Posture Detector

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Overview

- Analyzes accelerometer data from the **tinyCore MCU** to track lower-neck/upper-spinal position.
- **Detects bad posture** by comparing current position to a user-set "good posture" state.

How It Works

- User clips the device to their **shirt collar (back-side)** and sets their **good posture** with a quick button press.
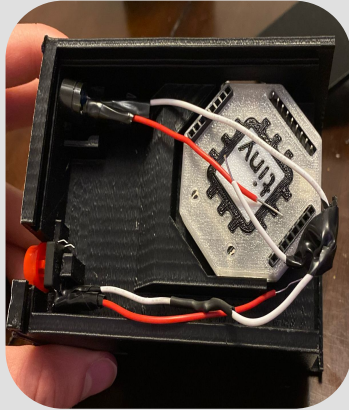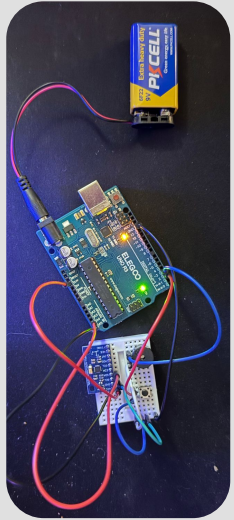- A **Kalman Filter** optimizes sensor data for accuracy.
- If posture deviates, the device **activates a buzzer** to remind the user to straighten up.
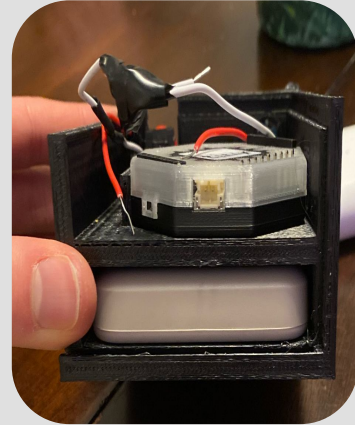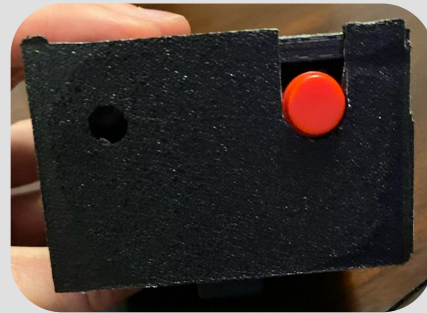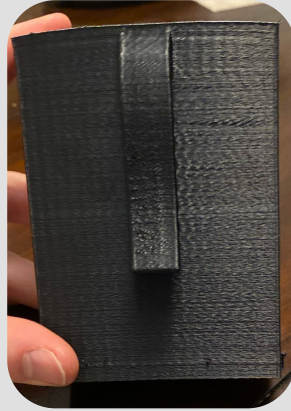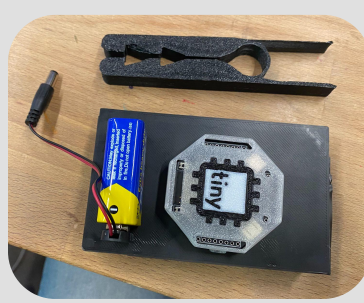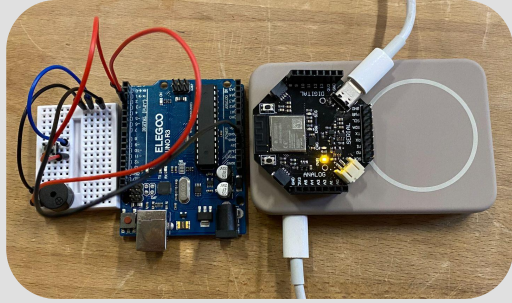
Design Iteration(s)

- tinyCore MCU
  - Accelerometer function & data
- PLA
  - Housing and lid
- Buzzer
- Button
- Battery
- Wires

Not exact components
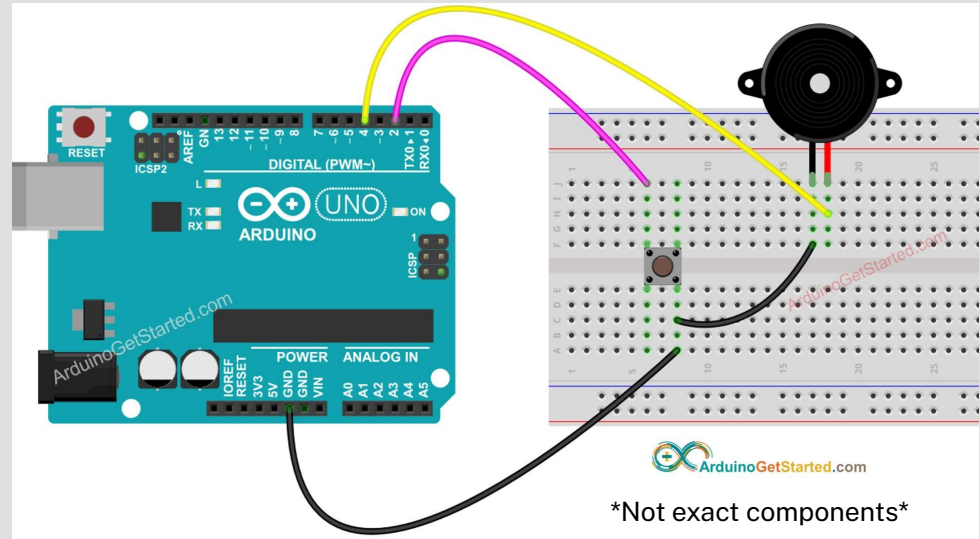
Circuitry + Components

