

A WEARABLE POSTURE CORRECTION SYSTEM

Problem Definition

Prolonged poor posture can lead to chronic back pain, spinal issues, and discomfort, especially with modern sedentary lifestyles. [1] Research indicates that poor posture can affect both physical health and productivity. [2] Many people remain unaware of their poor posture habits, especially while sitting for extended periods.

Research Findings:

- Up to 80% of the population will experience back pain at some point due to poor posture. [4]
- Studies highlight that wearable technology can help create awareness of posture and prompt behavioural change. [5]

Constraints:

- Lightweight and non-intrusive design.
- Effective detection using simple sensor input.

User Experience Goals:

- Instant feedback when posture deteriorates.
- Comfort and ease of use during prolonged periods.

Prototype

Technical Implementation:

- Sensor Used: micro:bit's built-in accelerometer to monitor tilt along the Z-axis.
- Actuator Used: micro:bit's speaker to produce a sound alert when poor posture is detected.

Code Functionality:

- Posture Check: The accelerometer continuously monitors tilt (forward or backward).
- Sound Alert: A beeping sound is played if poor posture is detected, and a happy sound when posture is corrected.

User Instructions:

- Attach the device to the back of your t-shirt near the neck.
- Power it on and continue with your activities.
- When you hear a beep, adjust your posture.

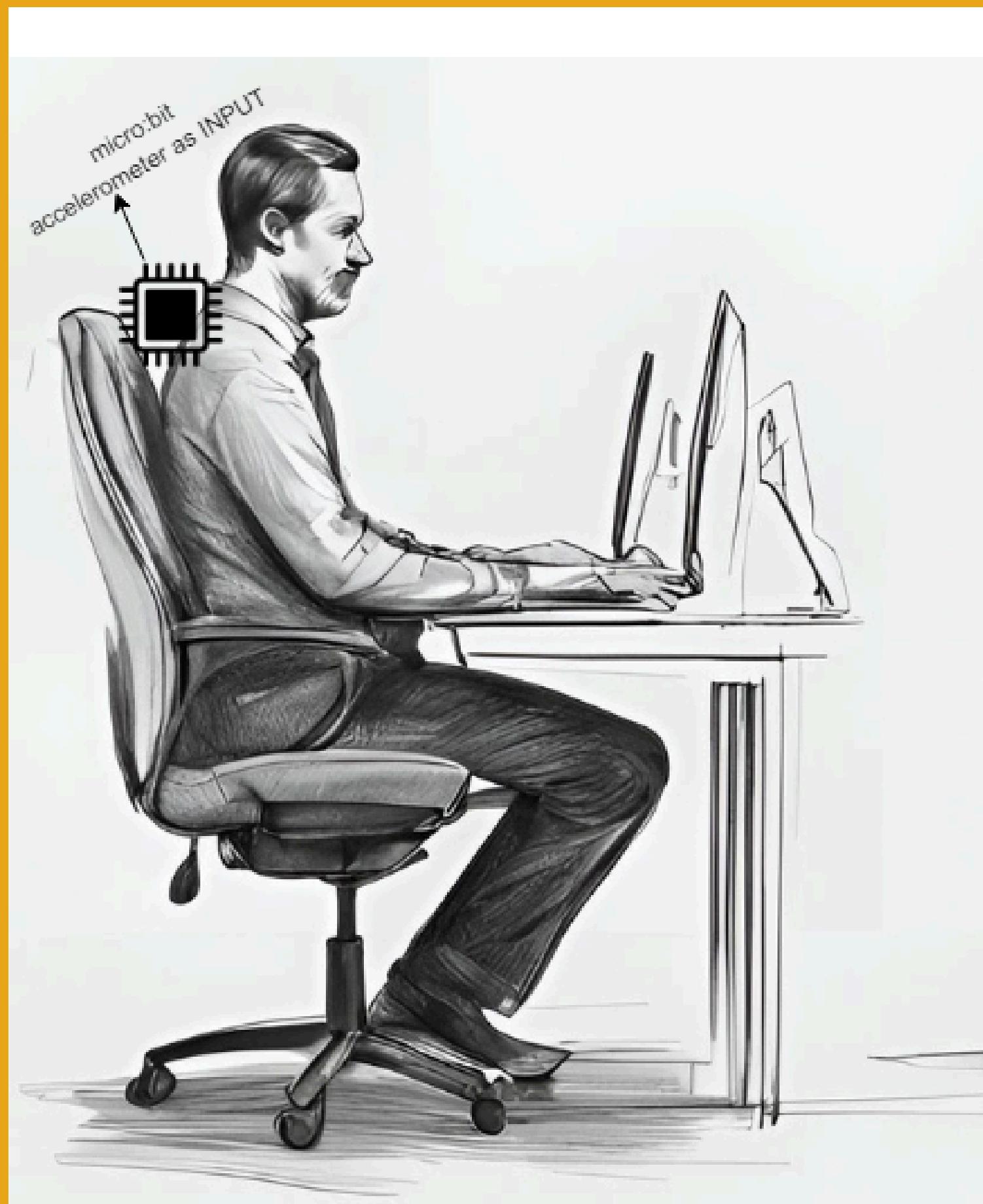
Project Code Link: <https://github.com/anirbandey303/Poor-Posture-Detection-with-microbit>

