Brenyn Jungmann

bwjmbb@mail.missouri.edu

Abstract

This combination of hardware and software is used to determine what pass a quarterback threw based on the real time event of when he released the football.

ECE 4220 Project Proposal

Quarterback Passing Estimator

Introduction/Problem Statement:

The topic that I want to address is that of a quarterback passing a ball to his receiver. What I want to determine is what pass the quarterback threw based on the amount of time the ball is in the air. The reason I chose this is because my brother is a quarterback in high school and I originally wanted to be able to track the ball in the air to determine the route that was thrown. After doing some research and determining what it would take to do this, I found that this was out of my price range and rather hard to implement. So I determined that I could make this a lot easier and cheaper by taking out the GPS tracking aspect of it as well as the wireless pressure sensor. In doing this I would be doing more of a simulation and testing of components that I could later add to and possibly complete my original idea. My plan is to use an Arduino board that is connected to a pressure sensor that will sense when the pressure sensor is released and then when it has pressure on it again. During the time it is released there will be a timer running and then based on the amount of time it took for the pass it will then access the FairCom database which will have all the passing routes and an average time it takes for a quarterback to throw each pass. From the time I calculate, I will then use an algorithm to calculate which possible routes the quarterback could have thrown. There are a few routes that have very close times so that is why there can be multiple routes but on most passes there will be only one possible pass route.

Related Systems:

As far as I know there is no way that a coach can track his quarterback passes each and every throw in practice and have it saved to access at a later time. Normally the coach would have to watch and time each and every pass the quarterback throws and then compare it to that of previous throws or even a list of the best quarterback times. If I get this small start of a big project done then I can determine how helpful I can make it for a quarterback coach and if it would be helpful to the football industry. There is a lot of things that need to be watched when a quarterback is practicing and wouldn’t it be nice if a coach had a piece of hardware that could help him with timing the passes so he could focus more on the quarterbacks form? There is a lot of possibilities to this system I think, you would have to add something so the football could tell the quarterback was actually the one with the ball in real life and then you could even program in the receivers on your team and then tell how many passes they caught and dropped.

Goals:

In this project my goal is to incorporate a few aspcts from the class. These are networking (sockets), real time applications (task and threads), named pipes, and task synchronization. I have kind of mentioned this throughout the document but to further clarify the short term goal for this project is to get the Arduino board reading in the pressure from a pressure sensor and then timing the amount of time the football was in the air. Then once the total travel time is calculated then the time is checked against the times in the FairCom database and then the algorithm finds which route was thrown by the quarterback. The long term goal would to be to save each pass that was thrown with the corresponding route and time. There could also be a visual representation of the throw but that is based on how long the programming and implementation takes. The final goal of this project would be to actually implement the real world application but as talked about in the problem statement the funds and the learning curve seem to be out of range right now so this would be implemented in the future.

Benefits:

The benefits of this product would be to help a quarterback coach and make it easier for him to do his job. He could use the data received by this real time system to see if his quarterback was improving or getting worse. This would help him to determine which passes the quarterback needed to work on and would help him determine if the quarterback was getting the football off in time. This meaning that he isn’t holding the football too long in the backfield so that he will not be sacked. The expected outcome of this project in the time given is to be able to determine what pass was thrown by the quarterback based on the amount of time the football was in the air.

Constraints:

In this project there are a lot of limitations based on time and money because of these I am held to creating a small part of a much bigger and more complete project. Some of the specifications of the project are based on the hardware components of the Arduino board and the pressure sensor. I will be using a force sensitive resistor (FSR) that can detect physical pressure (ADA). This is a much smaller senor than what would be needed for the real world application but since we are only simulating a small part of the system this will do.

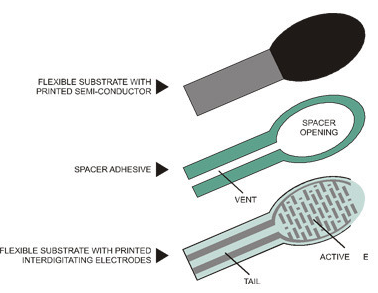
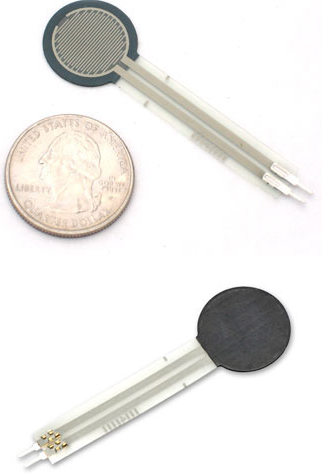


Figure 1: FSR

Assumptions:

I am under the assumption that we will be learning about networking in this class in the time that we have left in this semester. I would like to incorporate this into my project by having one computer getting the data from the pressure sensor and calculating the total time of the pass and then through a network pass the time to another computer which has the FairCom database on it that can then compare the results. The second computer will then pass the data found and pass it back to the computer that calculated the amount of time the pass took. Another assumption that I am making is that in the FairCom database I can build a table and store the values I want in it. Once I have my table built I will need to be able to read certain columns and rows of it and test values versus my time. I will also need to build a new list of data of the passes a quarterback has just thrown.

Methodology:

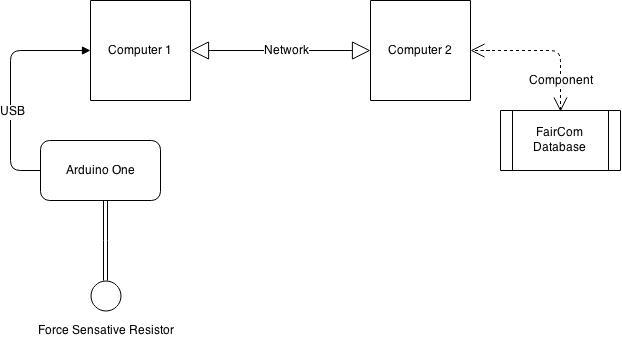


Figure 2: Methodology Flow Chart

Timeline/Schedule:

I will be getting all the necessary components for this project by April 1st they are currently ordered and being shipping to me. We currently have 6 weeks to complete our project when we get back from spring break so my schedule will be as follows.

Table 1: Schedule

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| --- | --- |
| Week 1 (04/06 – 04/10) | * Configure Arduino Uno and the FSR * Write Program to read from analog input * Run Multiple Tests |
| Week 2 (04/13 – 04/17) | * Figure out how to Network between two computers * Start learning on about FairCom * Hopefully print message over network from FSR |
| Week 3 (04/20 – 04/24) | * Finish up Networking * Build table in FairCom database of pass routes * Learn how to create a FairCom at runtime |
| Week 4 (04/27 – 05/01) | * Write algorithm to determine what passing route was thrown * Create table of passing data * Possible graph creation * Write Preliminary Report |
| Week 5 (05/04 – 05/08) | * Write Final Report * Testing and Final Touches |
| Week 6 (05/11 – 05/15) | * Testing and Final Touches |

Strengths of the System:

The strengths of the system will be that no matter what pressure is put on the sensor it will always read a pass once the sensor is released and then a pressure is applied. Another strength will be the reliability and sustainability of the programming portion of this project. It will be programmed to run multiple passes in one setting and you will also be able to clearly see the results on screen. The algorithm to determine which passing route was thrown will be very accurate and consistent.

References:

ADA, LADY. “Overview”. Learn.adafruit.com. Adafruit. 29 July 2012. Web. 27 March 2015. <https://learn.adafruit.com/force-sensitive-resistor-fsr>