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BUMPY

for the Cycling Advocacy of the Zagreb Cyclists' Union

Acceptance Test Plan

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1. Introduction

1.1 Purpose of the Document

The purpose of this document is to describe the test procedures for Cycling Advocacy project. The goal of Acceptance Test Plan is to verify that the implemented application satisfies all of the functional requirements written in the Requirements Definition Document. It describes how to properly use both Android and Web applications.

1.2 Document Organization

- Section 1, *Introduction*, describes the contents of this guide, used documentation during the developing process, etc
- Section 2, *Background*, provides the project background information as well as a high-level description of the domain and problem
- Section 3, *Overview of the testing process*, describes how system is tested
- Section 4, *Test*, contains a list of test cases for Android and Web applications.

1.3 Intended Audience

- The customer
- The project's team
- Project supervisors
- All other project stakeholders

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1.4 Definition and Acronyms

1.4.1 Definitions

Keyword	Definition
Collected data	Data collected by Android during cycling, consists of Location and Motion data.
Location data	Location data collected by Android. Each GNSS point has a timestamp, latitude, longitude, elevation, speed and accuracy.
Motion data	Sensors data collected by Android. Each motion data acquisition consists of a timestamp, and three floats (one per each axis) for each sensor (accelerometer, magnetometer and gyroscope).
Trip	All the synthetic information about a trip (including path and issues).
Road Quality	It is a signed float measuring the quality of the road. It can be assigned both to segments and bumpy issues.
Road Quality Map	It is a collection of paths and represents all the roads which have been ridden by the users. It can be plotted over a world map (e.g. OpenStreetMap).
FixMyStreet	An external platform for reporting road issues to authorities
FixMyStreet Issue	An issue pointed out by users. For example, a tree that fell over a street or a damaged semaphore.
Bumpy Issue	An issue automatically detected by the system. Only hard bumps can be identified at the moment.
Heat Map	A map plotting different level of colours (green to red) over a city map to indicate the road quality

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1.4.2 Acronyms and Abbreviations

Acronym or Abbreviation	Definition
<i>POLIMI</i>	Politecnico di Milano (Polytechnic University of Milan)
FER	Fakultet Elektrotehnike i Računarstva (Faculty of Electrical Engineering and Computing)
UUID	Universally Unique Identifier
UI	User interface
REST	Representational State Transfer
API	Application Program Interface
ID	Identifier
GNSS	Global Navigation Satellite System
CSV	Comma Separated Values (file format)
AT	Android Test
WT	Web Test

1.5 References

Cyclist's Union: <http://sindikاتبiciklista.hr/en/>

Fakultet elektrotehnike i računarstva: <https://www.fer.unizg.hr/en>

Politecnico di Milano: <https://www.polimi.it/en/>

FixMyStreet: <https://www.fixmystreet.org/>

Web application: <http://161.53.67.132:3000/>

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2. Background

The customer of the project is the Cyclist's Union, a volunteer association founded in 2011 and located in Zagreb, Croatia. Their goal is to promote cycling as an efficient, sustainable and healthy way of transport in order to have a clean, safe and pleasant green cities.

In accordance with their goal of getting more people to use cycling as a means of transportation, the Cyclist's Union wishes to develop a technological solution for the reporting of road conditions with the goal of monitoring and improvement. More specifically, the solution should be able to detect rough roads and road bumps, collect that information and visualize it. The basic idea is to rely on today's widespread usage of smartphones, namely Android phones, and utilize their various sensors to obtain road surface data. The data obtained by such means can then be analyzed by some algorithm in order to identify road issues like bumps and abrupt breaks, and then used to visualize and locate all potential road issues and encourage local administrations to intervene, which in turn will result in better road conditions that will incentivize people to turn to cycling.

The project team consists of four students from FER and four students from POLIMI, with one supervisor from each university.

