



**University of
Nottingham**

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COMP2043.GRP INDIVIDUAL REPORT

Wearable Posture Healthcare Monitoring System

Team15

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Abstract

This report talks about the detailed story about what happened in the last 6-8 months of GRP project condition of how I am doing in the project. Along with reflection peer assessment and sources.

In this report, the following parts will be discussed in the order of: the summary, the reflection, peer assessment.

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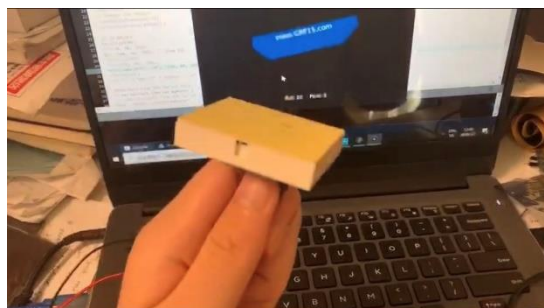
1 Summary

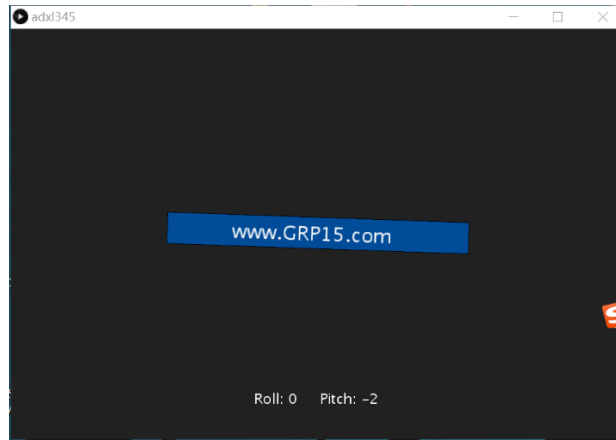
1.1 Contribution

I have started to dig into the project as soon as get the project information, initially we didn't get any funding from school so I started to purchase our own equipment , initially I started to tinkle on the equipment Dr.Lee gave us, it is a raspberry pi 0w,I installed its operating system-Raspbian(there is a thing I found out during the last of this course, that Raspberry Pi need something called a firmware to open it up in the computer storage, like a USB-disk ,Pi foundation clearly didn't indicate this, I was taken covered ways, there should be some ways that we can directly open it in windows, but initially we just use balenaEtcher, a software to burn the system into the hardware), after several days we managed to soldered pins, put accelmeter/gyro data on screen.



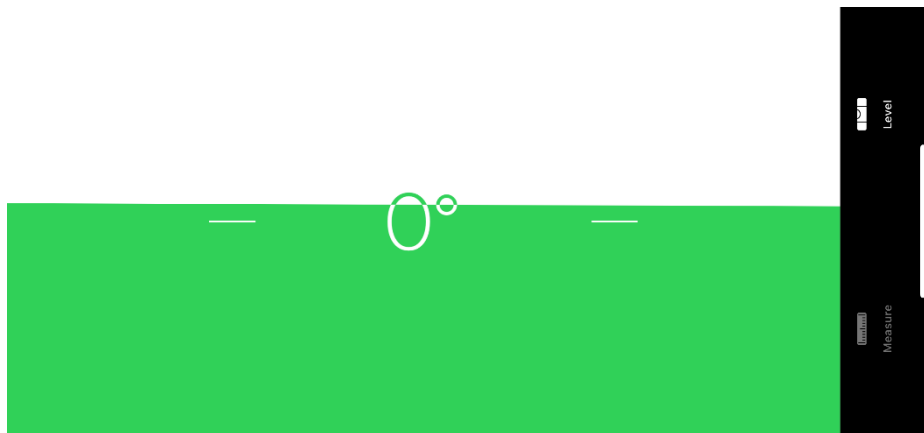
After that we stuck into a problem of how to use these data into posture. I couldn't figure out this, and I thought maybe some company guy can solve the problem for us. I thought they could solve the problem. It turned out very differently , they came up with a naïve prototype just as what we did above. They promised us for comments , blueprints, and the total solution, I felt deceived. I didn't mind this at the beginning and focus on the project once again. This time I thought of something I watched before about visualizing the data on the screen , yes, there are similar projects used on raspberry Pi , too. But I think that if the company is using the Arduino , and Arduino has more users and resources ,I should try it, several days later I begin to work this out on **Processing IDE** and Arduino , it is from articles online. I've also seen Pi with opencv.



