ECE4011/ECE 4012 Project Summary

Project Title	Free Throw Form Analytics
Team Members (names and majors)	Edison Carrick, EE Adam Jackson, EE Kyle Kizirian, CmpE Patrick Miller, EE Mickeal Taylor, EE
Advisor / Section	Dr. Erick Maxwell / A05
Semester	2017/Spring Circle: Either **Intermediate (ECE4011)** or Final (ECE4012)
Project Abstract (250-300 words)	Sports such as basketball where a repeated motion is required to achieve the perfect shot do not have a wearable technology created that uses tracking data to compare their shots. The team will create a sleeve with embedded sensors and develop a software interface to track the motion of these shots and compare them to a standard "best shot," helping the player more accurately develop their skills. The motion for the shooting a free throw will be tracked in order to develop a baseline for the software, and prove the use case in a more isolated environment. After confidence in the system has been established with this application, the project could be expanded to many other repeatable motion sports such as bowling, darts, golf, and tennis. The three main parts of this project will be the placement of sensors on the arm through hardware design, the development of a wearable sleeve, and the software interface to interpret the data and provide the user with a way to see the difference in their stroke and improve it accordingly. The sensor placement must be good enough to track all motion of the thrown object in order to record sufficient data points. By integrating the acceleration and rotation data from the inertial measurement units (IMUs), it will be possible to model a sensor in space relative to the other sensors. The development of the wearable sleeve isn't a priority for the project, but if time permits this could be developed as a better way to package the technology.

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List **codes** and **standards** that significantly affect your project. Briefly describe how they influenced your design.	- I2C: To connect sensors to microprocessor - IEEE Standard 802.11 (WiFi) for the microcontroller to connect and save data to the cloud. - UL 2054: standard for wearable battery pack usage - ANSI C18: standard for battery performance
List at least two significant **realistic design constraints** that applied to your project. Briefly describe how they affected your design.	- Minimizing weight and size of the IMUs and the microcontroller is critical so as not to impede or affect the user's motion. Sensors will be sewn onto a shooting sleeve to provide an accurate depiction of the motion. However, they can not be so invasive that they impede the natural flow of motion. - Minimizing weight and maximizing battery life/power output of wearable battery pack while storing in non-invasive package. The facilitator needs to provide consistent power to multiple different sensors and possibly a microprocessor while not impeding the motion of the user. This presents a challenge in finding a safe, durable battery that provides reliable power.
Briefly explain two **significant trade-offs** considered in your design, including options considered and the solution chosen.	- Bluetooth vs. Wi-Fi for relaying data - WiFi was chosen for its ability to save information to cloud and the ease Wifi. The tradeoff is that Bluetooth BLE uses much less power than Wifi. - Number of sensors vs. battery life - having more sensors will allow us to gather more fine grained data, but the tradeoff will be power consumption.
Briefly describe the **computing aspects** of your projects, specifically identifying **hardware-software** tradeoffs, interfaces, and/or interactions. *Complete if applicable; required if team includes CmpE majors.*	This project will involve multiple IMUs interfacing with a single microcontroller to relay IMU data to the cloud. This will require writing software for the microcontroller to process and relay the data from each individual IMU through WiFi and the cloud. Additionally, software on the PC, such as a web app other application, will be needed to read, process, and display the data from the IMUs to give feedback on the user's motion.

ECE4011/ECE 4012: International Program

(Only groups with one or more International Program participants need to complete this page)

Project Title	
Global Issues (Less than one page)	(10 point font, single spaced)