Android Running Tracker App

1. Introduction

This application is an android mobile running tracker which aims to track users' real-time movement when they are doing different exercises and store their data for further feature usages. A real-time map and exercise data are shown by logging the change in physical location using GPS. Users are able to inspect and annotate their data when they finished their exercises. Useful performance statistics analysis will be provided for each exercise as well.

2. Design and Application Structure

The design and application component structure are shown as below.

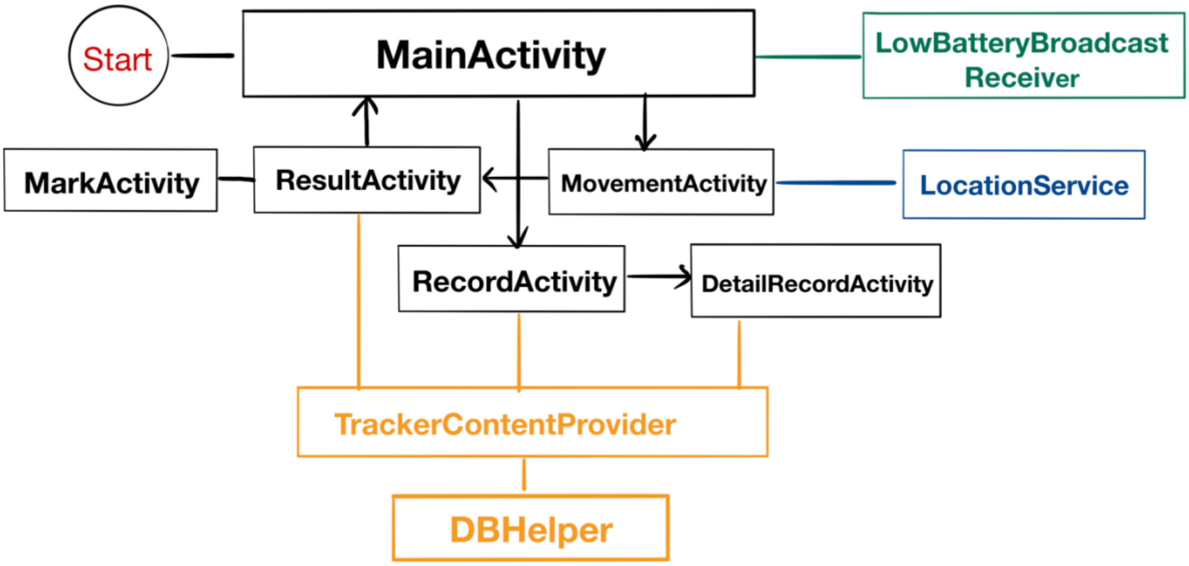


Figure 2.1 Design and Structure

This application contains four main components that support the real-time movement tracking mechanism.
MainActivity is the first activity shown for users when they open this application. Several options are available for users to choose from. When users click the "Go" button, MovementActivity will be called for users to start tracking their movement. When users click the "History" button, RecordActivity will get called for users to view their previous exercise record. More details of each exercise can be seen from DetailRecordActivity by clicking rows in the history record list. When users finished their exercise, they will be led to ResultActivity where they can see their performance and annotate this exercise journey in MarkActivity by clicking "Mark" button. Users can easily go back to Menu by clicking the "back" button in ResultActivity.
MainActivity and MovementActivity will get the low battery alert broadcast from LowBatteryBroadcastReceiver when user's devices battery life is low.

ResultActivity, RecordActivity and DetailRecordActivity access TrackerContentProvider for data manipulation to keep the record up-to-date.
Location Service starts and binds with the MovementActivity when clicked the “Go” button in MainActivity.

3. Component Rationale

- **Activity**

1. MainActivity:

MainActivity class is the first activity which provides two different buttons for users to either start the tracking in MovementActivity or view their previous history records in RecordActivity. A switch button is provided for users to apply with different theme, such as dark mode, for battery saving in the application. It will also get alert prompt to ask users to turn on Dark Mode when device’s battery life is low.

2. MovementActivity:

MovementActivity class is the movement tracking activity which shows the users’ current running distance, current spent time and current running speed. Real-time google map also enables users to view their current location and running route.

3. ResultActivity

The ResultActivity class is used to show the result and all the performance of users during that exercise, “mark” button enables users to annotate more on that journey, and send all the data into database by clicking the “back to Menu” button.