Good Posture

Bad Posture
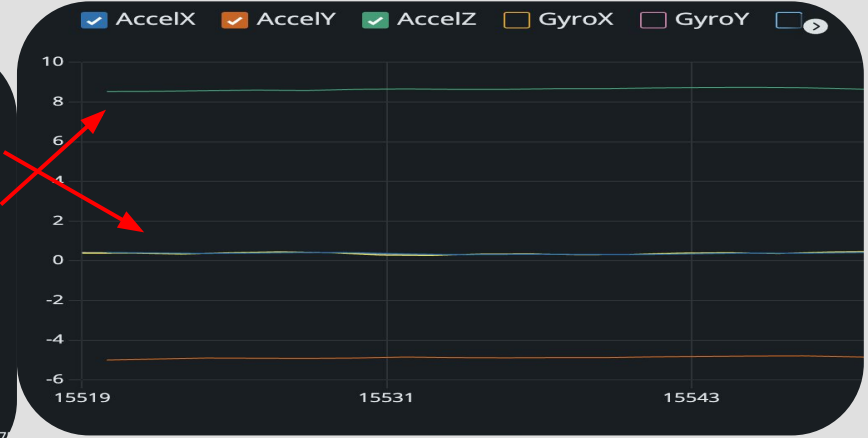
Thresholding Levels

```
float filteredAccelX = kalmanX.update(accel.acceleration.x);
float filteredAccelZ = kalmanZ.update(accel.acceleration.z);
```

```
KalmanFilter kalmanX(0, 1.5, 0.08);
KalmanFilter kalmanZ(0, 1.5, 0.08);
```
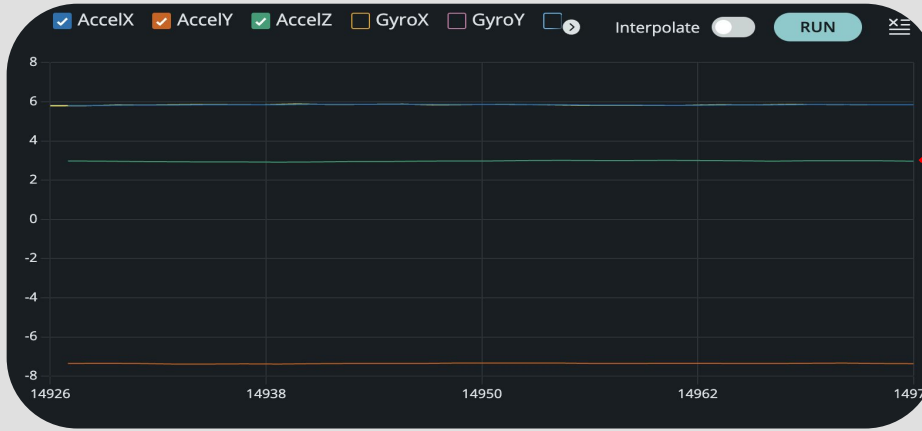
```
if (deviceOn && neutralSet) {
  float deviationX = abs(filteredAccelX - neutralX);
  float deviationZ = abs(filteredAccelZ - neutralZ);

  if (deviationX > BAD_POSTURE_THRESHOLD || deviationZ > BAD_POSTURE_THRESHOLD) {
    tone(buzzerPin, 700);
  } else {
    noTone(buzzerPin);
  }
}
```

Kalman Filter

Put simply, our Posture Detector analyzes accelerometer data from our tinyCore MCU in order to detect changes in lower-neck/upper-spinal position. In order to detect bad posture, the user sets the state of the device in accordance with their respective "good posture" after clipping the device to their back-side, shirt collar. Thereafter, utilizing a Kalman Filter to optimize our data, the MCU can detect a deviation from the set state, initializing a buzzer to inform the user they are slouching, gently encouraging them to fix it. The device is simple; housed in a PLA, 3D-printed case with a clip on the outside for ease of attachment. Aside from the MCU, our housing has built-in space for an internal battery pack, as well as the buzzer and button. The button is used to turn the device on and off with a single long press, as well as to set the "good posture" state for the accelerometer data using a single quick press.

Product Statement

Demo: