University of Pittsburgh at Johnstown

Department of Electrical and Computer Engineering

EE 1195 / COE 1195 Engineering Practice and Professional Development

Software Requirements Specifications

Cycle Statistic Tool Companion Application

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1. Introduction

a. Purpose

The purpose of this document is to provide a detailed description of the Cycle Statistic Tool Companion Application. The contents of this document will include an explanation of the system features and objectives, system interface designs and attributes, and operation limitations based upon user input. The documentation is intended for the developers and stakeholders of the project so that the scope of the project's requirements is clearly provided.

b. Scope of Project

The companion applications's software will implement a mobile application for iOS and Android that utilizes data collected from the Cycle Statistic Tool. The mobile application will provide cycling statistics, performance tracking, and will enable improvement through goal setting features. The application will allow the user to save collected data about individual cycling trips to their smartphone. The user will also be able to review each recorded trip on the application. Goal profiles may be created to allow the user to filter specific trips into a set that corresponds to specific goals input by the user. Not only will each recorded trip have a viewable statistics breakdown, but all trips and each goal profile will be used to determine overall performance statistics that may be reviewed by the user. Additionally, the user will have access to customizable settings for their device profile and for proper functionality of the application.

c. List of Terms

i. CST - Cycle Statistic Tool

ii. Trip - A complete data collection of a user cycling session entry

iii. Goal Profile - A profile/filter with corresponding goal settings attached. Also used for categorizing trips.

iv. AndroidOS - Mobile Operating System

v. iOS - Mobile Operating System

2. Overall Description

a. Product Perspective

The software product being developed is for enabling data collection of cycling sessions to a personal smartphone device (iOS/AndroidOS only) owned by a CST user. The application will feature session activation/deactivation to produce a full data set of a recorded trip. This functionality will be contained in a main page view to allow the user to efficiently begin a trip recording. The application will also allow for the user to create/edit/delete goal profiles in a goal setting view. The goal profiles will be selectable when beginning a cycling session and will associate a recorded trip with that specific profile for categorizing functionality. Additionally, the user will have access to a statistics view that presents a performance breakdown of all trips and of individual goal profiles. Within each category, every associated trip will be listed and selectable, and once selected will provide a specific statistics breakdown. The user will also have access to a settings view to confirm the connection status to the CST hardware, input custom user settings used in statistics calculations (weight, height, age), and fully reset the application. This product will use local storage on the user's smartphone to save user settings and all trip data collected.

b. Product Features

The Cycle Statistic Tool Companion Application contains the following key features:

i. Allow the user to connect to the CST.

ii. Allow the user to begin a trip under the trip view (main page). This will present the current trip state within the view.

iii. From the current trip state in the trip view, allow the user to end a trip.

iv. Allow the user to create a goal profile under the goals view. This will present the create goal state within the view.

v. Allow the user to delete a goal profile under the goals view by selecting the goal profile. This will present the edit goal state within the view.

vi. Allow the user to edit a goal profile under the goals view by selecting the goal profile. This will present the edit goal state within the view.

vii. Allow the user to select a goal profile to be associated with a trip under the trip view.

viii. Save trip data locally to the device under all trips whenever a trip is ended.

ix. Mark any trip associated with a goal profile to the corresponding goal profile category.

x. Showcase all trips and goal profiles in a list under the performance view.

xi. Allow the user to select all trips or any goal profile to present a new state in the performance view that displays an overall performance breakdown and a list of individual associated trips.

xii. Within the previously mentioned (2.b.xi) state in the performance view, let the user select individual trips from their corresponding list to present the statistics view which displays the specific trip's statistics breakdown.

xiii. Allow the user to check CST connection status, view/edit user settings, and delete all trips under the settings view.

c. User Classes and Characteristics

i. User:

Primary users of this software will include both platforms of iOS and Android. Users will be utilizing the application to collect data from their CST device. It is recommended that the user has general knowledge about bicycling and different variables that are being collected by the device. However, a beginner may find benefit from using this product, therefore the aforementioned knowledge is not a requirement. The user will need a general understanding of how to operate a smartphone device. Instructions on operating the CST device will be provided with the hardware.