4. MarkActivity

The MarkActivity class allows users to annotate more thoughts on each journey and send collected data back to ResultActivity and add all them together into database.

5. RecordActivity

The RecordActivity is an activity which abstracts all the collected data from database and displays them as a list for users to view, delete and edit. It also shows the total personal data statistics.

6. DetailRecordActivity

The DetailRecordActivity class gets the ID from RecordActivity and collects all the regarding data of the corresponding exercise to enable users to view all details of the specific exercise, useful performance type analysis is also provided.

- **Service**

1. LocationService

The LocationService class serves as background longer-running component which monitors the change of the location every second via LocationManager, updates callback method and creates service notification.

2. ICallback

An interface allows services activity to get any updates from service

- **ContentProvider**

1. DBHelper

   The DBHelper class is the database helper class used to retrieve a handle to the writeable database.

2. TrackerProviderContract

   This class defines all the attributes string name that used in DBHelper table.

3. TrackerContentProvider

   This class provides several different methods for users to easily operate on the database.

- **BroadcastReceiver**

1. LowBatteryBroadcastReceiver

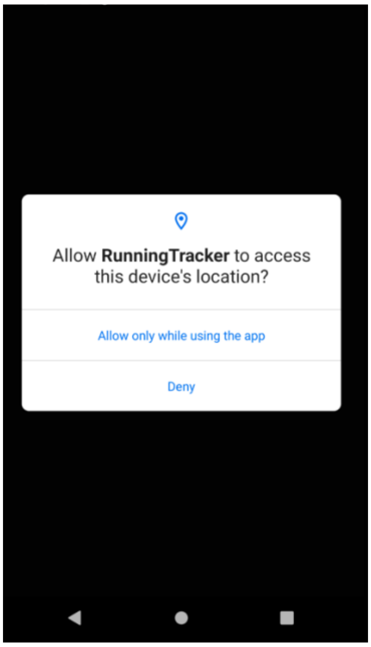
   This LowBatteryBroadcastReceiver class send the broadcast to activity when user’s device battery life is low.

- **Java class**

1. BounceInterpolator

   This class defines the animation movement such as bouncing amplitude and frequency for “Go” button in MainActivity to implements the bouncing effect when it’s clicked by users.

4. User Manual



Allow **RunningTracker** to access this device's location?

Figure 4.1 Location Permission Request

When users start using this application at the first time, it will detect if the application has had the location permission. If not, users will then be asked to allow location permission for this application as the screenshot shown above.

