MILITARIZED HAND GESTURE CONTROLLED ROBOT*

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ABSTRACT

This paper presents a hand gesture-controlled robot that can be used to control external devices with simple commands. The gesture-controlled robot is equipped with an accelerometer and a microcontroller. This paper describes how to control a robotic device without using remote or switches. Instead, it uses an intelligent system that can identify the hand movements and sends a command to the robot. A device controlled by with an ease of gestures. The system comprises of various electronic circuits and components along with computer programs. We know that a soldier's life is nothing but danger. Well, some of the crucial tasks can be more dangerous than others, which of those can be simplified with aid of technology. Those include walking through minefields, recon missions, surveillance, spying, negotiations. For these specific tasks, a small unit of robotic system could be deployed instead. This can save hundreds of lives of soldiers or even more. Since the robot is to be militarized, it can be made to carry out unsafe and recurring jobs with quite high precision and same. A robot with a blend of enthusiastic tech and military accuracy.

KEYWORDS

Gesture recognition, Accelerometer, Gesture controlled robot, Accelerometer controlled robot.

I.INTRODUCTION

Modern technology has enabled people to work seamlessly in a more complex environment. This is due to the emergence of robots that can perform tasks without requiring humans to be present in the workplace. The beginning of robotic technology can be traced back to the 19th century. Since then, various industrial sectors have started adopting this technology to provide faster and better work results. The interaction with machines has become more prevalent day

* Received 22 September 2021, Accepted 09 October 2021, Published 24 October 2021
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by day. There are numerous ways to interact with them, some of which are as simple as touching a button. Due to the increasing interaction between humans and machines, and the emergence of gesture-based control systems, it has become possible to control various devices without having to learn a language of the system. Various hand gesture techniques are being used nowadays. Gestures can be made from any bodily motion or state. They can also be derived from the hand or face. Gesture recognition is a way for computers to understand human body language. It could also help bridge the gap between machines and humans by making conventional input devices redundant.

The paper presents an interaction system which is composed of three parts: hand gesture segmentation, gesture tracking and recognition. The first step for recognizing a hand gesture is the cut-off point, which is the first step for hand gesture segmentation.

II.IMPLEMENTATION IN MILITARY

We propose on implementing this technology in military operations. The increasing number of soldiers wanting to use military robots can raise the demand for gesture-controlled machines. When soldiers are deployed in a combat zone, gesture-controlled robots can be used to aid and protect them. As the robot is equipped with a camera capable of capturing at different angles, it can be used for patrolling, manuring, path clearing. It can be very handful in detecting trip mines and traps.

III.MATERIALS USED

1.To control robot with hand gesture trans receiver is used. Then it is programed using Arduino IDE which helps robot to move in different directions by gesture using sensor MPU6050. The trans receiver used is NRF24L01.

Figure 1: NRF24L01

2.The sensor MPU6050 consists of 3 axis accelerometer and 3 axis gyroscope it is micro electro mechanical system and it is going to help to move robot in all the directions

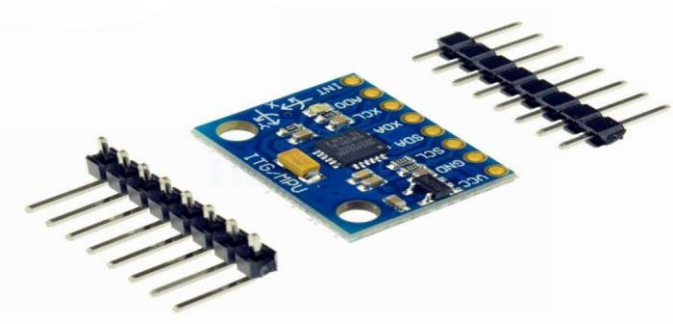


Figure 2: MPU6050

3.The Arduino Uno is an open-source microcontroller board based on the Microchip ATMEGA328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards(shields) and other circuits.

Figure 3: ARDUINO UNO

4.The ESP32 CAM is small size camera module with the ESP32-S chip that can operate independently with deep sleep current up to 6mA. It has a OV2640 camera, and many GPIOs to connect peripherals. It also comes with microSD card.

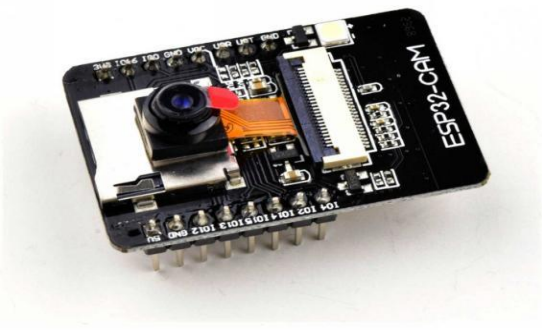


Figure 4: ESP32 CAM

5.This L298N Motor Driver Module is a high-power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator.

