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Testing Report

Broadsword Access

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Contents

1 Introduction

This chapter of the document aims to present the findings of the indepth testing done on the Gladios instance of the NavUP application. A test model was used for the various specifications of the core functions and innovations implemented.

1.1 Definitions, Acronyms, and Abbreviations

Table 1: Table of Definitions, Acronyms, and Abbreviations used in this document
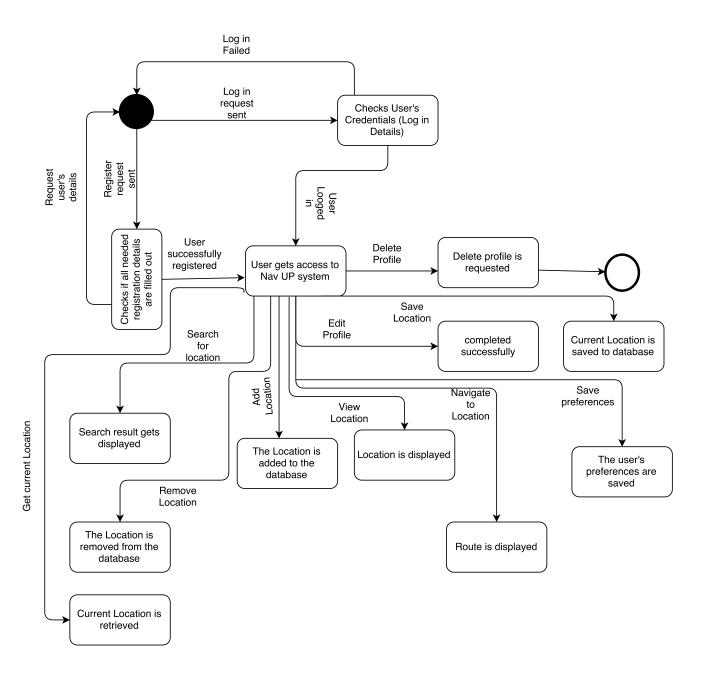
Term	Definition

1.2 Overview

The remainder of this document will consist the test model used during testing, to functional requirements tested as well as the non-functional requirements tested.

https://github.com/KeatonPennels/COS-301-Broadsword-Access

2 Test Model

Log in
Failed

Log in
request
sent

Checks User's
Credentials (Log in
Details)

Request
user's
details

Register
request
sent

User
Looged
in

Checks if all needed
registration details
are filled out

User
successfully
registered

User gets access to
Nav UP system

Delete
Profile

Delete profile is
requested

Current Location is
saved to database

Save
Location

Edit
Profile

completed
successfully

Search
for
location

Search result gets
displayed

Add
Location

View
Location

Navigate
to
Location

Save
preferences

The Location is
added to the
database

Location is displayed

The user's
preferences are
saved

Remove
Location

The Location is
removed from the
database

Route is displayed

Get current Location

Current Location is
retrieved

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3 List of Service Contracts Tested

NavUP is currently envisioned as a native mobile application that serves to navigate users around the Hatfield campus of the University of Pretoria. This application will be utilised by students, staff and visitors to the Hatfield campus in order to find their way around.

3.1 Users

3.1.1 User Registration

Input Element	Type	Value Specification	Valid	Invalid	Exceptional Cases
Username	string	Not used by another user	Unique username which does not exist on the system	Username already exists; No Input	N/A
Email	string	Valid email address format	The email address satisfies the email address format	Email address not in the required format; No Input	N/A
Password	string	8 characters and at least 1 number	Password satisfies the set requirements	Password doesn't satisfy the set specifications; No Input	N/A
Re-type Password	string	Same as previous password	Matches previously entered password	Doesn't match previous password; No Input	N/A
Full Name	string	Name and surname	Any string	No Input	N/A