3. Overview of testing process

The following tests are performed by a user using mobile or web application. Tests cover most of the system requirements and are focused on frontend. On the other hand, backend performs Unit tests. These tests are useful to test single functionalities like methods or classes. Unit tests will not be covered in this document.

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4. Tests

4.1 Android application

ID	AT-1
Name	Generating User Identifier
Tested Requirements	CFR-1, CFR-2
Preconditions	-
Procedure	User opens the application for the first time
Expected result	Random UUID is generated and can be checked in settings.

ID	AT-2
Name	Display map with road quality and bumpy issues
Tested Requirements	CFR-6
Preconditions	-
Procedure	User opens the application
Expected result	User sees interactive map with lines indicating the road quality. Lines are in color gradient, where one extreme is green meaning good quality and the other is red, meaning bad road quality. Also, for each detected bump there is a marker on the map.

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ID	AT-3
Name	Show device's location settings on actions that need location on.
Tested Requirements	CFR-14
Preconditions	Application has permission to access device's location. Location is turned off.
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User clicks on target image button or "Start Trip" button
Expected result	Device's location settings screen is shown where user can turn location on.

ID	AT-4
Name	Display current location on map
Tested Requirements	CFR-6
Preconditions	User turned on location on phone and application has permission to access device's location.
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User clicks on target image button
Expected result	User sees a pin on a map with his location. The pin positioning is precise.

ID	AT-5
Name	Starting a trip
Tested Requirements	CFR-15
Preconditions	Application can access location and motion sensors. Location is turned on.
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User clicks "Start Trip" button
Expected result	Trip is started.

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ID	AT-6
Name	Displaying trip statistics
Tested Requirements	CFR-17
Preconditions	User started a trip. User enabled keeping screen on in settings.
Procedure	Trip is in progress
Expected result	User sees a dashboard with speed, distance, duration and vibration measurements. The screen is kept awake.

ID	AT-7
Name	Hiding trip statistics
Tested Requirements	NCFR-1, NCFR-10
Preconditions	User started a trip. User disabled keeping screen on in settings.
Procedure	Trip is in progress
Expected result	Dashboard with speed, distance, duration and vibration measurement is shown for a while until the application does not go to background and screen is turned off. Data is still collected even if application is in the background.

ID	AT-8
Name	Collecting data during trip
Tested Requirements	CFR-10, NCFR-2, NCFR-3, NCFR-4, NCFR-5, NCFR-6
Preconditions	User started a trip.
Procedure	Trip is in progress
Expected result	Location data are collected every 3 seconds (approximately). Motion data are collected at a frequency of 50Hz (approximately) and wrote in CSV file with title equal to trip id. Format of collected data is as specified in Requirements. Collected data are used to show trip's statistics.

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ID	AT-9
Name	Ending trip
Tested Requirements	CFR-16
Preconditions	User started a trip.
Procedure	User clicks on "End Trip" button
Expected result	Trip is ended. User is returned to the previous screen (the one with map). Trip can be checked in "Past Trips" screen.

ID	AT-10
Name	Sending collected data (WiFi connection)
Tested Requirements	CFR-11, NCFR-7
Preconditions	User ended trip. User is connected to WiFi.
Procedure	-
Expected result	Collected data are sent immediately. CSV file regarding motion data is deleted from a device.

ID	AT-11
Name	Sending collected data (Mobile data connection)
Tested Requirements	CFR-11, NCFR-7
Preconditions	User ended trip. User enabled option to use mobile data to send collected data (it can be found in settings). User is using mobile data.
Procedure	-
Expected result	Collected data are sent immediately. CSV file regarding motion data is deleted from a device.

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ID	AT-12
Name	Manual upload of collected data
Tested Requirements	CFR-13, NCFR-8
Preconditions	User ended trip. User enabled option to manually upload collected data (it can be found in settings).
Procedure	-
Expected result	Dialog is shown, asking user if they would like to send collected data immediately. It has two buttons, confirmation button "Yes" that sends data and button "No".