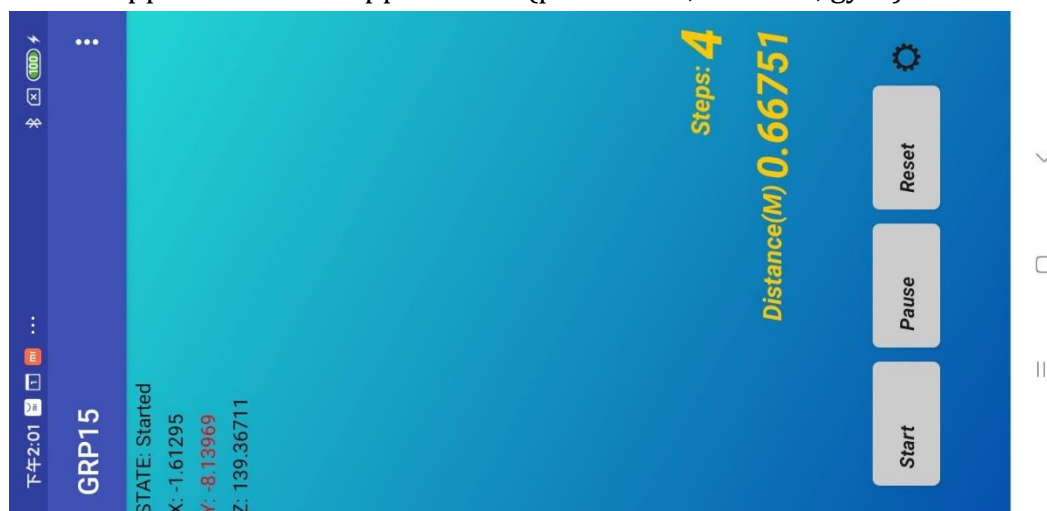


Soon afterwards, I think it is time to find out how to do Bluetooth connection with Android, I was trying both way of IOS and Android, it turns out for IOS you need a Mac and a IOS developer membership. So I tried to work on Android. **MIT App Inventor** and **Android Studio** come into our interests. Meanwhile , I found out that there are sensors inside the phone as well. It's amazing that these things have similarity. So here is things that I found in the phone that might benefit the project.

IOS level developed by Apple Inc(no source code).



An app I built out of App Inventor(pedometer, distance, gyro)



These two doesn't use Bluetooth at all. It uses inner-built sensors like pedometer and accelerometer. I have looked through the contents of the Bluetooth, and some existing projects on the internet, like turn LED on and off. From what I learned it is a little bit like what we learned in the module **System and Architecture, three way handshake**, there is a server machine which is our Developer-board, and the client is our phone. You have to pair them first.

Well...This is what gets tricky, we have already paired it, how can we send data through then? Maybe we should use some function? Maybe socket programming? There is no such function as in MATLAB and as in other Software, we have to do the complete logic ourselves. Surely this adds burden to the difficulties.

And thinking about this, I felt a loss. I immediately called the policeman, to sue the small company I encountered before, 1700RMB was burned for just a naïve prototype!

I was taken to the bureau(police station) to do dictations, the policeman wrote a report to the computer and try to reason me that, because the company was doing it, and you agree beforehand, you can't say they are fraud, they have difficulties in doing the software. And the policeman

said still this story was a little abstract to them, they don't know what I am talking about. And on second thought 1700RMB was quite insignificant in the city, even if they report it no superior officer would open a case. After all some granny was deceived by fraud for 5 digits.

After a week or two, adafruit bluefruit was delivered to my home via TaoBao purchase(no mailing option to China from adafruit).Some useful links like <https://learn.adafruit.com/bluefruit-playground-app> and

<https://learn.adafruit.com/bluefruit-le-connect>

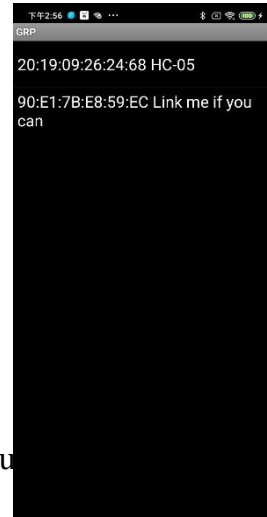
<https://learn.adafruit.com/adafruit-circuit-playground-bluefruit>

were found, and check out for <https://github.com/adafruit/Bluefruit-Playground>

That is mostly how this magic happens, and for previous software it is accessible from youtube:

