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Hand Gesture Controlled Robot

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ABSTRACT:.

An An autonomous robot is one that is not controlled by humans and makes its own decisions based on its surroundings. The majority of robots are self-contained because they must function at fast speeds and with excellent precision. However, some applications necessitate the use of semi-autonomous or human-controlled robots. Despite the fact that there are numerous controlled robots that use user commands or self-controlled robots that use GPS and sensors, the demand for gesture controlled robots is increasing for disabled people, military applications, and other reasons. Voice recognition, tactile or touch control, and motion control are some of the most commonly used control systems. In recent years, tremendous research has been conducted in various parts of the world to develop robots for disabled people and military applications.A Hand Gesture Controlled Robot is one of the most commonly used motion controlled robots. A hand gesture controlled robot is created in this project using the MPU6050, which is a 3-axis accelerometer and 3-axis gyroscope sensor, and the Arduino as the controller.The project is separated into two sections: transmitter and receiver. Both the transmitter and receiver sections have their own circuit diagrams and components.The paper goes over the entire setup and operation of the hand gesture control mode.

Keywords: unmanned ground vehicle (UGV),robots, gesture control mode, Arduino,GPS.

1. INTRODUCTION

The demand for military robots has exploded in recent years. As a result, many soldiers will be able to control robots to fight against their enemies, and the demand for various controlling robots will increase. A gesture-controlled robot is one example. What exactly do you mean when you say "gesture controlled"? A gesture is a movement of the hand (particularly, the fingers and arms) or the face that conveys information. Static gestures (using hand forms) and dynamic gestures are two types of gestures (using hand movements). To efficiently execute orders, gesture recognition requires an accurate interpretation of the hand movement. The Data Gloves Approach and the Vision-Based Approach are the two approaches. The former will be used in this project. Humans and computer-based systems, including robots, can communicate in real-world systems. Hand gesture is one of the most important ways for people to communicate in order to control technology, which we refer to as gesture controlled. Because of its applications for interactive human-machine interfaces and virtual environments, hand gesture recognition systems are the subject of current study. Why are gesture-controlled robots used in the military? When individuals and soldiers are faced with terrorist attacks or insurgency difficulties, as well as inability by disabled persons, gesture controlled robots can be deployed. The soldier on the battlefield can use the gesture control mode to control the robot through wireless modem. Hand gestures will eventually be used to control the robot. We first created a prototype command controlled robot, but when we considered how robots could be used more effectively, we came up with the concept of gesture controlled robots. To be clear, an unmanned ground vehicle is a vehicle that operates on the ground remotely with or without the presence of humans (also gesture controlled) to give navigation commands and make decisions (UGV). Hand gesture signals were considered in this paper, and the UGV will be controlled using commands sent based on the hand movements. Instead of using traditional input technologies, hand gestures are used to move the robot, and commands acquired using an inertial measurement unit are wirelessly transmitted. The Foster-Miller TALON robot and the DRDO Daksh robot are two of our robotics project's inspirations. They can travel on flat and hard surfaces, as well as sand and water, and are used in military applications. We developed prototype command controlled and self-controlled robots, which was motivation enough to develop prototype gesture controlled robots for border patrol and surveillance missions. We describe the setup and design of the unmanned group vehicle that will be controlled by hand gestures in this paper.

2. ALGORITHM DESIGN FOR GESTURE CONTROL MODE

2.1 Transmitter Section

The Arduino Nano board, MPU6050 Sensor, HT-12E Encoder IC, and an RF Transmitter make up the robot's transmitter section. The I2C interface is used to communicate between the Arduino and the MPU6050 Sensor. As a result, the MPU6050 Sensor's SCL and SDA pins are connected to the Arduino Nano's A5 and A4 pins.In addition, we'll be using the MPU6050's interrupt pin, which is connected to D2 on the Arduino Nano.The HT-12E encoder IC is frequently found in RF Transmitter modules. It converts 12-bit serial data to 12-bit parallel data. The address and data bits are separated from the 12-bit data. The address bits are A0 to A7 (Pin 1 to Pin8) and are utilized for secure data transmission. These pins can be connected to ground or left open (Vss). Pins 1 to 9 (A0 – A7 and Vss) of the HT-12E are connected to ground in this circuit.The data pins of the HT-12E are pins 10 to 13 (AD8, AD9, AD10, and AD11). They get the 4 word parallel data from a microcontroller or another external source (Arduino Nano in this case). They are wired to the Arduino Nano pins D12, D11, D10, and D9, respectively. The transmission enable pin, designated as TE', is an active low pin. As long as the TE' is low, the data is sent. As a result, Pin 14 (TE') is also grounded.Between pins 16 and 15, the encoder IC features an internal oscillator circuit (OSC1 and OSC2). To enable the oscillator, a 750K resistor is inserted between these pins. The serial data out pin is Dout (Pin 17). It is connected to the RF Transmitter's data in pin. The 3.3V Regulator is present in both the Arduino Nano and the MPU6050. As a result, all VCC pins are wired to a controlled 5V supply.

