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"Gesture Controlled Robot"

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***Abstract*— This research paper presents the design and development of a Gesture Controlled Robot that responds to human hand movements. The system uses an MPU6050 accelerometer sensor to capture gesture data, an ATmega328 microcontroller for processing, and an L298 motor driver to control DC motors. The robot allows contactless human–machine interaction and is suitable for surveillance, assistive applications, and smart automation.**

I. Introduction

Gesture-controlled systems provide an intuitive method to operate machines using natural hand movements. This project focuses on creating a robot that moves according to the tilt and motion of the user's hand. The MPU6050 sensor detects gestures, which are processed by the ATmega328 microcontroller, and the resulting commands drive the motors through the L298 driver.

II. Literature Review

Gesture-controlled robotics has gained attention in human–computer interaction. Prior research includes accelerometer-based control, wireless communication, and real-time motion recognition. The integration of low-cost sensors and microcontrollers has allowed efficient and responsive robotic control.

III. System Components

A. MPU6050 Sensor

The MPU6050 combines a 3-axis accelerometer and a 3-axis gyroscope. It outputs readings representing tilt, rotation, and acceleration, which are used to determine hand gestures.

B. ATmega328 Microcontroller

This microcontroller processes sensor data and generates motion commands for the robot. It is programmed using Arduino IDE for simplicity and real-time control.

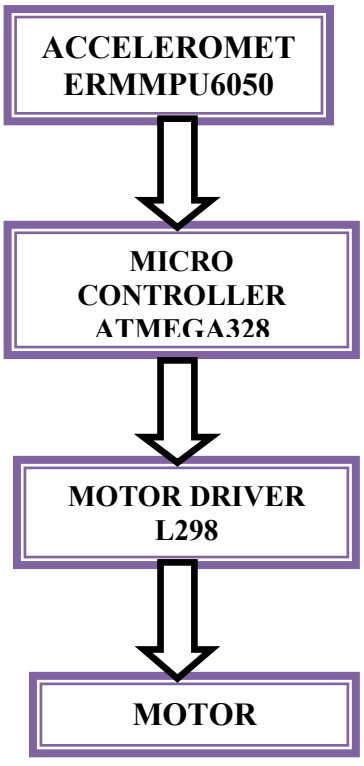
C. L298 Motor Driver

The L298 is a dual H-bridge motor driver that provides sufficient current to run DC motors. It receives digital control signals from the ATmega328.

D. Motors

Two DC motors are used to drive the robot's wheels, allowing forward, backward, and turning movements.

IV. Methodology



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The MPU6050 sensor detects hand gestures such as forward tilt, backward tilt, left tilt, and right tilt. These signals are filtered and processed by the microcontroller. Motion commands are then passed to the L298 driver to control motor direction and speed.

V. System Working

1. The MPU6050 reads hand orientation.
2. The ATmega328 analyzes acceleration and gyroscope values.
3. Control signals are generated based on predefined thresholds.
4. The L298 motor driver activates the motors accordingly.
5. The robot moves in the direction of the hand gesture.

VI. Results And Discussion

The robot successfully responds to gestures with minimal delay. It provides smooth control and accurate detection of hand movements. Reliability depends on sensor calibration and stable power supply.

Table I:
Gesture to Robot Movement Mapping

Hand Gesture	MPU6050 Tilt Reading	Robot Action
Forward Tilt	+X Axis	Moves Forward
Backward Tilt	-X Axis	Moves Backward
Left Tilt	-Y Axis	Turns Left
Right Tilt	+Y Axis	Turns Right

VII. Applications

- Surveillance and rescue operations
- Assistive robotics for disabled individuals

VIII. Conclusion

The Gesture Controlled Robot demonstrates efficient and intuitive control using hand movements. The integration of MPU6050, ATmega328, and L298 driver enables smooth operation. This system has potential for human–robot interaction applications and future enhancements such as wireless communication and advanced gesture recognition.

REFERENCES

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