Ubiquitous Computing : Project Report

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Project Goal :

The Goal of our project is to develop a Photo Gallery Application in Android (OS). Sync this built Photo Gallery with Thalmic Labs MYO (Ubiquitous Computing Device). And to control the functions of the Gallery like moving ,selecting and zooming pictures with the MYO controller worn on users arm with hand gestures such as spread fingers, make a fist, wave palm in / out

Project features:

The approach to this project consisted of a few elements that were discussed as a team.

As a user for a Picture Gallery App, we want to see the images on the mobile app.

As a user I want to be able to scroll from a list of different images .

To take a better look at the Selected picture, we needed the zoom functionality for the Images.

Now we as MYO users need to sync the above Gallery App with Myo Arm Controller

Need to know after successful connection is established between Myo and Mobile Gallery App

The arm on which MYO is worn should have certain gestures to control the Gallery without touching the Mobile screen

As users we need certain simple arm gestures which are compatible with Myo to control the Gallery functions such as scrolling through different images, selecting an image, also zooming in a selected image

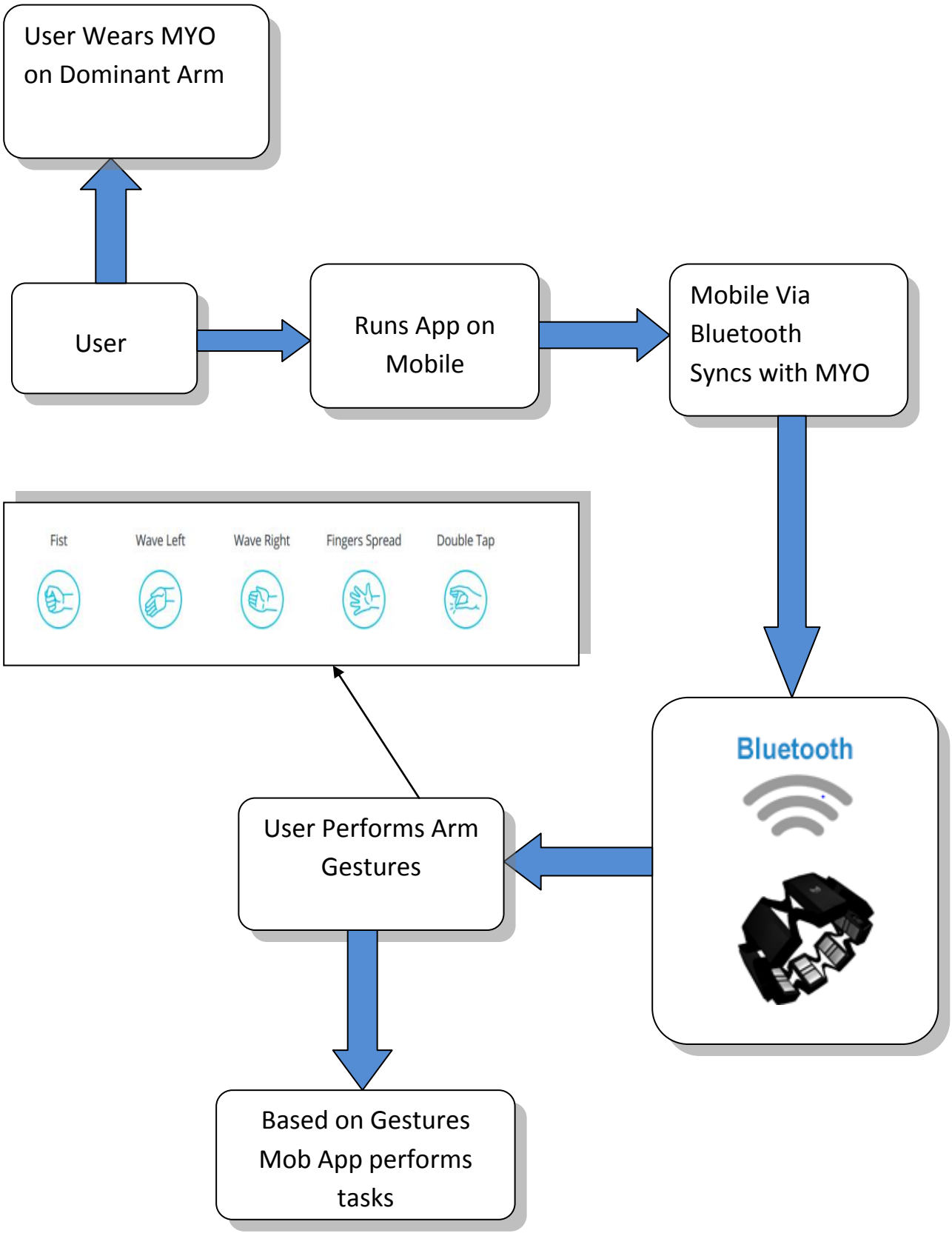
After completion of a gesture, app screen should notify about the gesture which was performed and the corresponding changes that take place.

Myo should lock itself down after short time of inactivity with arm gestures. so that normal

actions are not read as gestures. Users should be notified about the lock

To unlock Myo after self lock , a unique uncommon gesture should be available to unlock Myo and control the gallery application. Users should be notified about the Unlock

Project Design : Flow Diagram of the Work flow of Our Project



File Structure :

The project was made in 2 stages :
Stage1: Saurabh made application for the gallery app on Eclipse IDE

Stage 2 : Siddhant completed the project in Android Studio .

