IT5601

EMBEDDED SYSTEMS AND INTERNET OF THINGS

MINI PROJECT

REAL TIME SMART POSTURE CORRECTION

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Submitted to

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1.Introduction:

In today's digital age, an increasing number of individuals—especially students, software engineers, and office workers—are spending long hours seated in front of computers or mobile devices. Prolonged sitting with poor posture can lead to musculoskeletal issues, including chronic neck and back pain, spinal misalignment, and fatigue.

This project presents a **Posture Correction Robot** that uses the **MPU6050** sensor to detect incorrect posture in real-time and alerts the user to correct it immediately. The system is designed to be wearable and unobtrusive, making it suitable for daily use in academic, professional, or domestic environments. The primary aim is to promote better posture habits and enhance overall health and productivity.

2.Problem Statement:

Prolonged sitting and poor posture among software engineers and students lead to chronic health issues, decreased productivity, and long-term musculoskeletal disorders.Traditional ergonomic solutions fail to provide real-time feedback, making it difficult to correct posture dynamically

3.Objectives:

- To **develop a wearable device** that monitors the user's posture using sensor data.
- To **detect poor posture** by calculating the tilt angle of the back or neck.
- To **alert the user** through a buzzer or vibration motor when incorrect posture is detected.
- To provide a **low-cost, non-invasive solution** for posture monitoring.
- To create a system that can be **extended to include data logging and mobile app feedback**.

4.Possible Problems:

1. Sitting - Chronic back pain & spinal misalignment
2. Standing - Foot pain & swollen legs
3. Bending - Muscle injuries & ligament tears
4. Lying - Increased acid reflux & & breathing issues

5. Hardware and Software Used

Hardware Components:

Component	**Description**
MPU6050	6-axis Accelerometer and Gyroscope sensor used to detect orientation and movement
Arduino Uno/Nano	Microcontroller for reading sensor data and controlling feedback
Servo Motor	Output component to alert the user
Battery Pack	Power source for portability
Resistors, wires, straps	Miscellaneous components for circuit integration and wearability

Software Tools:

Tool	**Description**
Arduino IDE	Programming environment for the Arduino board
MPU6050 Library	Used to interface with the sensor and access motion data
Serial Monitor	For real-time testing and debugging of angle values

6. Proposed Methodology:

Step 1: System Setup
- Connect the MPU6050 to the Arduino via I²C interface (SDA to A4, SCL to A5 for Uno).
- Attach a servo motor to a digital output pin of the Arduino.
- Power the system using a USB or portable battery pack.

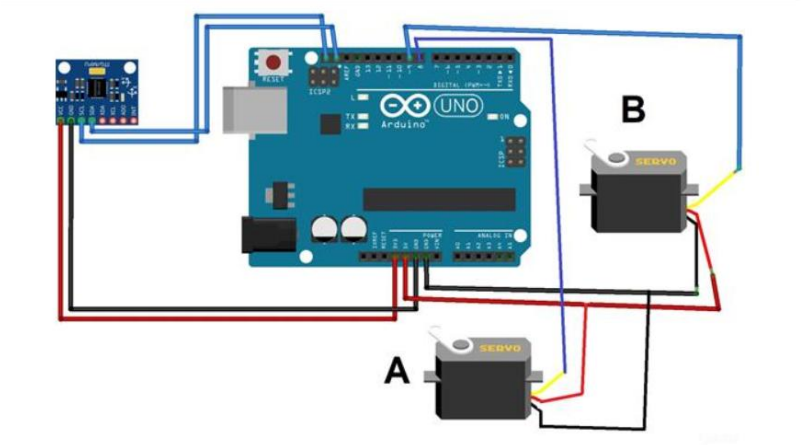
Step 2: Calibration
- When the user sits in correct posture, the system records the initial Y-axis tilt (pitch angle) as a reference.
- This angle is considered the 'ideal posture' threshold.

Step 3: Real-time Monitoring
- Continuously read the current angle using the MPU6050.
- Compare the current tilt angle with the calibrated reference angle.

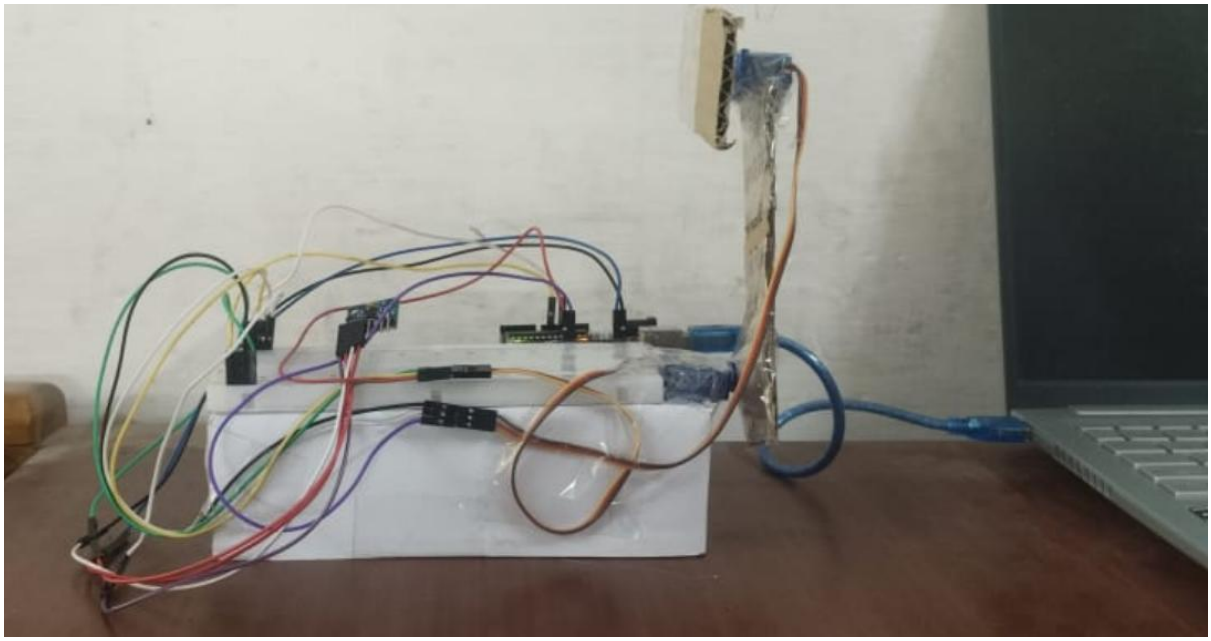
Step 4: Alert Mechanism
- If the angle deviates beyond a defined threshold (e.g., ±15 degrees), the Arduino activates the servo motor.
- Once the user corrects posture, the alert stops automatically.