ID	AT-13
Name	Sending collected data is pending
Tested Requirements	NCFR-7, NCFR-8
Preconditions	User ended trip. Upload option selected in settings screen is not satisfied (for example no internet connection) or user clicked "No" in dialog.
Procedure	-
Expected result	Collected location data are stored in device database. There is an upload icon next to trip title in "Past Trips" screen.

ID	AT-14
Name	Sending pending collected data.
Tested Requirements	CFR-22
Preconditions	User has one or more trips whose collected data aren't sent.
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to the "Past Trips" screen 3. User clicks on upload icon next to trip title
Expected result	Collected data are sent immediately. CSV file regarding motion data is deleted from a device.

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ID	AT-15
Name	Reviewing past trips
Tested Requirements	CFR-18
Preconditions	-
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to "Past Trips" screen
Expected result	If user hasn't yet performed a trip there is text indicating that there are no trips. Otherwise there is a list of trips, sorted by trip's start time with pending trips on top of the list. Each trip in list has start time as title, duration and distance as subtitles.

ID	AT-16
Name	Reviewing past trip statistics
Tested Requirements	CFR-20
Preconditions	User previously performed and uploaded at least one trip.
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to "Past Trips" screen 3. User clicks on one of the uploaded trips in list
Expected result	New screen is opened showing more details about the selected trip. This includes distance, duration, start time, max speed, average speed, elevation details, vibration, number of detected bumps and cycling route displayed on a map at the top of screen with start end end points. For each detected bump there is marker with bump classification. Trips that have not yet been uploaded can't be reviewed.

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ID	AT-17
Name	Export trip motion data
Tested Requirements	CFR-23
Preconditions	User has opened Trip Statistics screen for some trip.
Procedure	User clicks on export button from menu.
Expected result	File explorer is opened, allowing user to rename file and select where to save it. After that, trip motion data are exported in CSV file.

ID	AT-18
Name	Delete trip from Past Trips screen
Tested Requirements	CFR-24
Preconditions	User previously performed at least one trip.
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to "Past Trips" screen 3. User long clicks on one of the trips
Expected result	Dialog is opened with option to delete a trip. If selected trip is deleted and list is refreshed and does not contain deleted trip.

ID	AT-19
Name	Delete trip from Trip Statistics screen
Tested Requirements	CFR-24
Preconditions	User has opened Trip Statistics screen for some trip.
Procedure	User clicks on the delete button from menu.
Expected result	Trip is deleted and the user is returned to Past Trips screen. Deleted trip is not in list.

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ID	AT-20
Name	Completing Achievement
Tested Requirements	OFR-1
Preconditions	User ended a trip that matches conditions of achievement.
Procedure	-
Expected result	New screen is shown with a message about achievement. Screen is shown for 5 seconds after which home screen with map is shown. Check icon is added to the newly completed achievement in "Achievements" screen.

ID	AT-21
Name	Reviewing Achievements
Tested Requirements	OFR-2
Preconditions	-
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to the "Achievements" screen
Expected result	List of achievements is displayed with title and description. Completed achievements have check icon next to it, while uncompleted achievements are dimmed.

ID	AT-22
Name	Reporting issue
Tested Requirements	OFR-3
Preconditions	-
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to "Report Issue" screen 3. User fills needed information 4. User clicks on "Submit" button
Expected result	Issue is reported. Message is shown, indicating that issue reporting was successful.

