figure 5: use case personalisation.

3.3   Design Constraints

- The Nav UP application must be able to run on a cellphone which has limited process power and battery life. It thus has to be efficient and not drain battery life quickly.
- The application should not use a lot of bandwidth.
- The interface should be mobile compatible.
- Indoor navigation can only use wifi and not GPS.
- The application should work on Android and iOS devices.
- The application should not work on mobile data, but only on wifi.
- The application should have an aesthetically pleasing and easy to use interface.

3.4   Software System Attributes

- Users should have the option to withdraw all information gathered by the system.
- The system should be available online as well as offline.

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- The system should stay updated, to ensure reliable information. For instance the maps of campuses should be updated regularly.
- The system should easily be updated, without complications.
- The system should be managed efficiently, checking for problems regularly.
- The system should be secure to prevent unauthorized modification or access of information.
- The system should be user-friendly, the application should meet the requirements of the user by providing good access for disabled users, and resulting in a good overall user experience.

4 Appendixes

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