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Problem:

The problem my project aims help with is the concussion epidemic in sports, specifically football. Although large knock out hits are a concern, it is the repeated hits to the head that can lead to long term health effects. This project will utilize an accelerometer to track how many hits a player is taking to the helmet. This will aid in CTE research along with guide medical professionals to better understand the kind of trauma players are experiencing. This will lead to better diagnoses and prescribed treatments for the players. It will also help coaches better understand the health of their players and determine whether they are safe to continue action or not.

The internet is connected because the data from the accelerometer needs to be transferred from the helmet to a service that is able to track the hits. In this project when a hit on the accelerometer is registered a device state is sent to Losant which then sends a device command to another device which will turn on an LED light for 1.5 seconds.

Hardware:

1. ADXL 345 Accelerometer (Given)
2. ESP 8266 x2 (Given)
3. Breadboard x2 (Given)
4. KMASHI 1000mAh Portable Power Bank
   1. $14 on Amazon
5. LED Light (Given)
6. Football helmet (Borrowed from Brighton High School)

Network and Protocols:

A Wi-Fi chip is built into the ESP 8266 so for the sake of the project this is what will be used for the project. In terms of turning this into a real life product a different network would need to be used due to the lack of access to Wi-Fi while on a football field. I’d recommend one of the cellular networks so that at any point on the field there is good enough connectivity to transmit the data and with no packet loss from all 22 players on the field having connected devices. In terms of sending messages from the device to Losant MQTT is used. This is because it is an easy way for the device and service to connect to each other. Instead of always asking each other for data, they are just listening for a message which reduces overhead.

How it works?

The accelerometer is placed on a surface. The surface is hit and the accelerometer tracks the change in acceleration. The device is reading its current acceleration every 150 milliseconds. If the acceleration in any direction changes by 3 m/s2 a hit will be registered. When this occurs it sends a device state through MQTT to Losant. In Losant a workflow has been built to send a device command to a second device when it receives a device state. In the second device when it receives this message it will turn on an led light for 1.5 seconds.