So the final File Structure(Uploaded on Github) is as follows :

A) Files Coded by team members

1) Folder, file coded by team in **app/src/main/ java/com/example/picturegallery**

i) **ImageAdapter.java** - Provided and coded by Saurabh - Bindal

Loads the Images from the drawable folder and lists them horizontally like a gallery list

ii) **MainActivity.java** - **64 lines** of base code provided by Saurabh Bindal

It is the Main file which loads the app , it displays the images from ImageAdapter.java.
Also the selection of a particular image is taken care of in this file

On that code , functions , changes and Myo functionality added by Siddhant Jaiswal
total new code length **300 lines**.

Imports all the necessary Thalmiclabs, Myo Libraries.
This code handle the MYO bluetooth connection, it calls the functions from TouchImageView to implement zoom /reset zoom functionality .This code implements methods and cases to perform appropriate actions corresponding to the MYO gestures .
Displays messages on screen about the state of MYO and also current arm gestures performed

iii) **TouchImageView.java** - Code which has useful functionality (almost a framework for gallery apps) for gallery app found by Siddhant Jaiswal (I studied the code and removed the code part which was not needed and implemented its functions)
TouchImageView.java reference :
https://github.com/MikeOrtiz/TouchImageView/blob/master/src/com/ortiz/touch/TouchImageView.java

2) Folder, file coded by team in **app/src/main/res/layout/**

i) **activity_main.xml -** file was modified by Siddhant Jaiswal to manage design and look of app

3) Folder, file coded by team is in **app/src/main/res/**

i) **drawable** -This folder contains images which load in the gallery app all the images were added shot/clicked from mobile by Siddhant Jaiswal

ii) **drawable -hdpi to drawable-xxhdpi** -The images contained in this folder changes the App logo - modified by Siddhant Jaiswal to change the Icon launcher to UML Riverhawk Logo

iii) Rest of these files in res folder were automatically modified by Android Studio as coding was done in Android Studio example files like : values /strings.xml , values/dimens.xml

3) Folder, file coded by team in **app/src/main/**

i) **AndroidManifest.xml -** modified by Siddhant Jaiswal to adjust android version and title of project

B) Folders , files generated by Android Studio are

1. .gradle (folder and all files in it)
2. .idea (folder and all files in it)
3. build (folder and all files in it)
4. gradle (folder and all files in it)
5.build.gradle
6.gradlew
7.gradle.bat
8.import-summary.txt
9.local.properties
10.settings.gradle
11.Sid-MyoGallery 2.0.iml
12.Sid-MyoGallery.iml
13. jniLibs

and all other build folders which are not mentioned to be coded by team members

Project Evaluation : For Grad Students - By Siddhant Jaiswal

There were not many papers which could be found on MYO , from the ones that I (Siddhant Jaiswal) found, not even one was similar to the Application we had built that is a Photo Gallery application for Myo.
I even checked the MYO market for any apps on picture gallery and was not able to find it on their store. So planning to submit our app on MYO store.
Reference : http://developerblog.myo.com/how-to-submit-your-application-to-the-myo-market/

For the paper comparison as I could not find a similar project but there was one paper which uses Myo to control Musical Interfaces.
Link for the paper :http:/www.arj.no/wp-content/2015/06/0179-paper.pdf

As the paper in question is not having a similar functionality or idea one cannot actually argue which approach or method is better than the other and why. But we can discuss about the similarity of the approach and the how the Myo arm controller was used to perform necessary actions.

In the above paper their goal was to assess MYO's potential for developing new musical instruments. There paper starts with a test of the MYO's sensing capabilities they conducted all their testing in the fourMs motion capture lab at the University of Oslo, followed by a discussion of its conceptual possibilities. In the end of the paper they present their MuMYO prototype and evaluate it.
In the paper they finally came to a conclusion that despites MYO's shortcomings, the MYO controller has potential of becoming a new standard controller in the New Interfaces for Musical Expression (NIME) community.

In the publication it is stated that they conducted an informal test for 15 year old students at a local high school which drew a lot of attention and the testers were enthusiastic about the interaction . Along the same lines, we had given MYO to half a dozen of our friends to wear and perform the actions on our app. They found the idea of controlling the app without actually touching it very interesting and encouraged us to do more along the same lines . Overall they found difficulties at the start getting used to it ,but within 10 minutes they got a hang of it . Well I presume this may not be entirely true for an average user . As my friends who were using /testing it are all computer science students well into their 20's. So it is somewhat safe to assume that they are reasonably comfortable using a new technological device related to computer and programming.

The common conclusion which is drawn in the paper and by us is that sometimes the gestures were not read correctly by MYO controller and not the same gestures were recorded on the app which the user was trying to do. We personally think that this is because MYO takes approximately 2 mins to warm up to a users skin and understand his arm movements correctly.

To conclude I would like to say that though MYO armband is a very promising device for the price one can buy it for. But, it needs to add in more gestures so that more features of any mobile or desktop application can be targeted using Myo. Currently, Myo is promoting five of its gestures developed by their team at Thalmic Labs. Also they need to simplify some of the gestures such as double tap and holding fist (i.e. reduce the errors in reading the arm gestures) the accuracy of these particular 2 gestures is roughly 75% from what we have seen by using Myo over the past 3 weeks.