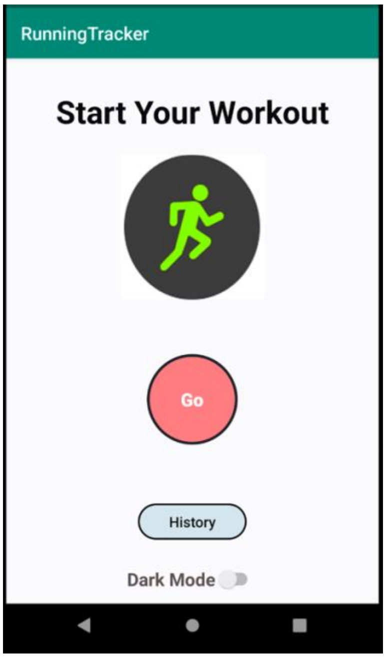


Figure 4.2 MainActivity Normal Theme

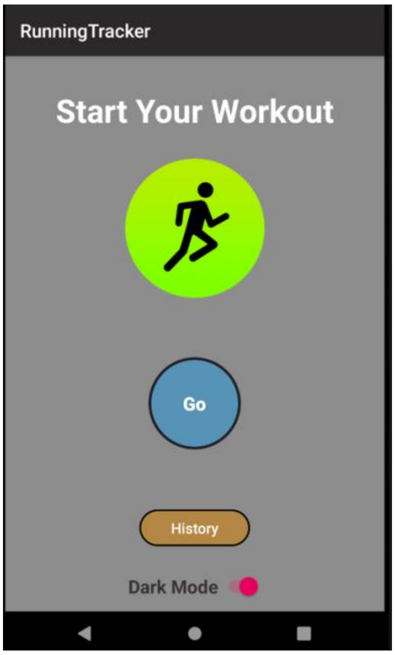
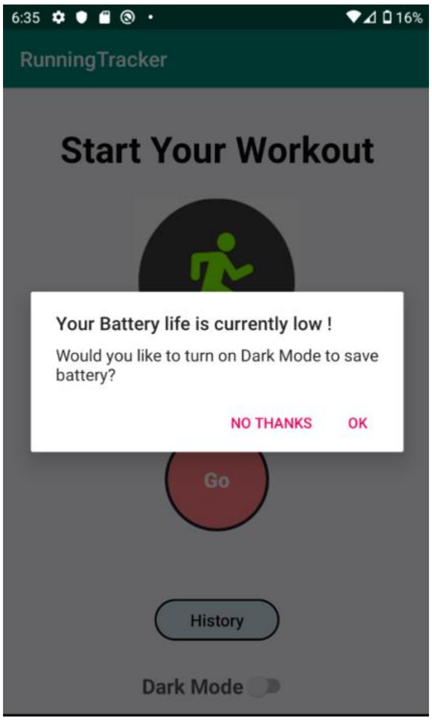


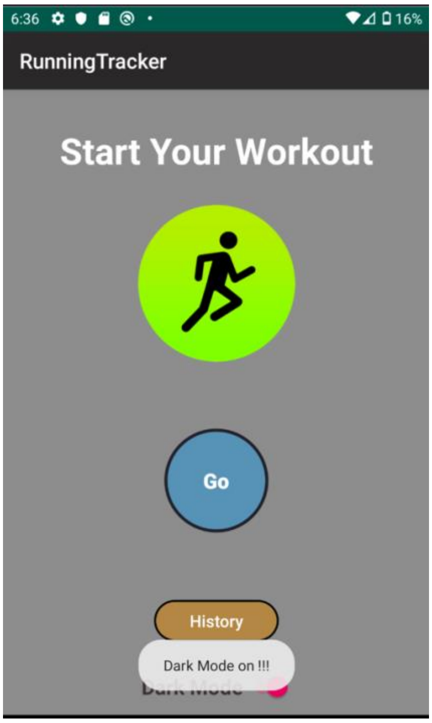
Figure 4.3 MainActivity Dark Mode Theme

Main activity allows users to start their exercise workout by clicking the “Go” button in the middle of the screen and also be able to view their previous exercise history and details by clicking the “History” button. Additionally, users can apply two different app theme by clicking the “Dark Mode” switch button at the bottom of the screen based on their preference.



Your Battery life is currently low !

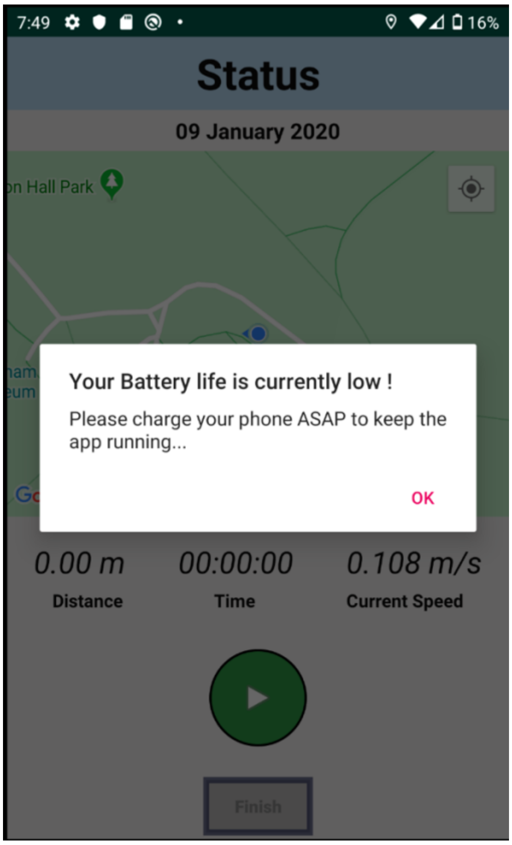
Would you like to turn on Dark Mode to save battery?



Dark Mode on !!!

Figure 4.4 Low Battery Alert Options and Effect in MainActivity

As can be seen from the screenshot, when users' device battery life is below 20%, they will get an alert prompt notifying them the low battery situation and asking them to turn on Dark Mode to save more battery. If users click "ok", then the app will be automatically applied with Dark Mode with the Toast telling users Dark Mode Theme has been set on and the alert prompt will not show up again. If users click "No Thanks", the App will remain the Normal App Theme.