Findings

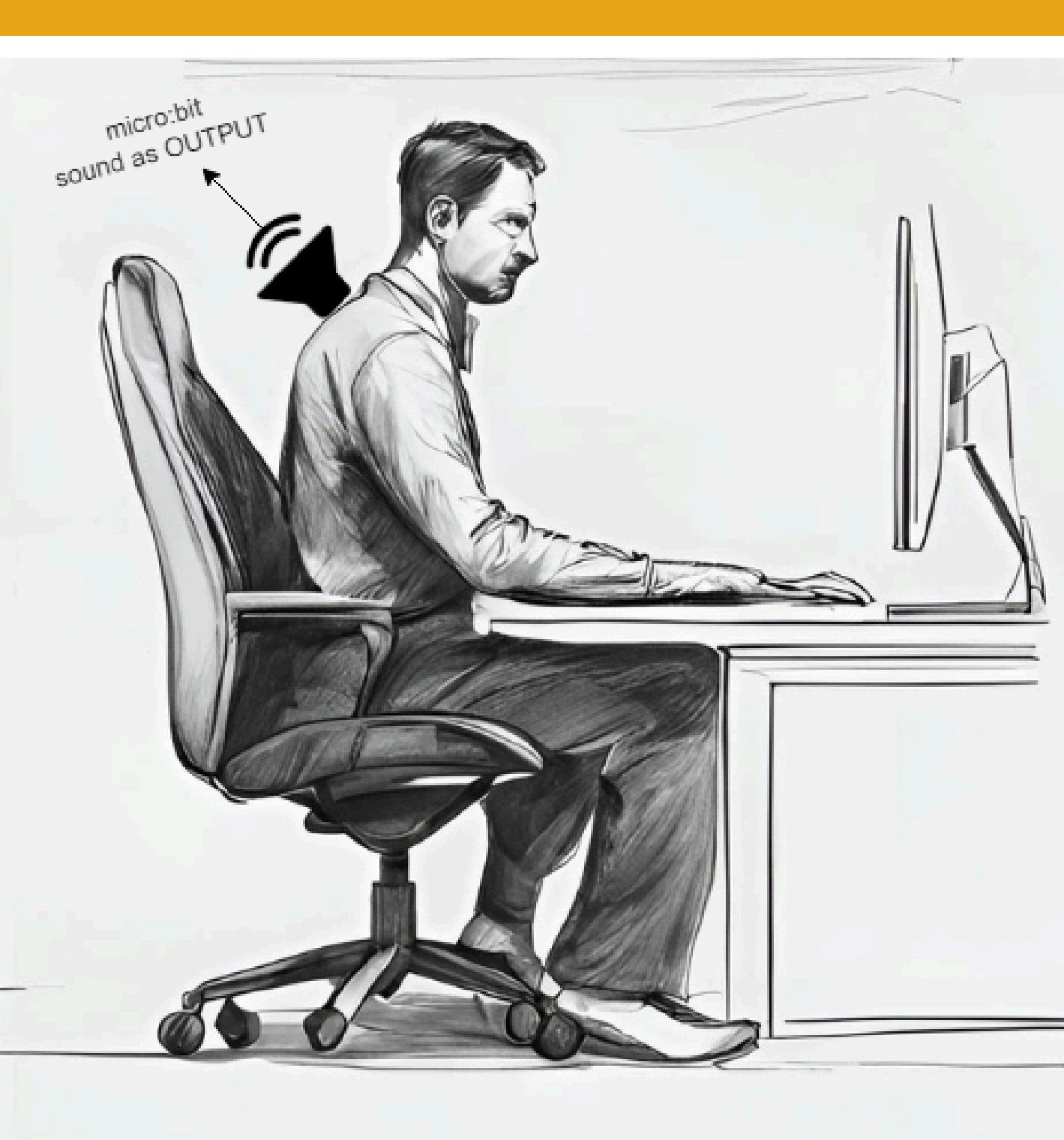


HCI Input: Accelerometer

- Micro:Bit with an accelerometer is attached at the back of the shirt: near the neck
- Monitors user's posture quietly until poor spinal posture is detected.



- An accelerometer is a device that measures acceleration forces along different axes (X, Y, Z). These forces can be due to motion, tilt, or vibrations, making it useful for detecting changes in position and orientation.
- We record movement along the Z-Axis to detect changes in posture.



HCI Output: Speaker

- Micro:Bit alerts the user of poor posture with a built-in speaker.
- The speaker continues to beep until the posture is corrected.

Design

Potential Solutions:

Several solutions were considered, including:

- A bulky device with multiple sensors.
- A wearable using vibration alerts.
- A lightweight, sound-based device that uses accelerometer data for posture detection.

My Solution:

- The final design focuses on a micro wearable that uses an accelerometer to detect posture changes. It alerts users with a beep when poor posture is detected. Micro:bits[3] are designed to be have small form factor and can be worn on the back of a t-shirt, and easy to attach.

Usage:

- Who:** Ideal for students, office workers, and anyone who spends long hours sitting.
- Where:** Can be worn anywhere—at home, in the office, or while studying.
- How:** Attach the device near the neck on the back of your t-shirt. The accelerometer tracks your posture, and the device provides instant feedback.

Limitations & Future Work

While the current design works well for detecting forward or backward slouching, future design iterations could include:

- Integrating lateral posture detection (side bending).
- Adding visual alerts like LEDs or integrating a vibrating motor.
- Syncing with a smartphone app to track posture trends over time.

References

- [1] Markova, Valentina, et al. "Assessing the Impact of Prolonged Sitting and Poor Posture on Lower Back Pain: A Photogrammetric and Machine Learning Approach." Computers 13.9 (2024): 231.
- [2] Wang, Charles. "Good Posture and its Wealth of Benefits to the Workplace." Lumo Bodytech.
- [3] Austin, Jonny, et al. "The BBC micro: bit: from the UK to the world." Communications of the ACM
- [4] Markova, Valentina, et al. "Assessing the Impact of Prolonged Sitting and Poor Posture on Lower Back Pain: A Photogrammetric and Machine Learning Approach." Computers 13.9 (2024)
- [5] Bootsma, Rik, et al. "Wearable technology for posture monitoring at the workplace." International Journal of Human-Computer Studies 132 (2019): 99-111.

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Resource Page

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