

Abstract

- o By utilizing load sensor technology, our project aims to detect improper form during the deadlift by measuring force on the back. A load cell anchored on the upper and lower back detects deviations from the ideal straight posture, indicating potential injury risks. We developed a mounting rig using a high-strength rope to connect the load cell securely to the user's back, ensuring accurate readings. Through extensive research, we identified a suitable load cell capable of detecting up to 20kg of force, providing versatility for various body types and lifting techniques.
- o We also created a mobile application to complement the hardware solution. The app, built using the MIT App Inventor, serves as a controller for the load sensor and provides users with real-time feedback on their lifting form. Furthermore, the app offers tutorials, exercise logging capabilities, and resources on correct form to enhance users' health and fitness journey.

Motivations and Objectives

- o According to World Health Organization, in 2020 **Lower Back Pain (LBP) affected more than 619 million people** and is expected to **increase to 843 million people** by the year 2050
- o Highlight the importance of regular exercise and the risks associated with improper deadlift form.
- o Emphasize the need to raise awareness about proper deadlift technique and develop a technological solution to assist users in maintaining correct posture during lifting

Project Challenges

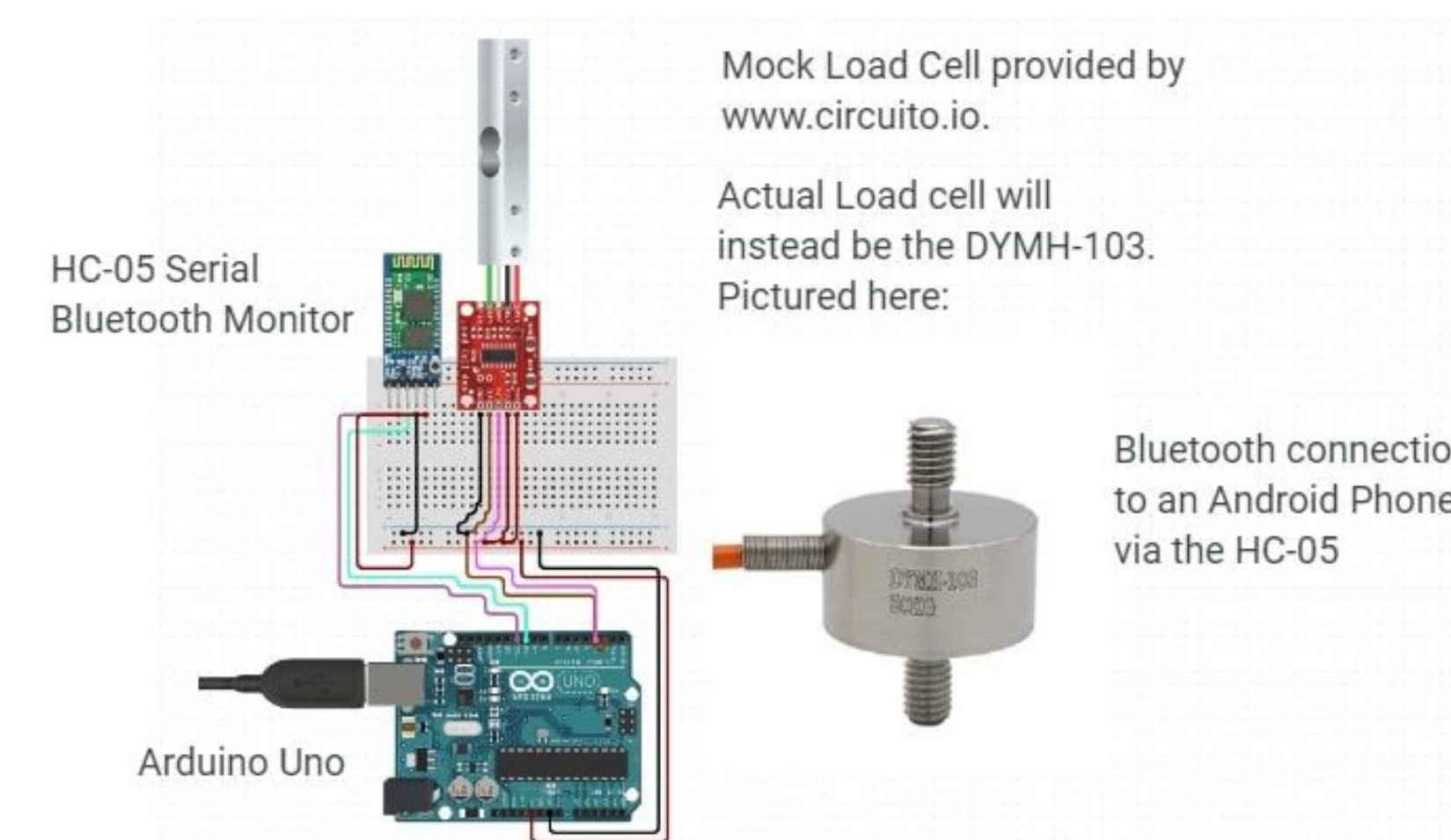
- o Sending live load cell information to the mobile application using an HC-05 transceiver.
- o Ensuring accurate measurements from the load cell
- o Designing a comfortable and versatile back mount

Acknowledgement

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System Design

- o Load Sensor Technology: Utilize the DYMH-103 Load Cell detecting pull force from the middle back to the lower back
- o Mounting Rig:
- o Arduino Uno: Display the Load Cell readings onto an I2C 2004 LCD Screen Module
- o Mobile Application: Display the Load Cell readings onto an Android phone using the HC-05 Bluetooth Transceiver



Results and Cost Analysis

- o Successfully created a system to calculate load forces on the back and alert users of potential harm to lower back.
- o Ensured minimal slack in the system for more accurate results.
- o Designed a sleek non intrusive mount for the system to not interrupt lifting motion.
- o Assisted users correct form and avoid injury.
- o Accentuated use of incorrect form, displaying load measurements mid lift to prevent issues mid-lift.
- o Produced a working product for only 157.50, with over half of the cost being in the Load Cell: \$65.00

Project Impact

- o Raise awareness about the dangers of lower back pain and prevent related injuries among individuals engaged in physically demanding occupations such as weightlifting, warehouse work, moving, construction, and others. Ensure the safety and well-being of these workers through proactive measures.

References

- [1] <https://docs.arduino.cc/>
- [2] <https://appinventor.mit.edu/>
- [3] <https://pubmed.ncbi.nlm.nih.gov/37315158/>