<https://www.youtube.com/watch?v=UxABxSADZ6U&t=497s>

<https://www.youtube.com/watch?v=ryqfQgyC8G4&t=1079s>



2 Reflection

2.1 Original Objectives

1. Collect sensors data from the device establish Bluetooth low energy (BLE) communication. (Semi-finished?)
2. Process and analyze the sensors data to identify the postures based on several features such as moving distance moving speed, distances etc. and further verify the correctness of the position angle in corresponding to the related postures.(Able to show angles, but not classifying postures)
3. User friendly design of GUI to display other direct motion information such as walking distances, speed, duration and indirect information such as calories burned etc.(no calorie , but User friendly GUI implemented)
4. Posture classification (failed)

2.2 Reflection

The most obvious mistake happens at let someone else do my work, it is very unnecessary to do so , and it cost so much. I know at the beginning that they probably not going to solve the problem, but I still take gambling psychology in hope that I can solve this problem without my own work.

It has always been a problem distribution of work. In Year1 I was taken a course Of CELE , Introduction to Mechatronics under Dr. Neil Arnold and Dr. Richard Hoban, I was doing a project that is by our own will, it is inspired by NASA's rovers. Basically it is very much similar to this, you have to read sensor data and then transmit it to the phone. The result is , yes , we can control the rover to move with Bluetooth from a software from an Indian programmer. And data were inside Arduino ide. Yet it is very hard for us to put data into phone.

Think this thing carefully, if we truly 100% did what we want to do. Why would we need NASA, Chinese Military , Soviet union? Maybe they should hire me to work for them.

But after I studied for a few years of computer science , some of the concepts were no longer unfamiliar to me. And I no longer wonder what an IDE is, how to write code. Maybe after a few more years of study , we can finally made these projects better.

And yes, it is possible to dig more into just one kind of machine, for example, use Raspberry Pi, but it takes so many years of experience, and other kind of computer knowledge. No undergraduate students would do these things easily.

Though it is possible, I can't say every undergraduate doesn't do the project well.

Talking about Richard Hoban ,CELE, reflection, this reminds me of Foundation Science A, which is a extremely hard module. What I found out is that, when you were measuring gravitation acceleration, you never measure the exact $9.8m/s^2$, and if you do record every data you have, you will have some data that is far from this number(Late stop watch counting, pendulum problem, uncertainty). And if you don't fabricate data, well, you never get 9.8. So does π , given a rope and a ruler you never get 3.14, actually in C you can define Pi as any number you want. I wouldn't say it is impossible to measure Pi, maybe there is some method I don't even heard of.

For now , I would imagine all these constants as a "established by usage"

3 Appendix

Peer Assessment

Name of assessed group member: Xin_Lin

	None	Lacking	Adequate	Good	Excellent
Research & information gathering					X
Creative input					X
Co-operation within group					X
Communication within group					X
Concrete contribution ¹					X
Attendance at meetings					X

Justification of assigned marks:

Group leader who arrange things carefully, detailed for every meeting and give out orders. Contributed a lot to interim report.

Name of assessed group member: Hao Mao

	None	Lacking	Adequate	Good	Excellent
Research & information gathering					X
Creative input					X
Co-operation within group					X
Communication within group					X
Concrete contribution ²					X
Attendance at meetings					X

Justification of assigned marks:

Trying very hard to find algorithms, contribute to matlab form and hardware design.
Trying hard to find the algorithm

Name of assessed group member: __ QiXiang Fan _____

	None	Lacking	Adequate	Good	Excellent
Research & information gathering					X
Creative input					X
Co-operation within group					X
Communication within group					X
Concrete contribution ³					X
Attendance at meetings					X

Justification of assigned marks:

Suffering from difficulties in learning, probably missed a few key terms and lack of ability to program. Able to communicate if you are patient enough. Trying hard to find the algorithm

Name of assessed group member: _____ YuXiang Sun _____

	None	Lacking	Adequate	Good	Excellent
Research & information gathering					X
Creative input					X
Co-operation within group					X
Communication within group					X
Concrete contribution ⁴					X
Attendance at meetings					X

Justification of assigned marks:

Made a Android Application from library and online resources. Contribute a lot to the report. Trying hard to find the algorithm