Test Plan for NAV-B system

A smart and safe bicycle system

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System Test Plan

Testing is done to ensure that the system is safe from errors as it is crucial for our system because the users depend on the accurate functionality of our system. To maintain high quality of EVR Tech products, the system undergoes a thorough testing process to ensure the system is working in the manner in which it was intended. The main phases of testing that need to be completed before a system can be cleared for use are unit testing and integration testing.

Phase 1: Unit Testing

Unit testing will be conducted on individual components of the system to determine each component is functional as follows:

Smartphone Application Unit Test Plan

To test the smartphone, need to ensure,
- It is compatible with iOS version 8.0 and higher and Android versions
- The device is capable to connect to Bluetooth
- The smartphone has access to the internet to run the application
- The application connects to the Google API web service

Test Case	Expected Result
Data connectivity	Ensure the app has internet access without disruptions in transfer of data
Setting destination	Users should be able to easily set their destination
View prior trips	Ensure previous destinations are recorded
API mapping	Ensure that the navigational information and routes displayed are correct
Bluetooth pairing	Ensure the app is connected to the microcontroller board at all times while attempting to transmit data

Microcontroller Unit Test Plan

To test the microcontroller, need to ensure,
- The sample projects will be able to run first to get used to the programming style
- Test the connections of the unit
- The decoding is done correctly after Bluetooth is integrated to the microcontroller unit

Test Case	Expected Result
Bluetooth pairing	Ensure the board is connected to the app at all times and is receiving data
Decode data	Verify that the data transmitted is correct
Performance metrics	Ensure speed, distance and all other metrics are calculated correctly
Toggle function	The data outputted should change as required on using the button

Display Unit Test Plan

To test the display, need to ensure,
- No physical defect/damage
- Wiring with Arduino is done properly
- Receives data from Arduino
- Able to show expected output

Test Case	Expected Result
Reading the screen	Users should be able to read all data on the screen without squinting at the screen
Toggling the screen	The data on the screen should change based on the pressing of the toggle switch
Screen glare	The screen should be readable in excessive sunlight
Screen protection	The display should be scratch proof and the fitted Plexiglas should be shatter proof

Mechanical Holding Arm Unit Test Plan

To test the mechanical holding arm, need to ensure,
- It is easily adjustable by user
- It is lightweight and comfortably wearable to the user

Test Case	Expected Result
Heat dissipation	Ensure that the vents are enough to allow for dissipation of heat
Toggling switch	Check to ensure that the switch is within reach for the user
Display holder integrity test	The display holder must be firm and should not break upon contact with the ground
Holding arm integrity test	The holding arm should not be heavy and should remain firmly attached to the side while travelling
Holding arm moving functionality	Ensure users can move the display screen as required

Phase 2: Integration Testing

Integration testing allows the opportunity to combine all of the units within a system and test them as a group.

We will integrate units to ensure correct data transfer between them and ensure the functionality of the product is as expected. To debug our product, we will start by testing each individual unit as mentioned in phase 1. Once the units are approved, we will then integrate them one by one and will test at each level to ensure proper functionality.

Firstly, we will make sure that the application is retrieving data from the Google APIs and required information is saved for later use. Secondly, we will connect the smartphone with Bluetooth, which is further connected to the Arduino, keeping in mind that both are tested and ready to be used. Then, we will connect the display unit with Arduino to output the desired information. At the end, all of the units will be placed in a holding arm and all possible combinations of inputs through smartphone application will be checked along with the corresponding output on the display unit.

Test Case	Expected Result
End to End display result	Ensure that the information displayed on the app and calculated by the microcontroller is the same as that on the screen
Output lag time	Verify that the data is transmitted and displayed on the screen with negligible lag time
Power output	Ensure all components receive power from the attached battery
Wires connectivity	All wires connecting all components should be attached securely and soldered where required
Toggling function	Users should be able to switch the metrics on the screen by pressing the toggle switch