Figure 1: Input Values Required

Test case	Username	Email	Password	Re-Type Password	Full Name	Expected Outcome
1	Valid	Valid	Valid	Valid	Valid	Registration successful
2	Invalid	Invalid	Invalid	Invalid	Invalid	Registration failed. Error message displayed
3	Valid	Invalid	Valid	Valid	Valid	Registration failed. Email related message displayed
4	Valid	Valid	Valid	Invalid	Valid	Registration failed. Password related message displayed
5	Invalid	Valid	Valid	Valid	Valid	Registration failed. Username related message displayed

Figure 2: Test Cases

Test case	Username	Email	Password	Re-type password	Full name	Expected Result	Actual Result
1	U15071830	U15071830@tuks.co.za	Password1	Password1	Munyaradzi Mpofu	Registration successful	Registration successful
2						Registration failed.	Registration Failed
3	U15071830		Password1	Password1	Munyaradzi Mpofu	Registration failed. Email related message displayed	Registration failed. Red border appears around email input field
4	U15071830	U15071830@tuks.co.za	Password1	1234	Munyaradzi Mpofu	Registration failed. Password related message displayed	Registration failed. Red border appears around retype password input field
5		U15071830@tuks.co.za	Password1	Password1	Munyaradzi Mpofu	Registration failed. Username related message displayed	Registration failed. Red border appears around username password input field

Figure 3: Use Case Based Testing

Test Case 1
Action: Fill out all of the user registration details with correct data
Expected Result: The registration is a success
Actual Result: The registration was a success. A message is displayed to the

user to indicate it was a success and the user is navigated back to the sign in page

Test Case 2
Action: All registration input fields are left blank
Expected Result: The registration is unsuccessful
Actual Result: The registration was not successful; the input boxes had a red outline to indicate that the data needed to be filled in
Possible improvements: Feedback in the form of text could have been given to indicate that the data needs to be filled in before a successful registration can be achieved

Test Case 3
Action: An incorrect email address is entered
Expected Result: The registration is unsuccessful
Actual Result: The registration was a success
Possible improvements: The application should check if the users email address actually exists before allowing users to register with it

Test Case 4
Action: Register using two different passwords
Expected Result: The registration is unsuccessful
Actual Result: The registration was not successful, the password input boxes have a red border to indicate there was a problem
Possible improvements: More feedback could be given. For example, a message saying that the passwords are not the same could be displayed. This would help the user as there could be other issues with the password such as it not being long enough or the password is not successful since it may need capital letters or characters.

Test Case 5
Action: Register using two different email addresses
Expected Result: The registration is unsuccessful
Actual Result: The registration was not a success, the email input boxes have a red border around them.
Possible improvements: More feedback could be given as to what the problem with the email addresses was.

Test Case 6
Action: Register more than one user with the same username
Expected Result: The registration is unsuccessful
Actual Result: The registration was a success
Possible improvements: More should be done in order to ensure that only users with unique usernames are allowed to register.

Test Case 7
Action: Register more than one user with the same email address

Expected Result: The registration is unsuccessful
Actual Result: The registration was a success
Possible improvements: The system should ensure that users are not registered to the application if their given email address is already been used by another user. This is important since email addresses are used to sign into the application.

Total Mark: 4.5/10
Additional Comments: Since almost half of the registration tests failed, the awarded mark out of ten was reduced to five and a half. This mark was then reduced by one since other improvements such as more feedback could be added in order to improve the registration process.

3.1.2 User Login

Input Element	Type	Value Specification	Valid	Invalid	Exceptional Cases
Email	string	Valid email address format	The email address satisfies the email address format	Email address not in the required format; No Input Email has not been registered on the system	N/A
Password	string	8 characters and at least 1 number	Password satisfies the set requirements	Password doesn't satisfy the set specifications; No Input; Username does not match password	N/A

Figure 4: Input Values Required

Test case	Email	Password	Expected Outcome
1	Valid	Valid	Login successful
2	Invalid	Invalid	Login failed. No input error message displayed
3	Valid	Invalid	Login failed. Username and password related message displayed

Figure 5: Test Cases

Test case	Email	Password	Expected Outcome	Actual Outcome
1	U15071830@tuks.co.za	Password1	Login successful	Login successful. The user is taken to a view of the map.
2			Login failed. No input error message displayed	Login failed. All the input fields have a red border around them.
3	U15071830@tuks.co.za	Invalid	Login failed. Username and password related message displayed	Login failed. Message box displayed stating "incorrect username or password entered"

Figure 6: Use Case Based Testing

Test Case 1
Action: Fill out all of the user login details with correct data
Expected Result: The user will be logged in successfully
Actual Result: The login was a success; a message is displayed to the user that they have logged in successfully
Possible Improvements: Instead of the application taking the user to the navigation page once they have logged in, they could instead be taken to a homepage.