Your Battery life is currently low !

Please charge your phone ASAP to keep the app running...

OK

Status

09 January 2020

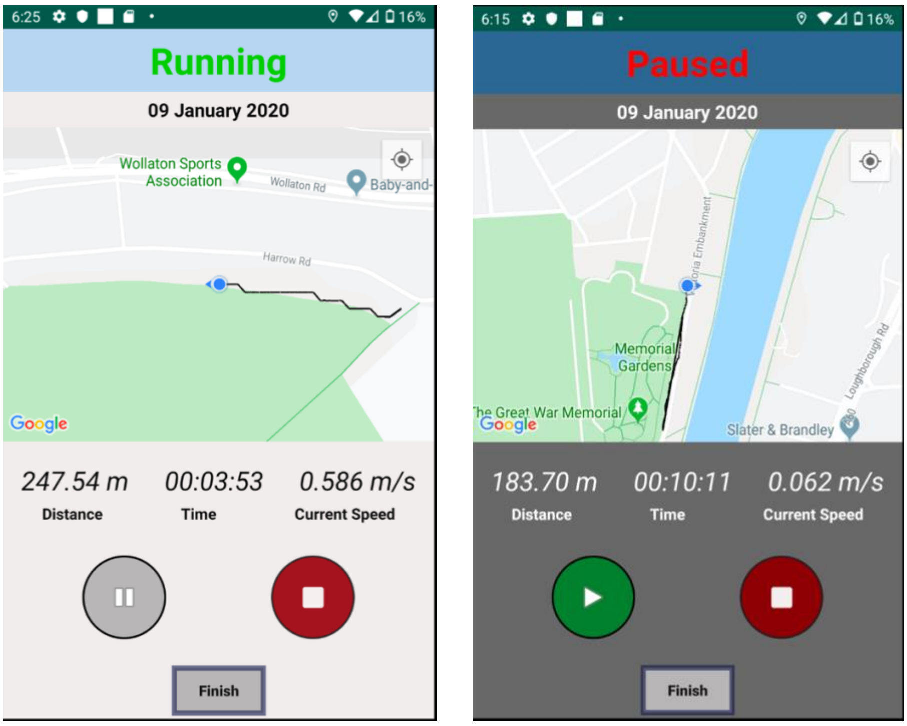
0.00 m Distance

00:00:00 Time

0.108 m/s Current Speed

Figure 4.5 Low Battery Alert in MovementActivity

When users are using tracking in MovementAcitivity, if the battery life of their device is still below 20 %, they will receive an alert warning that they should charge their phone as soon as possible in order to keep the tracking app functional.



Running

09 January 2020

247.54 m Distance 00:03:53 Time 0.586 m/s Current Speed

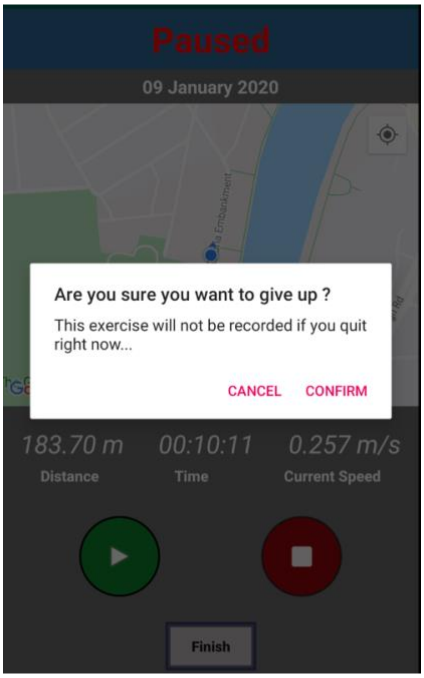
Paused

09 January 2020

183.70 m Distance 00:10:11 Time 0.062 m/s Current Speed

Figure 4.6 Movement Activity UI with Different Status and App Theme

Once users clicked the “Go” button in the MainActivity, they can start tracking their workout by simply pressing the green play button. User current status (Running, Paused), current total distance, current spent time, and current running speed are all shown and updated while users are doing exercises. Real-time google map with running route is also provided for users to see where exactly they are and view what their running route are like so far.



