Project Team

Team name: The Raiders
Team members:

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Introduction/Purpose/Objective

Our project is about a helmet for youth players who play American Football. Our device will track the acceleration and report it. There will be a microcontroller and the accelerometer and they will be implemented in the helmet and will be covered with a cushion. The microcontroller will be connected to the LoRaWAN network through Chirpstack. That will allow the data to be transferred without becoming over reliant on WiFi connections. The device's purpose is to track the hit and report it.

The work statement will have an outline of Scope, location of work, tasks and deliverables, period of performance/schedule, and acceptance criteria.

Scope

We will develop our prototype from the EE and CS sides. EE will work on the hardware and CS will work on the software. Our team will achieve the tasks that will be mentioned in the tasks and deliverables.

Location of Work

The primary location for the design and production of our Concussion Helmet is in GoCreate at John Bardo Center. There, the electrical engineers have access to various tools allowing the EE to design and link up the circuits in the helmet. While CS can work on their software in GoCreate. It's a good place to work as it has direct access to a LoRaWAN gateway to use.

Project Timeframe

<u>Week 1 - Week 5:</u> We will be working on the helmet on the software side and physical side. We will upgrade the helmet to a bigger size and then we will add new sensors to it. And in the meantime test it out to get the accurate frequency in real time.

Week 6 - Week 14: We will be having meetings with our Instructors, sponsors and we will be testing the product out.

Week 15 - Week 16: It will take the last few weeks to get everything together and we will be testing and making sure it will be accurate enough for the final presentation.

Hardware Requirements

Accelerometer Functionality: Microcontroller will receive data from a connected 3-axis accelerometer.

LoRa Radio Functionality: Microcontroller will be able to transmit data through a radio antenna to LoRaWAN gateway

Attachment Functionality: Device will be attached and protected in the sports helmet

Export data Functionality: Microcontroller will get data from the sensors and be able to send data to the server

Lithium battery charger: a device that will be separated from the circuit and its purpose is to charge the power source.

Lithium battery: the lithium will be the power source for the device.

Software Requirements

User Interface for Acceleration: UI will be implemented for ease of analysis of acceleration during a collision

Alert ping system: Ping system will allow a dangerous impact reported by the device to alert on-site personnel

Storage Functionality: System will be able to store data exported from device

Execute Functionality: Device should be able to recognize a dangerous impact

Testing Requirements

Accelerometer: The accelerometer must be able to record accurate data to properly determine a dangerous impact

<u>LoRa Radio:</u> The radio must be able to transmit device data to a gateway using the LoRaWAN network

<u>Durability:</u> The device should be secured to the helmet and be able to withstand high impact collisions

<u>Installation:</u> The installed device should not impair the user's ability to play in sports activities

Acceptance criteria

Both software and hardware will be tested by members of each discipline (CS and EE) to ensure that modules from both categories work individually and when integrated with each other
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<u>Hardware:</u>
In order for the hardware to be acceptable, the helmets needs to achieve the following objectives:
- Provide protection of a traditional helmet to the wearers head
- Be able to withstand impacts from top, sides and back of the helmet without damaging the device
- Transmit data in real time from the sensors to across the servers to be used by the software

<u>Software:</u>
The software needs to achieve the following objectives in order to be acceptable:
- Receive data from the sensors and convert raw sensor to relevant, useful and comparable values
- Program has to Identify the severity of the collision and possibility of the occurrence of a concussion
- Send an alert or notification to end-user device if collision achieves conditions set in the program

I have read the entire report and it meets my personal quality standards
    <u>Team Member #1:</u> Dallas Stroud
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