Test Case 2
Action: All login input fields are left blank
Expected Result: The login is successful
Actual Result: The login was not a success, the input boxes glow red to indicate that they should be filled in in order to login
Possible Improvements: The user could also be notified by means of an alert which indicates why the login was unsuccessful

Test Case 3
Action: Fill out the user login details with a correct username and an incorrect password
Expected Result: The login is not successful
Actual Result: The login was not a success, a message is displayed which states that either the email address or password were incorrect

Total Mark: 9/10
Additional Comments: Since the actual results of all there test cases were the same as the expected results, the sign in should be awarded full marks. However, since the sign in can still be improved by giving the user more feedback when data is left blank, only 9/10 was awarded as there is still room for improvement.

3.1.3   Edit Profile

Input Element	Type	Value Specification	Valid	Invalid	Exceptional Cases
Email	string	Valid email address format	The email address satisfies the email address format	Email address not in the required format; No Input; Email address already in use	N/A
Full Name	string	Any space separated string	Any space separated string	No Input;	N/A

Figure 7: Input Values Required

Test case	Email	Full name	Expected Outcome
1	Valid	Valid	Profile update successful
2	Invalid	Invalid	Profile update failed. No input error message displayed
3	Invalid	Valid	Profile update failed. Invalid email related error message.

Figure 8: Test Cases

Test case	Email	Full name	Expected Outcome	Actual outcome
1	U15071830@tuks.co.za	Munyayradzi Mpofu	Profile update successful	Profile update successful
2			Profile update failed. No input error message displayed	Profile update failed. A red border appears around the input fields.
3		Munyayradzi Mpofu	Profile update failed. Invalid email related error message.	Profile update failed. A red border appears around the input fields.

Figure 9: Use Case Based Testing

Test Case 1
Action: Update the user details and fill out all required input fields
Expected Result: The profile update is successful
Actual Result: The profile update is successful and the user is notified of the successful profile update.
Possible Improvements: Once the profile has been updated, the application remains on the update profile screen. As a possible improvement, the application could navigate back to the menu instead.

Test Case 2
Action: Update the user details and omit the details in one of the required input fields

Expected Result: The profile update process is not completed.
Actual Result: Upon clicking the "Update profile" button, a red border appears around the empty input field, and the profile update fails.
Possible Improvements: A possible improvement would be to notify the current user by means of an alert indicating to them why the profile update failed.

Test Case 3
Action: Update the user details with an invalid email address
Expected Result: The profile update process is not completed.
Actual Result: The update is a success even though the password is not valid
Possible Improvements: The email address of the user should be validated

Total Mark: 5/10
Additional Comments: The mark awarded for this module is 5/10 since the process of updating oneâĂŹs profile was not a completely uniform process. This is mainly because the user has to navigate to a different page if they wish to update their password. Marks were also lost since one of the test cases failed. A possible improvement could be to add an input field to the âĂIJEdit ProfileâĂİ page for the user to change their password.

3.1.4 Delete Profile

N/A

3.2 GIS (GIS Management)

3.2.1 View GIS Data

Test Case 1
Action: The admin user presses the "Manage GIS" button
Expected Result: The application displays an interface for the admin user to manage locations.
Actual Result: The application displays a list of location names. It is assumed that this is a representation of GIS objects.
Possible Improvements: The list of GIS locations displayed could also include the GPS coordinates of the location to the admin user.

