Sensor-Based Motion Tracking for Workout Injury Prevention

Status: Filled

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Sponsor(s): Tech-E

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Project Description

With the popularity of in-home workouts on the rise, the lack of corrective measures or proper observations of beginner athletes puts them at risk of developing issues with their form through overexertion, particularly on strenuous exercises such as compound lifts. Over the long term, bad form and the ensuing overexertion when exercising can cause severe injuries, including ones where the mobility of muscles, joints or tendons is permanently affected.

Within the scope of the project, we aim to do the following:

- Utilize a network of inertial measurement units (IMUs) to accurately plot the position of the wearer's body in 3D space.
- Embedded sensors in fabric to determine deformation, change in position and tensile load created by muscle movement.
- Use unobtrusive mechanical design that allows clothes to be exercised in comfortably.
- Create an effective feedback reporting system to users, allowing them to make corrections and avoid injury during physical activity.
- Make it low cost and low power to be accessible to as many users as possible.

Our team plans to use existing research done over the last 4 years to create the solution, as the idea has been demonstrated to be viable through the use of flexible PCBs, conductive fabric, and flexible electrodes. IMUs can also be hidden discreetly, as is already done in motion capture suits used in the film industry today.

Team Skill Sets (Technical Only)

Muhammad Abid has great experience in using SolidWorks and is up for the unusual challenge of working on the mechanical design of a product where all surfaces are flexible fabric. He will be responsible for ensuring the system is comfortable to use for the wearer through soft enclosures and strategic placements for electronic components.

Yash Bhavnani has experience working with machine learning and AI, and will be responsible for implementing the AI elements for sensor fusion in IMUs and other textile sensors we may