ii. Developer:

The developer must have knowledge of programming and UI design. To be more specific, the software will be developed using Xamarin.Forms and C# to be cross-platform. Additionally, the CST hardware will be programmed using Arduino microcontrollers and will require some understanding of bluetooth connectivity and data transmission.

d. Operating Environment

The software will operate using iOS and Android. It will be compatible with iOS 8 and Android 4.0 onward. The hardware will be any phone that can run iOS or Android.

e. Design and Implementation Constraints

i. Currently, there is no online database for storing the data collected from the CST. All user data is stored locally on the connected smartphone device.

ii. Currently, there is no online account system. Therefore, all data is saved locally and is lost forever if the user decides to delete their stored data.

iii. To begin a trip, the user must have an active bluetooth connection to the CST. Additionally, the user must maintain the active bluetooth connection to the CST during a current trip, and even after the trip is completed until notified that the data has successfully been transferred to the connected smartphone.

iv. Before a trip can be recorded, the user must input some general user settings. This should be alerted to the user upon initially starting the mobile application. Additionally, this will be mitigated by saving the user's settings locally to be re-used any time the application is launched.

3. Functional Requirements

a. Use Case: Display the Trip View (U1):

i. Objective: The U1 use case will present the user with the Trip View UI which will allow the user to begin a trip. The view can be selected from the navigation bar located at the bottom of the screen. This view will also be considered the home page of the application and will open up on launch. The user may begin a trip by selecting the “begin trip” button located at the center of the view. Additionally, the user may select their desired goal profile for the trip by selecting it from a list of all goal profiles located underneath the begin trip button.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: Selecting the trip tab
    a. The user selects the trip tab on the navigation bar.
    b. The trip view is displayed.
2. Alternative Flow: Launching the application
    a. The user initializes the application.
    b. The trip view is displayed.
3. Exception Flow:
    a. The data fails to be loaded.
    b. The user is notified of the failure.

c. The application is closed.

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The application must be initialized, or the user must be on another view to display the trip view.

ix. Post-conditions:

1. The trip view is displayed and the user may select to begin a trip with/without selected goal profile.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

b. Use Case: Select A Goals Profile (U2):

i. Objective: The U2 use case refers to selecting a goal profile from the list of created goal profiles within the trip view. By selecting a goal profile, the user will indicate that the subsequently recorded trip will be categorized under the chosen goal profile. Each goal profile within the list must be created under the goals view.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: Selecting the goal profile from the list

a. The user taps the list entry that references the desired goal profile.

b. The list entry indicates to the user that it has been selected.

2. Alternative Flow: N/A

3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user is within the trip view.

ix. Post-conditions:

1. The user has a goal profile selected to categorize their next recorded trip under.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

c. Use Case: Select Begin Trip (U3):

i. Objective: The U3 use case refers to the user engaging the begin trip button within the trip view. Before a trip will begin, the application will check if the CST connection is active. If there is not an active connection to the CST, the user will be prompted by a request to connect to the CST. Once there is an active connection to the CST, the user can select the begin trip button and will be directed to the current trip state within the trip view where CST data recording will be initialized.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: Selecting the begin trip button.
    a. The user engages the begin trip button within the trip view.
    b. The application will check if the connection to the CST is active.
    c. If the connection is active, the user will be directed to the current trip state within the trip view where CST data recording is initialized.
        i. If the connection is not active, a request to connect to the CST is activated. Once the connection is active, the user may attempt to engage the begin trip button again.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements:

1. The user must establish an active connection to the CST device.

viii. Pre-conditions:

1. The user is within the trip view.

ix. Post-conditions:

1. The current trip state must be initialized.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

d. Use Case: Display Current Trip State (U4):

i. Objective: The U4 use case refers to the user initializing a new trip recording and the subsequent state that is displayed. Once a user successfully begins a trip within the trip view, the current trip state will be presented which will provide the user with some statistics about the trip and the option to end the current trip. The application will be locked to this state until the trip has ended. If the user's smartphone disconnects from the CST in the middle of a trip, the data collected to that point is saved and the trip is automatically ended.

