Smart Sitting System

Team Member Names (Pratham Patel, Abdullah Azeem, Daidipya Mathur, Karthik M)
Faculty Supervisor Name: Prof. Gowrish B and Prof. Anshul Jaiswal

Problem Statement

We were to create a smart sitting system that uses sensors to help users correct poor posture, enhance their overall ergonomic comfort, reduce the risk of musculoskeletal disorders, and improve user well being in the office and home environments.

Methodology

Sensor Selection: We began by selecting suitable force and ultrasonic sensors that could accurately measure the distribution of forces on the seat. The sensors needed to be sensitive and durable.

Data Acquisition: We integrated these sensors into the seat and set up a data acquisition system, which included microcontrollers for real-time data processing

.Data Preprocessing: To ensure data accuracy, we processed the collected information. This involved filtering out noise, correcting for sensor drift, and calibration.

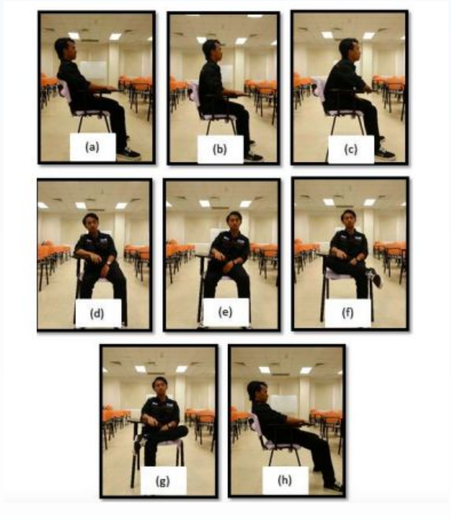
Feature Extraction: We developed algorithms to extract essential features from the sensor data, like pressure distribution, seat occupancy, and posture information.

Feedback Mechanism: We implemented a feedback mechanism, through buzzers, to alert users when they had an incorrect posture.

Testing and Validation: We conducted rigorous testing and validation to ensure the system's accuracy and reliability in posture correction.

Integration: Finally, we integrated the system into chairs or seats, taking into consideration aesthetics and ergonomic design.

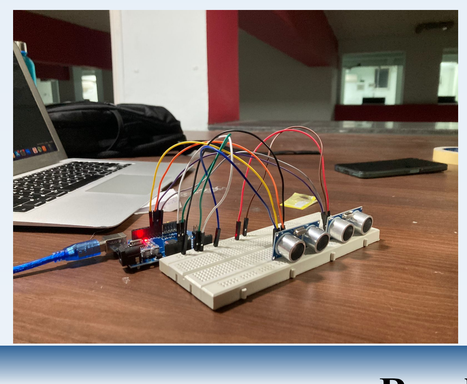
The whole process involved continuous refinement and adjustments, considering real-world usability and user feedback, to create an effective smart sitting system for posture correction.

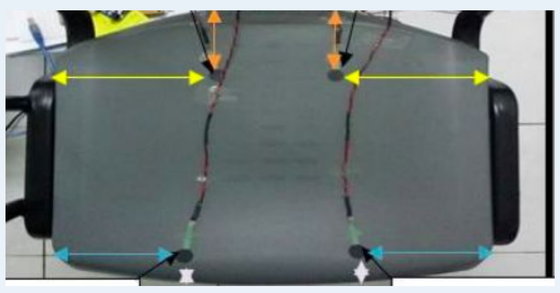


Prototype/Experiment Details

The prototype consists of 4 force sensors, and 2 distance/ultrasonic sensors, which use ultrasound to guage distance.

- The concept is that it sends an ultrasonic wave and receives and echo and measures the time taken between the 2 events. Using that, it can find the distance using the formula d=v*t, where d is the distance, t is the time taken and v is the speed of sound.
- The force sensors are placed on the base of the chair and are triggered based on the distribution of weight across the base. The distance sensors are placed on the back of the chair, one for the upper back, and one for the lower back, which will be able to detect hunching of the shoulders or rounding of the back.
- To process the data/variation in electrical signals given by the sensors, we've used an arduino uno microprocessor.
- All of the wires from the sensors connect to a zero board attached below the chair





Results & Discussion

It is anticipated that we obtain a system to correct all of the mentioned postures in the diagram to the left.
Positions (a) and (c) are to be corrected via ultrasonic sensors.
Positions d, e, f and g are to corrected via the weight imbalance read by the two force sensors at front.
Position h is to be corrected via the force sensors at the back of the base.

Conclusion & Applications

The data gathered on sitting posture can be analyzed to gain valuable insights into user behavior, which can be used to enhance the system and offer valuable information regarding posture-related issues.

Applications:

Office Environments: Companies can deploy this technology in office chairs to promote proper posture and reduce the incidence of work-related musculoskeletal disorders among employees.
Educational Institutions: Schools and universities can encourage students to maintain correct posture during long study sessions, improving learning outcomes and comfort.
Healthcare and Rehabilitation: In rehabilitation and physical therapy settings, the system aids patients in regaining strength and posture after injuries or surgeries.
Home Use: Individuals can use the system at home to cultivate better sitting habits, especially during remote work and leisure activities.

In summary, the smart sitting system, powered by posture-correcting sensors, is a versatile tool for promoting healthier sitting habits and enhancing overall well-being. Its broad range of applications caters to various users and industries, making it a valuable asset in the quest for improved posture and better health.

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