Total Mark: 2/10
Additional Comments: The application is intended to display an interface which an admin user can use to manage GIS locations, but instead it only provides a list of locations and no options to make any changes to these objects.

3.2.2 Add GIS Data

N/A

3.2.3 Edit GIS Data

N/A

3.2.4 Remove GIS Data

N/A

3.3 Points of Interest (Location Access)

3.3.1 Search Location

<u>Test Case 1</u>
Action: The search icon is pressed with the intent of searching for a location on the map
Expected Result: The application displays an input field in which the user can enter a location name and search for it
Actual Result: The application displays a list of location names.
Possible Improvements: The application could offer a search bar which the user can use to search for a specific location.

Total Mark: 2/10
Additional Comments: The absence of a search bar when searching for a location could lead to a very inconvenient experience for the user, especially if the user has a large list of saved locations.

3.3.2 Save Location

N/A

3.3.3 Get Current Location

<u>Test Case 1</u>
Action: The "Get Current Location" icon is pressed by the user.
Expected Result: The application will mark the user's current location on the map
Actual Result: The application marks a location on the map which is not the current user's location
Possible Improvements: A possible improvement would be to mark the user's correct location on the map

Total Mark: 2/10
Additional Comments: The application marks a location on the map, although this locations is not the correct location. This would lead to incorrect locations being saved, and could also affect the process of navigating from the users current location to another desired location.

3.4   Points of Interest (Location Management)

3.4.1   View Locations

N/A

3.4.2   Add location

N/A

3.4.3   Modify Location

N/A

3.4.4   Remove Location

N/A

3.5   Navigation

3.5.1   Navigate to Location

N/A

3.5.2   Save Preferences

N/A

Input Element	Type	Value Specification	Valid	Invalid	Exceptional Cases
Email	String	A string containing an "@" as well as a valid domain	Email satisfies the value specification and is not used by another user	Email satisfies the value specification and is not used by another user	Strings with illegal special characters
Password	Password	The length must be 8 characters or more. It should contain a capital letter as well as a number	The password satisfies the password rule given on the left	The password does not satisfy the value specification	Passwords with length = 0 or very large lengths Passwords with spaces, control characters or special characters

Figure 10: Input Values Required

Test Case	Email	Password	Expected outcome
1	Valid	Valid	show Login Successful page
2	Valid	Invalid	show Error Message
3	Valid	Exceptional	show Error Message
4	Invalid	Valid	show Error Message
5	Exceptional	Valid	show Error Message

Figure 11: Test Cases

Test Case	Email	Password	Expected outcome	Actual outcome
1	"stephaniegroutsch@gmail.com"	"Stephanie1"	show Login Successful page	The login was a success. A message saying the login was a success appears and the user is navigated to the navigation page
2	"stephaniegroutsch@gmail.com"	"InvalidPassword1"	show Error Message	The login was not a success. A message saying that either the email or password were invalid appears
3	"stephaniegroutsch@gmail.com"	"Stephanie 1"	show Error Message	The login was not a success. A message saying that either the email or password were invalid appears
4	"notRegistrerd@gmail.com"	"Stephanie1"	show Error Message	The login was not a success. A message saying that either the email or password were invalid appears
5	"steff@steff@gmail.com"	"Stephanie1"	show Error Message	The login was not a success. A message saying that either the email or password were invalid appears

Figure 12: Use Case Based Testing

3.6   Registration

Additional comments:

Feedback in the form of text could have been given to indicate that data needs to be filled in before a successful registration can be achieved.

More should be done in order to ensure that only users with unique usernames are allowed to register

The system should ensure that users are not registered to the application if their given email address is already been used by another user. This is important since email addresses are used to sign into the application.

Since almost half of the registration tests failed, the awarded mark out of ten was reduced to five and a half. One mark was then subtracted from this mark since more feedback could have been given.