ii. Priority: High

iii. Source: User

iv. Actors: User, CST, Bluetooth Connection

v. Flow of Events:

1. Basic Flow: The user initializes a new trip.
    a. The user initializes a new trip by engaging the begin trip button.
    b. The current trip state is displayed.
2. Alternative Flow: N/A
3. Exception Flow: The user's device disconnects from the CST intra-trip recording.
    a. The current trip state is active.
    b. The user's device disconnects from the CST.
    c. The trip is automatically ended and the collected data to that point is saved.

vi. Includes: N/A

vii. Requirements:

1. The user must maintain an active bluetooth connection with the CST to successfully record an entire trip.

viii. Pre-conditions:

1. The user must be within the trip view.
2. The user must be connected to the CST via bluetooth.
3. The user must initialize a trip successfully by engaging the begin trip button.

ix. Post-conditions:

1. The user's current trip will be actively recorded.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

e. Use Case: Check if CST Connection is Active (U5):

i. Objective: The U5 use case refers to a method for determining the connection status of the CST to the user's smartphone. If the connection is active, the method will be true. If the connection is not active, the method will be false. This will be used to determine if it is appropriate to begin recording a trip.

ii. Priority: High

iii. Source: User

iv. Actors: User, CST, Bluetooth Connection

v. Flow of Events:

1. Basic Flow: Check the CST connection status.
    a. Once called, check to see if the connection status is active or not.
        i. If the connection status is active, return true.
        ii. If the connection status is not active, return false.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions: N/A

ix. Post-conditions:

1. The method will return either true or false, depending on the CST connection status.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

f. Use Case: Request CST Connection (U6):

i. Objective: the U6 use case refers to an alert view that will be displayed when a request to connect to the CST via bluetooth is required. The request will be engaged whenever the application is initialized. Additionally, if the CST connection status is returned as false when attempting to begin a trip, the request will be engaged. The alert view will provide a message that explains the intention of the alert, the CST bluetooth connection status, a button that will launch the user's device bluetooth settings, and a button to close the alert.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: The user initializes the application.
    a. The application successfully launches to the main page (trip view).
    b. The application indicates that it has initialized and the check CST connection status returns as false.
    c. The request CST connection alert view is launched.
    d. The user may launch their device bluetooth settings to connect to the CST.
    e. The user may dismiss the alert at any time.
        i. This is to proceed to the trip view, or for use cases where the user only wants to view statistics.
2. Alternative Flow: The user attempts to begin a trip and the CST connection is not active.
    a. The user attempts to begin a trip and the check CST connection status returns as false.
    b. The request CST connection alert view is launched.
    c. The user may launch their device bluetooth settings to connect to the CST.
    d. The user may dismiss the alert at any time.

i. This is to proceed to the trip view, or for use cases where the user only wants to view statistics.

3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The check CST connection status must return as false.
2. The application must be initialized or the user must attempt to begin a trip.

ix. Post-conditions:

1. If the user launches their device bluetooth settings and successfully connects to the CST, the check CST connection status method will return true.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

g. *Use Case: Open User's Device Bluetooth Settings (U7):*

i. Objective: the U7 use case refers to the user engaging the connect to bluetooth button within the request CST connection alert view. Selecting the button will launch the bluetooth settings native to the user's device. This will lead the user to a location where they can connect their device to the CST.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: User engages the connect to bluetooth button within the request CST connection alert view

    a. From within the request CST connection alert view, the user selects the connect to bluetooth button.

    b. The bluetooth settings native to the user's device is launched.

    c. The user may use their native bluetooth settings to connect to the CST.

2. Alternative Flow: N/A

3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user's connection status to the CST is not active.