Paused

09 January 2020

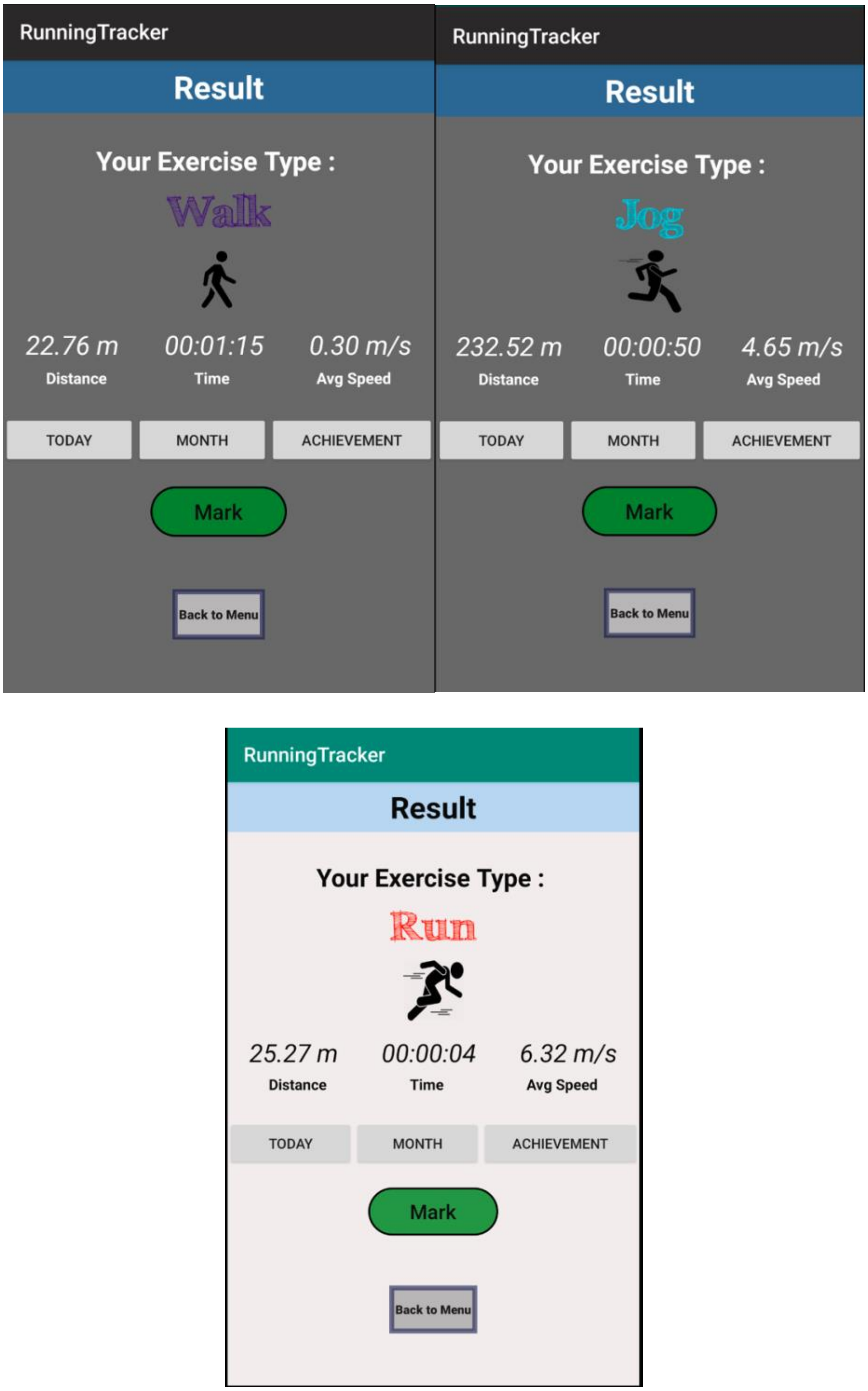
Are you sure you want to give up ?

This exercise will not be recorded if you quit right now...

183.70 m Distance 00:10:11 Time 0.257 m/s Current Speed

Figure 4.7 Alert when User Clicked Stop Button

When users clicked the Stop button, they will get an alert noticing that their exercise will not be recorded if they leave the tracking right now.



RunningTracker

Result

Your Exercise Type :

Walk

22.76 m Distance

00:01:15 Time

0.30 m/s Avg Speed

RunningTracker

Result

Your Exercise Type :

Jog

232.52 m Distance

00:00:50 Time

4.65 m/s Avg Speed

RunningTracker

Result

Your Exercise Type :

Run

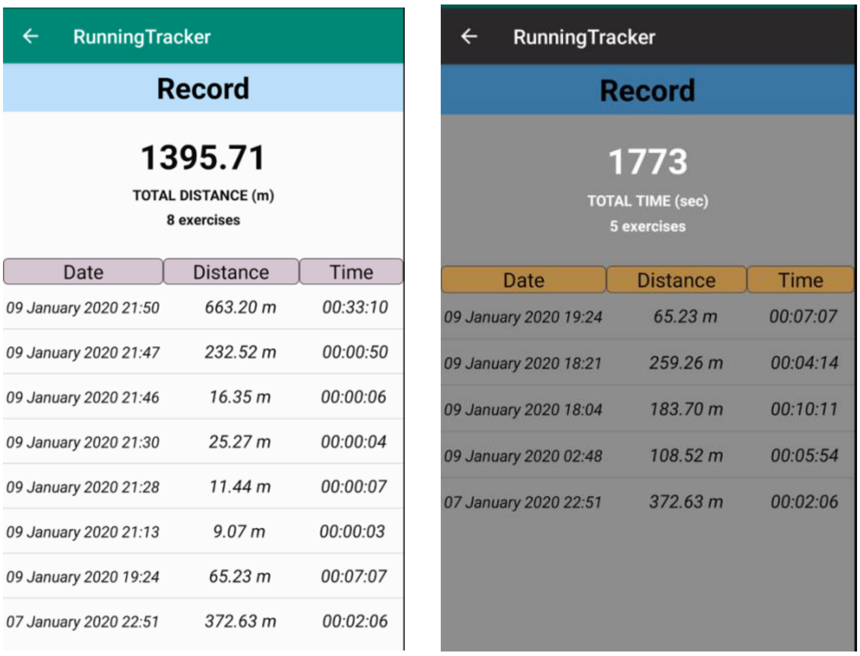
25.27 m Distance

00:00:04 Time

6.32 m/s Avg Speed

Figure 4.8 ResultActivity with Three Different Analysis and Theme

Once users finished the exercise by pressing the “Finish” button, they would be led to ResultActivity which shows all their exercise records and performance analysis for their exercise. “Mark” button allows users to annotate more thoughts and feelings of this journey, and they can go back to menu by clicking the “Back to Menu” at the bottom of the screen.



RunningTracker

Record

1395.71

TOTAL DISTANCE (m)

8 exercises

Date	Distance	Time
09 January 2020 21:50	663.20 m	00:33:10
09 January 2020 21:47	232.52 m	00:00:50
09 January 2020 21:46	16.35 m	00:00:06
09 January 2020 21:30	25.27 m	00:00:04
09 January 2020 21:28	11.44 m	00:00:07
09 January 2020 21:13	9.07 m	00:00:03
09 January 2020 19:24	65.23 m	00:07:07
07 January 2020 22:51	372.63 m	00:02:06

RunningTracker

Record

1773

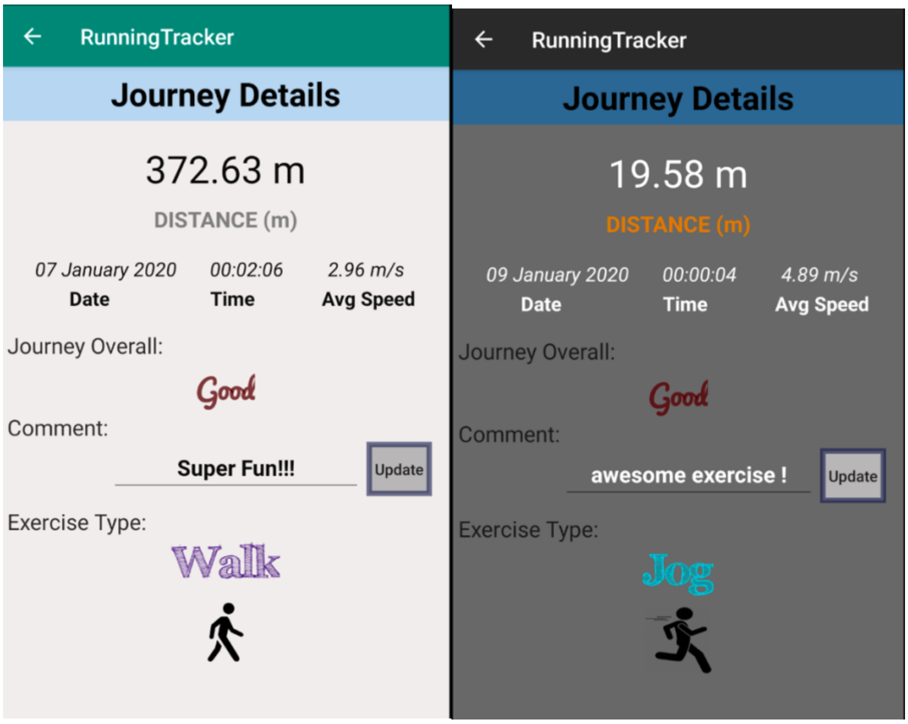
TOTAL TIME (sec)

5 exercises

Date	Distance	Time
09 January 2020 19:24	65.23 m	00:07:07
09 January 2020 18:21	259.26 m	00:04:14
09 January 2020 18:04	183.70 m	00:10:11
09 January 2020 02:48	108.52 m	00:05:54
07 January 2020 22:51	372.63 m	00:02:06

Figure 4.9 RecordActivity with All Previous Records and Personal Statistics

By clicking the “History” button in MainActivity, users are able to view all their previous exercises and personal records such as total Distance so far, total spent time and how many records users already have up to now. To see different aspects of their statics, users can simply click the personal statistics on top and it will show accordingly. Additionally, users can view and sort the list records by clicking titles of the list (date, distance, time) to have better viewing experience.



RunningTracker

Journey Details

372.63 m

DISTANCE (m)

07 January 2020	00:02:06	2.96 m/s
Date	Time	Avg Speed

Journey Overall: Good

Comment: Super Fun!!!

Exercise Type: Walk

RunningTracker

Journey Details

19.58 m

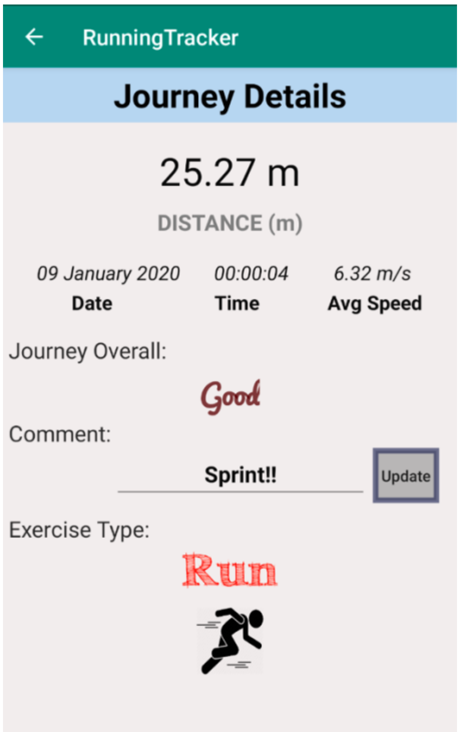
DISTANCE (m)

09 January 2020	00:00:04	4.89 m/s
Date	Time	Avg Speed

Journey Overall: Good

Comment: awesome exercise !

Exercise Type: Jog



Journey Details

25.27 m

DISTANCE (m)

09 January 2020	00:00:04	6.32 m/s
Date	Time	Avg Speed

Journey Overall: Good

Comment: Sprint!!

Exercise Type: Run

Figure 4.10 DetailRecordActivity with Data Details

By clicking each row of list view in RecordActivity, users can see all their exercise data with the corresponding performance analysis which gives users an awareness of what level of performance they had at that time. Users are also able to edit their comment and update their thoughts by clicking the “Update” button if they change their mind.

5. Other

Since MainActivity and MovementActivity are the activities where users may spend most of time on, implementing these two activities to get the message from broadcastReceiver should considered reasonable since users are most likely to encounter situations such as low battery, etc.