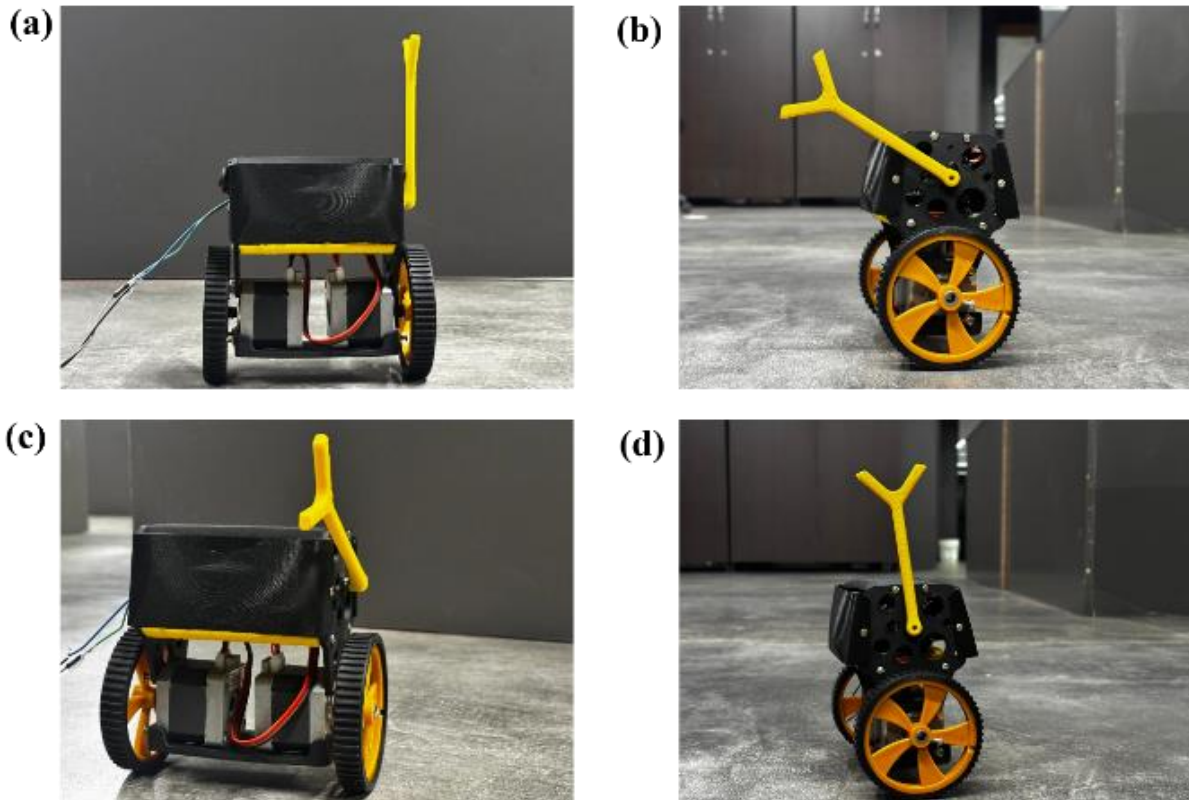


Self-Balancing Robot Using PID Control



The **Self-Balancing Robot** is a two-wheeled robotic platform designed to maintain its balance using a **PID (Proportional–Integral–Derivative) control algorithm**. The system is built around an **ESP32** microcontroller and uses an **MPU6050 IMU (accelerometer and gyroscope)** to continuously measure the robot's tilt angle.

The ESP32 processes the IMU data and computes the required motor corrections through the PID controller. Two **NEMA 17 stepper motors**, driven by **stepper motor drivers**, respond instantly to maintain the robot in an upright position.

The robot can be wirelessly controlled using the **"ESP32 WiFi Balancing Robot"** mobile application, allowing the user to perform the following movements while the balancing algorithm remains active:

- Forward
- Backward
- Rotate Left
- Rotate Right

This project demonstrates the implementation of **real-time sensor fusion, PID-based balancing, embedded control systems, and wireless robot control**, making it an excellent platform for learning control theory and robotics