2. The user is within the request CST connection alert view.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

h. Use Case: Select End Trip (U8):

i. Objective: The U8 use case refers to the user selecting the end trip button within the current trip state under the trip view. Upon selecting to end a trip, the data collection results from the CST will be finalized and the saved data will be confirmed. Then, the statistics view will be launched.

ii. Priority: User

iii. Source: User

iv. Actors: User, CST

v. Flow of Events:

1. Basic Flow: The user selects the end trip button.
    a. Finalize data transmission and record from the CST to the smartphone.
    b. Confirm the trip data has been saved to the smartphone.
    c. Upon save confirmation, launch the statistics view to allow the user to view saved trips.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user must be within the current trip state to have access to this functionality.
2. The CST must have a maintained connection to the smartphone.

ix. Post-conditions:

1. A new trip is saved to the user's smartphone.
2. The statistics view for the specific trip is opened.
3. The current trip is finished and the user may begin a new trip.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

i. Use Case: Display the Statistics View (U9):

i. Objective: The U9 use case presents the user with the statistics view of a given trip. This view will provide a breakdown of all collected statistics for the given trip.

ii. Priority: High

iii. Source: User

iv. Actors: User, Trip

v. Flow of Events:

1. Basic Flow: The user selects a trip to display within the goal profile performance view.
    a. The user has selected a goal profile category within the performance view.
    b. The user selects a recorded trip within the goal profile category to display the statistics of.
    c. The statistics view for the chosen trip is displayed.
2. Alternative Flow: The user has ended a trip
    a. The user has ended a trip.
    b. Once the trip is successfully finalized and saved, the statistics view for the trip is displayed.
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions: N/A

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

j. Use Case: Display the Performance View (U10):

i. Objective: The U10 use case presents the user with the performance view. This view will display a performance breakdown of the corresponding profile based on the trips that comprise it. Additionally, each trip will be listed and selectable within the performance view. Selecting a trip will launch the statistics view for the corresponding trip.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: User selects an entry in the Performance List View
    a. The user selects the performance list view on the navigation bar.
    b. The user selects an entry in the performance list view.
    c. The selected entry's corresponding performance view is displayed for the user.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions: N/A

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

k. Use Case: Select A Goal Profile to Display (U11):

i. Objective: The U11 use case refers to the user selecting an entry from the performance list view. This view will list all goal profile categories that have been created and an additional profile that includes all trips. Selecting an entry will present the performance view of the corresponding goal profile.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow:User selects an entry in the performance list view
    a. The user selects the performance list view on the navigation bar.
    b. The user selects an entry in the performance list view.
    c. The selected entry's corresponding performance view is presented to the user.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user must be within the performance list view.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

l. Use Case: Select A Trip to Display (U12):

i. Objective: The U12 use case refers to the user selecting an entry from the trip list within a performance view. The selected entry will launch the trip view corresponding to the trip represented by the entry.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: User selects an entry from the trip list
    a. From within a performance breakdown view, the user selects a trip from the trip list.
    b. The corresponding trip view for the selected trip is presented to the user.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user must be within the performance list view.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

xii.

m. Use Case: Display the Goals View (U13):

i. Objective: The U13 use case refers to the user launching the goals view from the navigation bar. This will present a view that allows the user to create, edit, and delete goal profiles.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: User selects the goals view
    a. The user selects the goals view tab from the navigation bar.
    b. The goals view is presented to the user.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions: N/A

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

xii.

n. Use Case: Select An Existing Goal Profile (U14):

i. Objective: The U14 use case refers to the user selecting an existing goal profile under the goals view. This will allow the user to edit the performance goals specific to the goal profile.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: The user selects a goal profile to edit.
    a. From within the goals view, the user selects a goal profile from the list.
    b. The user is prompted to edit any performance goals.
    c. The user may save or cancel the edit.
    d. The user is returned to the goals view.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes:N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user is within the goals view.
2. There is at least one existing goal profile.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

o. Use Case: Create New Goal Profile (U15):

i. Objective: The U15 use case refers to the user selecting the new goal profile button within the goals view. This will prompt the user to input all performance goals and a name for the goal profile.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: The user selects the new profile button.
    a. From the goals view, the user selects the new profile button.
    b. The user is prompted to edit any performance goals.
    c. The user may save or cancel the new goal profile.
    d. The user is returned to the goals view.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user is within the goals view.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

p. Use Case: Display the Settings View (U16):