Mark awarded: 4.5/10

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3.7 Login:

Input Element	Type	Value Specification	Valid	Invalid	Exceptional Cases
Username	String	A string that starts with a "u" followed by a number	Username satisfies the value specification and is not used by another user	Username does not satisfy value specification or the username already exists	Strings with length = 0 or very large lengths Strings with spaces, control characters or special characters
Full Name	String	Two separate strings containing at least one character each	Full name satisfies the value specification	Full name does not satisfy value specification	Strings with length = 0 or very large lengths Strings with spaces, control characters or special characters
Email	String	A string containing an "@" as well as a valid domain	Email satisfies the value specification and is not used by another user	Email satisfies the value specification and is not used by another user	Strings with illegal special characters
Confirm Email	String	Match with email	Retyped email does match email	Retyped email does not match email	
Password	Password	The length must be 8 characters or more. It should contain a capital letter as well as a number	The password satisfies the password rule given on the left	The password does not satisfy the value specification	Passwords with length = 0 or very large lengths Passwords with spaces, control characters or special characters
Confirm Password	Password	Password matches original password	Match with password	Retyped password does not match password	

Figure 13: Input Values Required

Test Case	Username	Full name	Email	Confirm email	Password	Confirm Password	Expected outcome
1	Valid	Valid	Valid	Valid	Valid	Valid	show Registration Successful page
2	Valid	Valid	Valid	Valid	Valid	Invalid	show Error Message
3	Valid	Valid	Valid	Valid	Invalid	Valid	show Error Message
4	Valid	Valid	Valid	Valid	Exceptional	Valid	show Error Message
5	Valid	Valid	Valid	Invalid	Valid	Valid	show Error Message
6	Valid	Valid	Invalid	Valid	Valid	Valid	show Error Message
7	Valid	Valid	Exceptional	Valid	Valid	Valid	show Error Message
8	Valid	Invalid	Valid	Valid	Valid	Valid	show Error Message
9	Valid	Exceptional	Valid	Valid	Valid	Valid	show Error Message
10	Invalid	Valid	Valid	Valid	Valid	Valid	show Error Message
11	Exceptional	Valid	Valid	Valid	Valid	Valid	show Error Message

Figure 14: Test Cases

Test Case	Username	Full name	Email	Confirm email	Password	Confirm Password	Expected outcome	Actual outcome
1	"u14293324"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Stephanie1"	"Stephanie1"	show Registration Successful page	The registration was a success. A message is displayed to the user to indicate it was a success and the user is navigated back to the sign in page
2	"u14293324"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Stephanie1"	"Stephanie2"	show Error Message	The registration was not a success. A red border appears around the confirm password input box.
3	"u14293324"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"steff"	"steff"	show Error Message	The registration was not a success. A red border appears around the password input box.
4	"u14293324"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Groutsch1 1"	"Groutsch1 1"	show Error Message	The registration was a success. A message is displayed to the user to indicate it was a success and the user is navigated back to the sign in page
5	"u14293324"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch22@gmail.com"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was not a success. A red border appears around the confirm email input box.
6	"u14293324"	"Joe Soap"	"s@jks123.shouldnotwork"	"s@jks123.shouldnotwork"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was a success. A message appears to say the registration was a success and the user is navigated to the Login page
7	"u14293324"	"Joe Soap"	"s@jks@123.wrong"	"s@jks@123.wrong"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was not a success. A red border appears around email input box.
8	"u14293324"	"Joe"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was not a success. A red border appears around the Full name input box.
9	"u14293324"	"St3ff Grou@sch"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was a success. A message appears to say the registration was a success and the user is navigated to the Login page
10	"u"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was a success. A message appears to say the registration was a success and the user is navigated to the Login page
11	"@"	"Joe Soap"	"stephaniegroutsch@gmail.com"	"stephaniegroutsch@gmail.com"	"Stephanie1"	"Stephanie1"	show Error Message	The registration was a success. A message appears to say the registration was a success and the user is navigated to the Login page

Figure 15: Use Case Based Testing

Additional comments:

Instead of the application taking the user to the navigation page once they have logged in, they could instead be taken to a homepage.

The sign in can still be improved by giving the user more feedback when data is left blank.