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ID	AT-23
Name	Selecting upload trip data type
Tested Requirements	CFR-12
Preconditions	-
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to "Settings" screen 3. User clicks on "Upload trip data"
Expected result	<p>Dialog is opened with three options:</p> <ul style="list-style-type: none"> - Automatically upload using WiFi - Automatically upload using WiFi or Mobile data - Manual upload

ID	AT-24
Name	Enabling/Disabling keeping screen awake while cycling
Tested Requirements	NCFR-10
Preconditions	-
Procedure	<ol style="list-style-type: none"> 1. User opens the application 2. User navigates to "Settings" screen 3. User clicks on switch "Keep screen awake"
Expected result	Keep screen awake option is enabled/disabled

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4.2 Web application

ID	WT-1
Name	Display map with road quality and bumpy issues
Tested Requirements	CFR-6
Preconditions	-
Procedure	User opens the Home page
Expected result	User sees interactive map with lines indicating the road quality. Lines are in color gradient, where green means good quality and red is bad road quality. For each detected bump there is a marker on the map.

ID	WT-2
Name	Entering User identifier
Tested Requirements	CFR-1
Preconditions	-
Procedure	User opens the "User" page
Expected result	Page is opened with one form field for entering Identifier. After valid Identifier is entered, the user is redirected to Trips page.

ID	WT-3
Name	Changing user
Tested Requirements	CFR-3
Preconditions	Some User Identifier is active
Procedure	<ol style="list-style-type: none"> 1. User opens the "User" page 2. User enters new valid User Identifier
Expected result	New User Identifier is active and page with trips from new user is shown.

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ID	WT-4
Name	Log out
Tested Requirements	CFR-4
Preconditions	Some User Identifier is active
Procedure	<ol style="list-style-type: none"> 1. User opens the "User" page 2. User clicks on "Log out" button
Expected result	Current User Identifier is deleted and there is no currently active user.

ID	WT-5
Name	Not viewing Trips until User Identifier is entered
Tested Requirements	CFR-19
Preconditions	No User Identifier is currently active
Procedure	User clicks on "Trip" in navigation bar
Expected result	User is redirected to User page to enter Identifier.

ID	WT-6
Name	Reviewing past trips table
Tested Requirements	CFR-18
Preconditions	User entered identifier
Procedure	User open the "Trips" page
Expected result	<p>Table with past trips is shown. Data in table can be sorted and filtered. Each row contains trip start and end time, distance and average vibration. There are also two buttons, one to get trip info and another to delete it.</p> <p>If there are no trips for given user, message is shown indicating that there is no data.</p>

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ID	WT-7
Name	Reviewing specific past trip
Tested Requirements	CFR-20
Preconditions	User previously performed and uploaded at least one trip. User entered identifier.
Procedure	User clicks on one of the trips in table
Expected result	New page is opened showing more details about the selected trip. This includes start time, distance, duration, maximum speed, average speed, elevation details, average vibration and cycling route display on a map with start end end points. There are also delete and export buttons. For each detected bump there is marker with bump classification.

ID	WT-8
Name	Export trip motion data
Tested Requirements	CFR-23
Preconditions	User previously performed and uploaded at least one trip. User entered identifier.
Procedure	<ol style="list-style-type: none"> 1. User clicks on one of the trips in table 2. User clicks on export button
Expected result	Trip motion data are exported in CSV file with trip id as a file name.

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ID	WT-9
Name	Delete trip from table
Tested Requirements	CFR-24
Preconditions	User previously performed and uploaded at least one trip. User entered identifier.
Procedure	User clicks on the delete button in the row with trip they want to delete.
Expected result	Alert is shown, asking the user to confirm the delete action. If action is confirmed, selected trip is deleted and is not shown in the table anymore.

ID	WT-10
Name	Delete trip from trip preview
Tested Requirements	CFR-24
Preconditions	User opened Trip Preview for one of the trips
Procedure	User clicks on the delete button
Expected result	Alert is shown, asking the user to confirm the delete action. If action is confirmed, selected trip is deleted and user is redirected to "Trips" page. Deleted trip is not shown in the table anymore.

ID	WT-11
Name	Reporting issue
Tested Requirements	OFR-3
Preconditions	-
Procedure	User opens "Report Issue" page
Expected result	FixMyStreet page is opened, where user can report issue.

End of document