i. Objective: The U16 use case presents the user with the settings view after it is selected on the navigation bar. The settings view will include a display of the CST connection status, modular user settings, and an option to delete all trips from the device.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: The user selects the settings view from the navigation bar.
    a. The user selects the settings view from the navigation bar.
    b. The settings view is presented to the user.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user must be on a different view to be able to launch the settings view.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

q. Use Case: Select User Settings (U17):

i. Objective: The U17 use case refers to the user selecting the user settings option to be edited. Selecting the user settings button will prompt the user to edit their personal user settings.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: User selects the user settings button.
    a. From within the settings view, the user selects the user settings button
    b. The user is prompted to edit any user information values.
    c. The user may save or cancel the user settings edit.
    d. The user is returned to the settings view.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user is within the settings view.

ix. Post-conditions: N/A

x. Notes/Issues: N/A

xi. Special Requirements: N/A

r. Use Case: Delete All Trip Data (U18):

i. Objective: The U18 use case refers to the user selecting the delete all trips button within the settings view. This button will cause the collection of all trips saved to the users phone to be deleted.

ii. Priority: High

iii. Source: User

iv. Actors: User

v. Flow of Events:

1. Basic Flow: User selects the delete all trips button.
    a. From within the settings view, the user selects the delete all trips button.
    b. The collection of all trips saved on the user's smartphone is emptied.
2. Alternative Flow: N/A
3. Exception Flow: N/A

vi. Includes: N/A

vii. Requirements: N/A

viii. Pre-conditions:

1. The user must be within the settings view.
2. The all trips collection must not be empty already.

ix. Post-conditions:

1. All performance and trip statistics will be cleared.
2. All goal profile categories will be emptied.

x. Notes/Issues: N/A

xi. Special Requirements: N/A

4. Interface Requirements

a. User Interfaces

The Cycle Statistic Tool Companion Application's user interface is designed with simplicity in mind. Based on the Cycle Statistic Tool's engineering specifications, the target goal for beginning a trip is three steps. Correspondingly, the main view of the application is the trip view. This view allows the user to begin a trip and select a goal profile, view general information about a current trip in progress, and complete a current trip. A user can select other views from the navigation bar at the bottom of the screen. The user will have access to the statistics view which will provide a list of all trips and goal profiles. The user may select these from the list to launch a new state that provides an overall performance breakdown and another list of individual recorded trips. Another state within the statistics view can be launched by selecting an individual recorded

trip which will provide a specific statistics breakdown of the corresponding trip. The user will be able to create, edit, and delete goal profiles from the goals view. Each goal profile will be selectable. Subsequently, the user may edit or delete the goal profile once selected. A button may be selected in the goal view to allow the user to create a new profile. Finally, the user will have access to a settings view. This view will allow the user to check the bluetooth connection status to the CST, edit their user settings, and delete all trip data. Upon initially launching the application for the first time, an alert view will be presented to the user to input their required user data. Additionally, every time the application is launched, an alert view will be presented to connect the smartphone to the CST via bluetooth. For instances when the user only wants to view statistics, this alert may be dismissed; however, a trip will not be able to be initiated unless the smartphone is connected to the CST via bluetooth; therefore, any time the user tries to begin a trip, if the bluetooth connection to the CST is not active, the alert will also be presented to connect the smartphone to the CST.

b. Hardware Interfaces

They Cycle Statistic Tool Companion Application requires connection to the Cycle Statistic Tool hardware device. Without the required hardware, the application cannot record any amount of data. The Cycle Statistic Tool is a data recording device which will be attached to the frame of a bicycle. In this position, several electronic components may be used to record statistics about a user's cycling trip. The Cycle Statistic Tool will transmit data to the companion

application that is installed on a user's smartphone via bluetooth connection. Please reference the Cycle Statistic Tool's final design and block diagram documentation for an in-depth description of all hardware components.

c. Communication Interfaces

The application will be uploaded to a user's device via connection to the system that development is taking place on. Bluetooth connectivity will be utilized for data transmission to the user's smartphone.

d. Software Interfaces

The application will need to save a user's data of all trips and user settings locally to the smartphone device.