



Head trauma and impact measuring in sport

Beng Electrical and Electronic Engineering

By Morgan Jones (1706863)

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Sport Head Collision Severity Diagnostic Aid



Introduction

To create a device to measure impacts and then store the relevant data

Aims

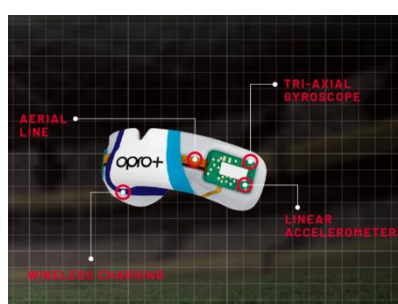
1. To create a device to measure impact forces in sport
2. To assist in sport diagnosis

Objectives

1. Research head trauma injuries
2. Create a functioning device with working program
3. To reduce the number of repeat injuries

Research

1. History of head trauma.
2. History of protective equipment and how it works.
3. Medical risks of head trauma in sport.
4. Benefits of impact detection.
5. Other commercially available devices



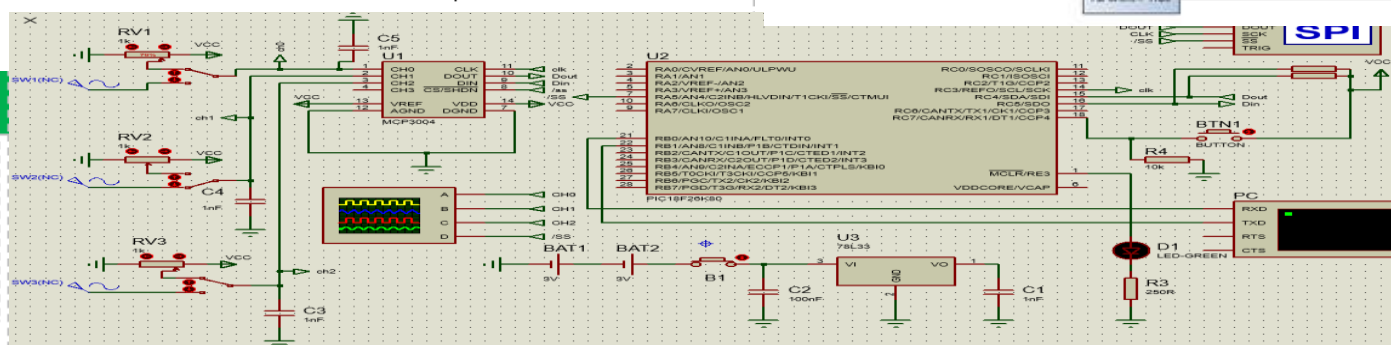
Device Design

The device schematic on the below contains:

A set of 3 sensors which are connected to ch0, ch1, ch2 on the accelerometer as shown on the left of the schematic these can readings obtained via a random sign wave or via the variable resistor.

These reading are sent to the pic and the values are stored and displayed with their memory locations for inside the PIC as shown in the image on the lower left. You also have the LED which flashes depending on the values i.e. the values pass the threshold.

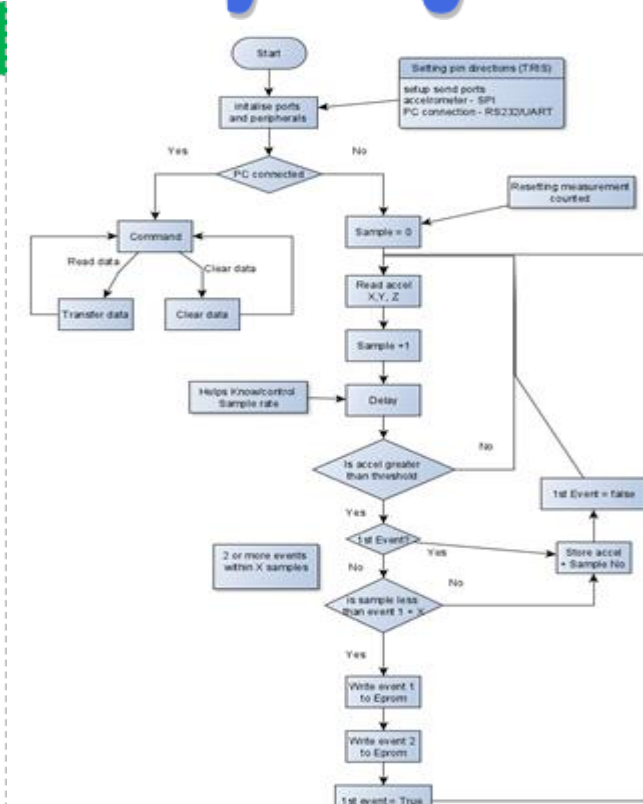
There is also a button which is used to Reset and clear the memory.



Virtual Terminal - PC

```
Starting scanning memory location= 0x000C
data stored - 0x07C7 @ 0x000C
Ch0 - 808 Ch1 - 365 Ch2- 818 Value-1991
data stored - 0x07F1 @ 0x000E
Ch0 - 808 Ch1 - 407 Ch2- 818 Value-2033
data stored - 0x07F3 @ 0x0010
Ch0 - 808 Ch1 - 409 Ch2- 818 Value-2035
data stored - 0x07ED @ 0x0012
Ch0 - 808 Ch1 - 403 Ch2- 818 Value-2029

Resetting memory
data stored - 0x07E0 @ 0x0004
Ch0 - 808 Ch1 - 390 Ch2- 818 Value-2016
data stored - 0x07CB @ 0x0006
Ch0 - 808 Ch1 - 369 Ch2- 818 Value-1995
```



Software Design

The software flowchart shows how the physical device will be set up.

1. First the power button is pressed (Start)
2. The ports and peripherals are initialized
3. Is the device connected to the PC (YES/NO)
- 4A. YES (display data and allow data transfer or deletion)
- 4B. No (begin sampling)
5. Read Accel X,Y,Z
6. use delay to control sampling
7. is reading greater the thresh hold (YES/NO)
8. YES (STORE SAMPLE AND KEEP SAMPLING)
9. NO (KEEP SAMPLING)
10. Any reading over the threshold store in PIC
11. Keep repeating steps 5 TO 10
12. The power button is pressed (stop)

Testing

The testing of the device shows that that each channel is working and are giving individual readings. The PIC is also working properly as by showing where the readings which are above the threshold and where they are stored

Conclusion

The device works as it was designed too.

However improvements to the code could improve the capabilities, for example, the device to measure, save and display how long the device has been active