Since the actual results of all of the test cases were the same as the expected results, the sign in should be awarded full marks. However, since the sign in can still be improved by giving the user more feedback when data is left blank, only 9/10 was awarded as there is still room for improvement.

Mark awarded: 9/10

4 List of Functional Requirements Tested

This chapter aims to give an overview of the entire NavUP system. The system will be contextualised in order to demonstrate the basic functionality of the system as well as demonstrate how the system interacts with other systems. It will also describe the levels, or types, of users that will utilise the system and describe the functionality that is available to said user. At the end of this chapter, the constraints and assumptions for the system will be addressed.

- Create route to valid location

- Save routes

- Heat maps

- Current user location

- Save locations

- Search for locations

- Report protest action or emergency

- Create public event

- View all locations

- Request addition, removal, or modification of locations

- Register as student, staff, admin or guest

- Login

- Manage user accounts

- Add profile information

5 List of Non-Functional Requirements Tested

5.1 Performance requirements:

5.1.1 Performance:

- Offline activities should have a response time of $+/-$ 2 seconds (instantaneous) when responding to an activity, while online activities such as calculating routes should have a response time of $+/-$ 2-4 seconds so that the users have an uninterrupted experience.

- It should also allow the integration of a variety of services.

5.1.2 Reliability:

- The application should be reliable, in that it will provide the fastest route every time without fail and complete all other computations successfully.

- All activities should be completed with a 10

- The application should provide accurate locations in a constantly changing environment.

5.1.3 Security:

- Data transmission should be securely transmitted without unauthorized access, or loss of information.

5.2 Design Constraints:

- The system should be accessible on smart devices, such as Android and iOS devices.

- The system should not use GPS, but only the WiFi network.

- The proposed system should be able to be integrated into the Computer Science Department's Web site.

- The system should be a modular system, to reduce the dependencies in the system.

- Software Fault Tolerance: If a malfunction cannot be avoided, then the software design should be constrained so that the system can recover without causing damage to the system.

- The system should have an aesthetically pleasing and easy to use interface.

- The system must be able to run on smart devices which has limited processing power, battery life and storage space. The system must thus use resources efficiently.

- The system needs to use open source technologies.

5.3 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.

- 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.

6 Evaluation of Test Cases for Non-Functional Requirements

6.1 Security

Password Protection
Action: Attempt to circumvent the password protection
Expected Result: The password protection should be secure and impervious to circumvention.
Actual Result: The password protection at the login screen is secure and doesn't allow users to login unless their password is correct. The Profile Management page however has a loophole when changing passwords though, in that it allows users to change passwords even if the password they enter into the Old Password field (for authentication) is incorrect.
Possible Improvements: The app should lock down the profile if the password is entered incorrectly too many times. The profile can then remain locked until an authentication email is sent to the user allowing them to unlock their profile.
Mark: 7/10

SQL Injection
Action: Attempt to inject SQL code into the database
Expected Result: The SQL injection should be blocked by escaping the special characters entered.
Actual Result: The SQL injection couldn't be tested because none of the data entered is persisted to a database. However, no code was found to sanitize harmful characters from user input before passing it to the user module.
Possible Improvements: The app could escape characters before passing it to the user module.
Mark: 2/10

6.2 Stability

Crash Testing
Action: Attempt to crash the Access module through overloading input.
Expected Result: The app will remain running.
Actual Result: The app avoided crashing but was slowed down to an extent by the large amount of input.
Possible Improvements: The app should implement a character limit on input fields to fully guard against this issue.
Mark: 8/10

6.3   Accessibility

Support for disabilities with routes

Action: Does the app provide an option for routes that are friendly to people with disabilities?

Expected Result: The app does provides such a feature with routes that avoid stairs and follow wheelchair-friendly routes.

Actual Result: The app does not provide such a feature.

Mark: N/A

Support for colour-blindness

Action: Does the app provide an option to present the User Interface in a manner that is colour-blind friendly?

Expected Result: The app has options for different kinds of colour-blindness.

Actual Result: The app doesn't provide support for different kinds of colour-blindness.

Mark: N/A