CHULA ENGINEERING

Innovation toward Sustainability | ACTNOW

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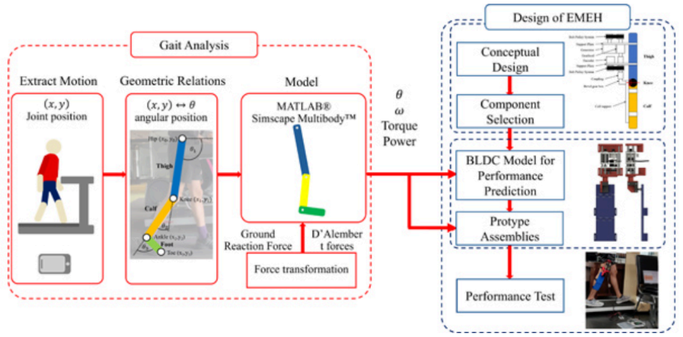
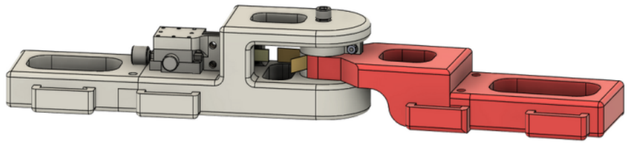
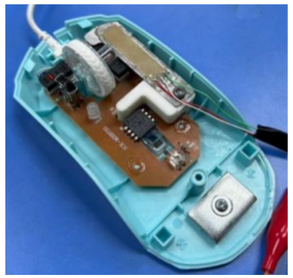
As an engineering education institute, our research aims to advance energy awareness and explore the practical applications of energy harvesting (EH) technologies. Specifically, our research group focuses on vibrational energy harvesting from human body movements, employing electromagnetic (EM) generators and piezoelectric materials to convert biomechanical energy into electrical power.

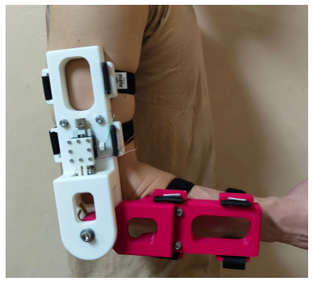
To support the design and optimization of these EH systems, we have developed a cost-effective gait analysis methodology that combines mobile camera-based motion capture with biomechanical modeling in MATLAB-Simscape. Additionally, we have designed and analyzed a piezoelectric cantilever (piezo-bender) EH by developing a mathematical model for predicting the energy harvesting potential under different movement conditions.

These efforts contribute to the broader goal of creating efficient, low-cost EH solutions suitable for wearable and portable applications.









Kinetic Energy Floor

Design and optimize the EM energy floor including mechanical and power management systems

https://www.mdpi.com/1996-1073/15/18/6539

https://www.mdpi.com/1996-1073/13/20/5419

EMEH from knee muscle work during walking

- Develop EM energy harvesting from knee muscle work during walking
- Analyze gait, muscle torque and power from walking using mobile camera and Matlab Simscape

https://ieeexplore.ieee.org/abstract/document/10705309

Piezoelectric bender EH for upper limb movement

- PEH for finger movement in computer mouse clicking
- Frequency up-conversion, plucked-PEH for elbow rotation
- Modeling bender-PEH to predict energy performance

https://www.mdpi.com/1996-1073/17/16/4121