L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

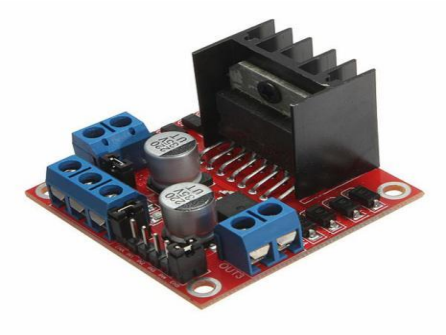


Figure 5: L298N Motor driver

6.The chassis is predesigned. It comes with a strong base and holes for attachments.

Figure 6: Chassis

7.A servo motor is a device, that rotate parts of a machine with high efficiency and with great precision. The output shaft of this motor can be moved to a particular angle, position and velocity that a regular motor does not have. The Servo Motor utilizes a regular motor and couples it with a sensor for positional feedback. The controller is the most important part of the Servo Motor designed and used specifically for this purpose.

Figure 7: Servo motor

8.A gear motor is a standard electric motor coupled with gears. The purpose of these motors is to increase torque without increasing the power input. Its size is relatively smaller, compared to the torque output.

Figure 8: Gear motor

Components to make trans receiver module

Module	**Specification**
Interface	Arduino Uno
Trans receiver	NRF24L01
Programming language	C Language
Sensor	MPU6050

IV.DESIGN OF WEARABLE SYSTEM

The system consists of three things Arduino Uno board which runs the whole code, MPU6050 which senses the acceleration and NRF24LO1 transceiver which transmits the signals. Whole robot is in turn consist of two modules named transmitter and receiver module. The gyroscope senses the five positions of a hand: Horizontally at rest, bent forward, lifted backward, bent rightward, bent leftward.

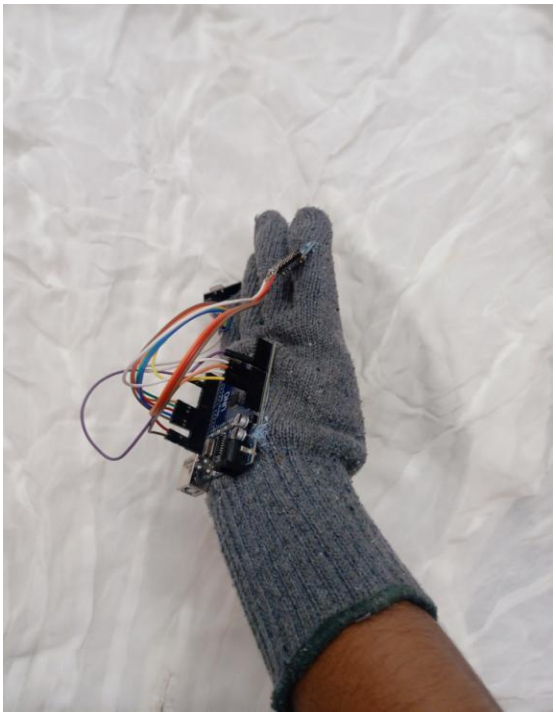
The MPU6050 is a micro-electro mechanical system consist of 3-axis accelerometers ,3-axis gyroscope, and a temperature sensor within it. The sensor measures velocity, displacement, acceleration, and orientation of object.

An accelerometer measures the acceleration or gravitational force. By tilting the accelerometer along its measured axis, one read the gravitational force relative to the amount of tilt. Most of the accelerometers available today are small surface mount components, so that we can easily interface them to a microcontroller. There are three axes that can be measured by an accelerometer and they are labelled as X, Y and Z. Each measured axis represents a separate Degree of Freedom (DOF) from the sensor—thus a triple axis accelerometer might be labelled as 3 DOF.

The robot does not move if the hand is horizontal at rest, that is neutral.

If hand is leaned forward, the accelerometer detects downward acceleration and the robot moves forward. This happens because of the negative acceleration in X direction.

Similarly, when the hand is lean backward the accelerometer detects an upward acceleration and the robot move backward. This too happens as the acceleration is in positive X direction.

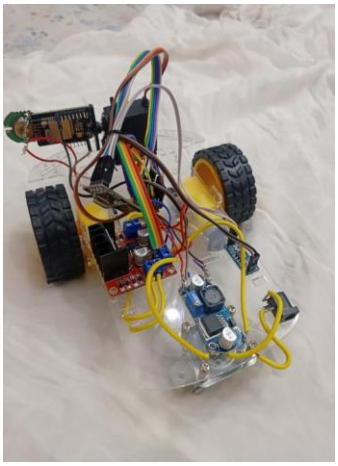


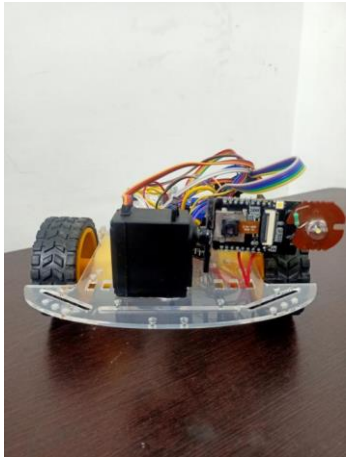
If the users wish for the robot to move left, they simply have to tilt their hand left wards and the robot will follow the command. This occurs due to the acceleration in the Y axis.

