Simple Biomedical
Intelligent Fitness Apparel

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Abstract
Current physiotherapy can be expensive, time-consuming, and lacks quantitative analysis. Physiotherapy can be made more accessible through a guidance application that monitors patients and suggests proper form. Fitness apparel will be able to transmit full-body motion sensing data to the user’s phone. Our project contributes to this vision by providing a prototype application that receives data from two sensors and displays 3D modeling of real-time movement. We created a Bluetooth application with Unity that receives gyroscope data from two MPU6050 sensors. The application maps the movement onto a 3D model, thereby displaying the real-time motion of the arm.

Results
We used the Arduino Uno, MPU6050, and BLE3360 to take in live motion data and sent it via Bluetooth to the mobile unity application. By integrating the angular velocity, we receive rotational data to plot the movement of the arm. In Unity, we used the transformation library to animate a 3D figure. In this case we used a template of a human arm.

Architecture

Summary
We used the Arduino Uno, MPU6050, and BLE3360 to take in live motion data and sent it via Bluetooth to the mobile unity application. By integrating the angular velocity, we receive rotational data to plot the movement of the arm. In Unity, we used the transformation library to animate a 3D figure. In this case we used a template of a human arm.

Impact
Current physiotherapy methods work well in the hospital setting with a professional on hand to guide the patient. However, when the patient is at home practicing those movements, often times they are not as accurate as they need to be. Thus either being harmful to the patient or requiring prolonged therapy. The Simple Biomedical application is designed in conjunction with the intelligent fitness apparel to track patient’s movement and visually guide them when they are practicing alone.

Metrics

1) Were we successful in proving the feasibility of this project?
"The team's output for the provided development period was significant and valuable, but did not successfully prove the feasibility. However, these limitations were not the team's fault, but with inherent limitations in the provided sensor provided to the team which demanded them to learn and implement basic prototyping. Despite this, they provided a working app and framework."

2) How well did we do to create a backbone/framework for this project?
"The backbone/framework was functional and reliable, but the appearance of the final output could have been better. However, the goal of this project was to get basic motion tracking which the team setup in a satisfactory manner while also identifying issues that future developers should keep in mind. Given the 'startup' nature of the project and limited resources, this was a good outcome."

3) Were the prototype requirements met?
"Prototyping requirements were met commensurate to the tools and resources provided to the team."

4) Do you have any further comments on this project and its success? If so, please describe:
"The team was dependable and dedicated towards their task which made the working experience fun and productive. They were also very flexible and worked with our second contracted UTDesign team without any trouble, and were very cooperative despite the required extra time commitments and skill requirements. Good work team!"