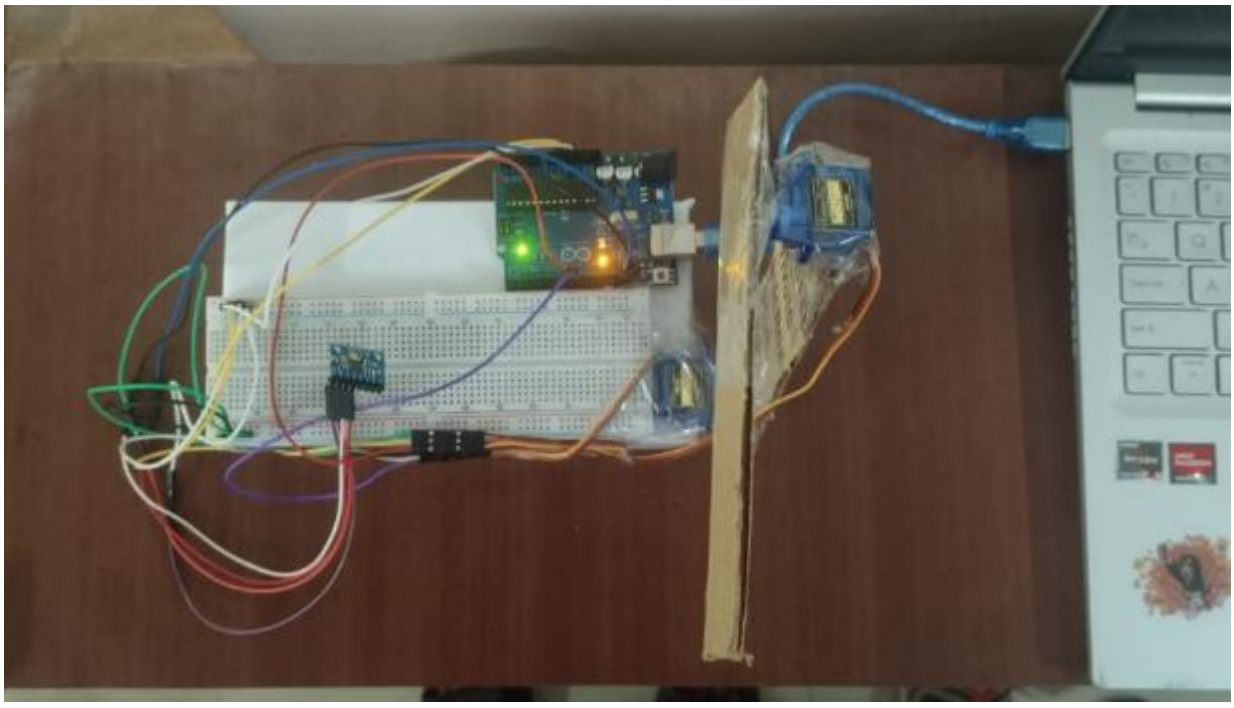
Step 5: Reset and Recalibration
- The system can include a button or command to recalibrate based on different sitting postures.

7. Implementation:



8. OUTPUT:





9. Future Enhancements

- Bluetooth or Wi-Fi Connectivity: To send data to a smartphone app for tracking posture history and analytics.

- Mobile App Integration: Display live posture data, maintain posture logs, and provide performance graphs.

- AI Posture Classification: Use machine learning to detect different types of poor posture and suggest targeted corrections.

- Memory Storage: Add EEPROM or SD card module to store posture data locally for offline analysis.

- Battery Optimization: Use low-power components and sleep modes to improve battery life.

- Flexible Design: Integrate the system into wearable clothing or posture belts for user comfort.

10. Conclusion

The posture correction robot using MPU6050 is a practical solution to a common yet serious health concern. It offers a simple, affordable, and wearable means to detect and correct improper posture in real-time. By leveraging motion-sensing technology, the system helps inculcate healthy posture habits, thus reducing long-term health risks related to poor ergonomics. With further development and integration of data tracking, AI, and app connectivity, this system can evolve into a powerful tool for physical wellness and preventive care in educational, professional, and personal settings.