Workout App: Android Wear with Sensors

Project Description

Workout applications are proving extremely popular. However, very few of the workout applications on the market implement Android Wear capabilities. This application will allow the following:

Store All Workout Data in a Database

The user will be able store all of their workouts in a local database on the smart phone. The data that will be being stored will include variables such as the date of the workout, length of workout, exercise name, weight lifted, amount of repetitions completed and the amount of sets completed.

Track Each Workout

A workout can be created by the user by selecting exercises of their choice. Once the user has selected all the exercises they wish to perform, the workout be saved and then performed. As the user is tracking the workout, they can enter the amount of repetitions and sets completed for each exercise. During a workout, there will also be a timer that the user can start/stop in order to time their rest periods.

Record Repetitions Using an Android Wear Smartwatch

The user' can be record specific exercises through Android Wear using gestures and motion sensors to track repetitions (accelerometer, gyroscope). Only certain exercises allow a big enough range of motion in order for repetitions to be calculated accurately. The primary exercises the application will enable automatic repetition tracking will include the barbell squat, barbell deadlift and the barbell bench press.

In short, the application will allow the user to track their workout with minimal effort through the option of using of their Android Wear device.

Project Aims & Objectives

Upon the completion of my project, I am aiming to have developed:

1. **An Android Application which will function as a Workout Journal:**
    - SQL Database to store workout history
        - e.g. date of workout, exercises, sets and repetitions completed, total volume of weight lifted etc.

    - 1 rep max (1RM) calculator
        - A 1 rep max is a value predicting the maximum amount of weight a user can lift of a certain exercise

        - The user will enter a weight they have lifted for X amount of reps of a certain exercise
        - The calculator will then be able to predict how much weight the user could lift for 1 repetition

    - Analysis of workout data upon completion such as:
        - Muscles targeted
        - The amount of sets completed during the workout
        - The time taken to complete the workout

1. **A method of data processing using a smartwatch running Android Wear:**
    - Calculate repetitions completed using sensors (accelerometer)
        - The accelerometer will be used in order to determine repetitions completed
        - This can be done by tracking distance moved by smart watch
        - This can also be done by monitoring the spikes in acceleration

    - Initiate start of exercise with gestures (gyroscope)
        - This will help to remove anomalies from the data
        - Acceleration/distance will only be tracked once the user begins exercising (not just moving)
        - An example of the type of gesture would be a shaking the smart watch
        - There should also be a button the user can press as an alternative

    - Monitoring heart rate during exercise
        - The smartwatch must be enabled with a heart rate monitor in order for this to be possible
        - The monitoring of heart rate will begin once the initiation gesture has been performed
        - The heart rate monitor will be active whilst the user is completing a set
        - This will allow post-workout analysis of the user's workout such as most intensive exercise performed

Work Plan

I will be implementing an Agile method of working during this project. I feel this is the better approach for myself as there will be features of the application that will change as the project develops. For example, the method used to track repetitions will be decided upon later in the project and may change once issues, such as accuracy, are discovered. This method will allow me to be more flexible and allow for modifications where necessary.

There are 15 weeks from start to finish (including the Easter Break) for this project. My work plan will break down when key components of the project should be completed. Please note: The writing of reports will be an ongoing process throughout the project. I will be focussing at least one day per week on my report. Hence, it will not be included in the outline of my work plan.

The key components of my project are the following:

Research & Requirements – Time: 1 Week
This will involve researching all the features to be implemented within the application such as most popular exercises to include, most accurate 1RM formula, potential database implementations etc.

I will develop a set of use cases during this period. The use cases will help me then develop a set of functional and nonfunctional requirements that should be met. Additionally, test cases will be created in order to test against the requirements. Note: Due me implementing Agile, test cases will be applied after each feature is implemented to realise if changes are required within the project.

During the research period, a basic mockup should also be completed that the application can be based on. However, it does not matter if the final outcome looks dissimilar to the initial mockup. The actual UI will be developed as each feature is implemented. Hence, it will be developed throughout the majority of the 15 weeks.

Implement Repetition Tracker – Time: 3 Weeks
The repetition tracker will be implemented using the android wear devices accelerometer. At this point I will discover which method is more accurate (tracking distance moved vs acceleration spikes etc). Once I have decided which method I wish to implement, I will begin programming the repetition tracker. The feature will count the amount of repetitions completed by the user and then update the counter on the user's mobile application. Hence, no user input will be required at times in order to enter repetitions. This is a major component of the application. Therefore, I am allowing myself 3 weeks. However, I feel it could be completed in 2 weeks..

Implement Gesture Functionality – Time: 2 Weeks
The gesture functionality will allow the user to state when they are about to begin an exercise by performing said gesture. This will in turn mean that various anomalies, such as quick user movements prior to beginning their set, are eliminated from the tracking. Thus, this feature will help to improve the accuracy of my repetition tracking. I am of the opinion that 2 weeks for this feature will allow me to implement it fully and perform an adequate amount of testing.

Implement Heart Rate Monitor – Time: 2 Weeks
The heart rate monitor will be activated during an exercise that the user is performing. This will provide my application with key data that can be used to provide the user with workout analysis. This analysis will include details such as the exercise that caused the user's heart rate to reach its highest level. In turn, the user can then realise which exercise is most difficult for them and what they need to work on in order to improve.
This feature will require a heart rate monitor to be implemented in the user's smartwatch. I am giving myself 2 weeks for this feature in order to allow for implementation of the heart rate monitor but also to allow time for me to implement a check that should enable the application to realise if

the users device has a heart rate monitor or not. This process should be completed seamlessly and without user interaction.

Implement Database Facility – 2 Weeks
The database functionality is a key component because the user must be able to store their workouts. If the user cannot store their workouts, then only their current workout will be visible. This would not be a desireable workout journal if this were the case. I have given 2 weeks to this component as the database must be created with all the required details but also integrated with the rest of the application.

Finalise UI – 2 Weeks
Initially, I will give a beta version of the application to various users (of various technical ability) to determine how easy the application is to navigate around and what changes should be made to increase efficiency. This process will involve making any stylistic tweaks to the interface on parts that I am subsequently not happy with. This will also give me time to make any functional changes I feel necessary, such as making the menu more efficient by providing more relevant links or shortcuts throughout the application.

Final Testing – 2 Weeks
This testing period will be performed despite testing being applied throughout the implementation of each key component. The 2 weeks allocated to this period will allow for test cases to be run extensively. Therefore, any issues regardless of the size should be picked up. I will also aim to test the application on multiple devices during this period (if I haven't been able to throughout the project) to ensure that it is working correctly on multiple android devices.

Milestones
Each implementation within the project should be considered as milestones. As each implementation is completed, a milestone has been reached. Additionally, 2 milestones to be included in the project will be the 2 mandatory meetings with my supervisor. I am planning for these meetings to be held during the end of week 5 and week 11 of the project. I have chosen these week 5 as this will be after the main component of the application should have been implemented. I have chosen week 11 as this is the last week prior to the Easter holidays and I feel that this would be one of the final opportunities to discuss any issues with my supervisor. I can also give a good outlook of how the project has gone at this point.

Note: The work plan stated above should be viewed as being in chronological order. I have left one week unallocated in the above work plan (14/15 weeks allocated). I have purposely done this to give myself extra time if a major issues arises during any part of the project. Therefore, I will have an extra week work with in order to fix the problem(s) without affecting the rest of the work plan.