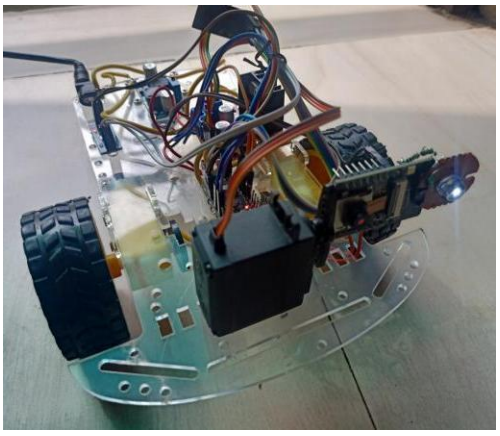
The same is for turning right. Simply hold out the palm and tilt to the right side and the accelerometer detects an imbalance in the Y axis.

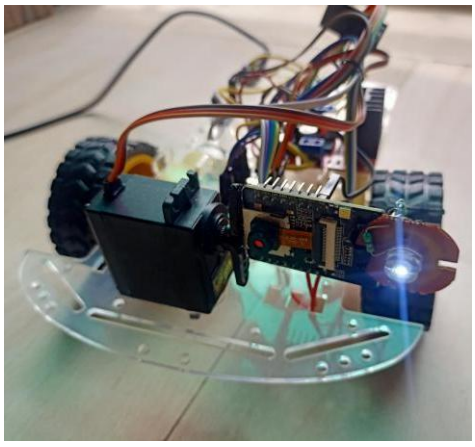
The very logic is applied on the camera module. The only key difference is that it only moves in X axis i.e., upwards, and downwards.

V.THE ROBOT









VI.FLOWCHART OF WORKING ROBOT

In the figures down below the working of the model is represented, in figure 9 the it is shown how the signal is being transmitted through glove to the body to move the of robot.

MPU6050 is sending signal to Arduino based on acceleration it senses.

The Arduino then forwards it of NRF24L01 transmitter which further relay it to the receiver module on the body.

After that the Arduino on the body runs the code and sends the instructions to motor driver which controls gear motor.

This is how the whole body moves by hand gestures.

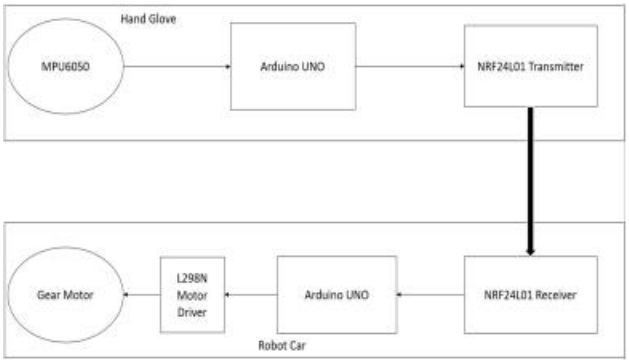


Figure 9: Working of Body

The same process is occuring in figure 10 like figure 9 but here instead of the whole body only camera is moving.

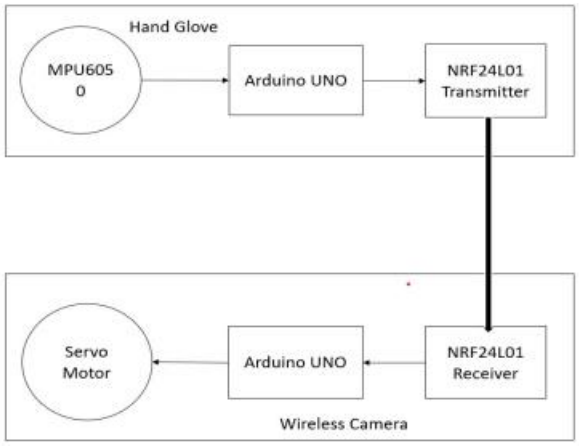


Figure 10: Working of Camera

VII.CONCLUSION

Hand gesture-controlled robots can be very naturally controlled by the user. Without much complexity, and deep knowledge of the technology, this robot can be used effortlessly. From all the observations, it seems clear that it is quite precise, accurate and smooth along with being

extremely user-friendly. The paper presents a gesture-based robotic hand that is easy to use and accurate to control. Its ability to move precisely has been demonstrated through its hardware and software.

This paper also presents a novel approach to recognizing hand gesture in an interaction between humans and machines. The proposed system can be used in military. This technology is quite futuristic in nature it has many imaginable uses in many sectors including the military. The thousands of lives of soldiers it can save both directly and indirectly. It can be used for surveillance, spying and all that can be achieved in complete stealth.

VIII.ACKNOWLEDGEMENTS

Throughout the writing of this dissertation, we have received a great deal of support and assistance. We would like to thank our guide and teacher Prof. Sameer Agrawal, Assistant Professor, School of Engineering, whose expertise was invaluable in the formulating of the research topic and methodology in particular. He provided us with the tools that we needed to choose the right direction and successfully complete our dissertation.

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