CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36083

Project Title

Play Safe: An Arduino Based Solution to Sports Injuries

Abstract

Objectives/Goals

Injuries are a common occurrence in sports of all types. Football, in particular, causes concern in coaches and parents because of the higher incidence of injuries. Often times injuries that seem to be trivial end up having severe consequences due to negligence(e.g. players fail to seek immediate medical attention and continue playing). The purpose of this project was to address two common injuries in football namely concussion and heat related injury, and to develop a small, inexpensive, and lightweight device attached to a players helmet that would help coaches and guardians to monitor concussion and the temperature statuses of the players. This device could also guide the coaches and inform them when a player should stop playing, seek medical attention or cool down.

Methods/Materials

Used Arduino microcontroller as the programming platform for my device to which accelerometer and temperature sensors were connected to obtain data. Accelerometer is used to detect any shock or vibration to the device which is expressed in terms of 'g' values. A Bluetooth module was attached to the device to send the information to mobile devices. Developed the app for the smart phone or tablet that allows a user to set a threshold for both sensors according to players age or weight. A timer was built into the app that facilitates notification to coaches to take breaks for cooling down.

Results

I tested the device by subjecting it to conditions that simulated hit on the players head as well as temperature. This involved shaking or oscillating the device at different oscillating speed along x-y and x-z axes and noting the reading. The temperature sensor was tested by placing the device under different temperatures and then comparing the readings to the actual temperature measured by a conventional thermometer. Several trials were performed and the readings were averaged. I set different threshold in the smartphone app and verified that the alarm indicator on the app got activated whenever the reading of vibrations or temperature exceeded the threshold.

Conclusions/Discussion

This device could be an inexpensive solution for early detection of a hard hit (by creating a potential concussion warning) and heat injury (by making a heat alert) in football, or other sports like hockey.

Summary Statement

Developed a small, inexpensive, and lightweight device that can be attached to a player's helmet and helps coaches and guardians to monitor concussions and the temperature statuses of the players.

Help Received

Parents helped in purchasing materials and the display board.