2.2 Receiver Section

An RF Receiver, HT-12D Decoder IC, L293D Motor Driver IC, and a robot chassis with four motors coupled to wheels make up the robot's receiver part.The decoder IC HT-12D is frequently connected with RF receivers. It converts serial data received over the radio frequency channel into parallel data. The address pins are A0 to A7 (Pin 1 to Pin 8) and must be matched with the encoder's address pins.Because the encoder's address pins (HT-12E) are grounded, the decoder's address pins must also be grounded. As a result, pins 1 to 9 (A0 – A7 and Vss) are grounded. The serial data from the RF receiver is fed into the decoder IC's Din (Pin 14).The HT-12D contains an internal oscillator, and between OSC1 and OSC2 is a 33K external resistor (Pins 16 and 15). Pin 17 (VT) signifies a legitimate data transfer, and when valid data is present on the data pins, this pin will be high. A good data transmission is indicated by an LED in series with a 330 resistor connected to this pin.The parallel data out ports on the HT-12D are pins 10 to 13 (D8, D9, D10, and D11). They are connected to the L293D motor driver IC's input pins (Pins 2, 7, 10 and 15 respectively).The L293D motor driver IC is utilized to supply the appropriate current to the motors (in both forward and reverse orientations). Pins 1 and 9 are enable pins and are connected to VCC (+5v), whereas Pin 16 is connected to ground (which is the logic supply). The outputs, pins 3–6 and 11–14, are connected to the four motors.The Motor Supply Pin is connected to a separate power supply and is connected to Pin 8. As a result, the Receiver Section will require two batteries: one for the circuit and one for the motors.The design of the algorithm for gesture control mode is simple and uncomplicated. For the UGV to navigate automatically, we mainly studied two crucial algorithms: path planning and obstacle detection techniques.

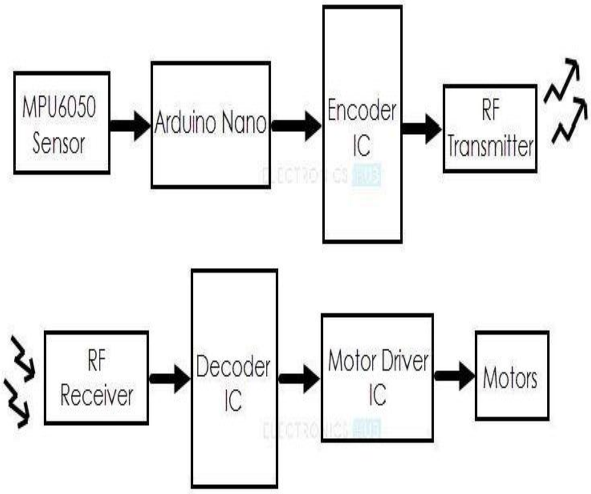

Figure 1 Block diagram for the gesture control mode

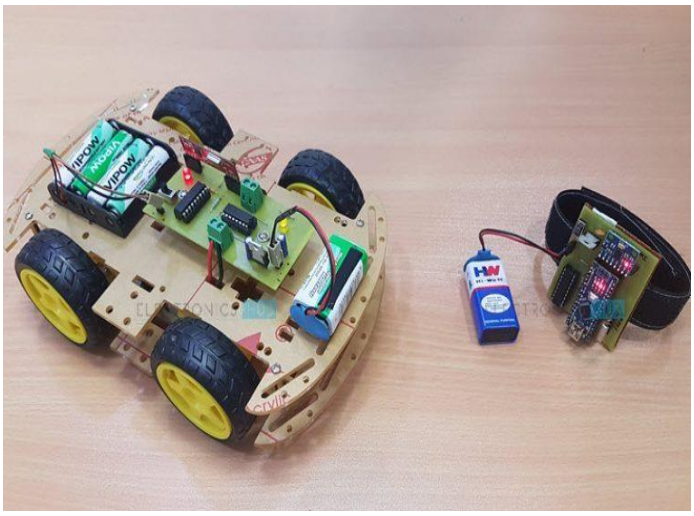

Figure 2 Proposed hand gesture robot

Figure 3 Top view of robot with battery

3. FUTURE SCOPE AND CONCLUSION

The Gesture Controlled Robot proposed in this paper offers a wide range of applications in the future. The robot can be used to keep an eye on things. The robot can be used in a wheelchair that is controlled by the movements of the rider's hand. To access it from a larger distance, Wi-Fi can be utilized instead of Bluetooth for communication. It can be equipped with edge sensors to prevent the robot from slipping off any surface. Installing a camera that can capture and communicate data to a nearby computer or cell phone is possible. It can be used in a watch or any other home appliance, such as a room heater.Modern ARDUINO chips support both intranet and internet connections, which can be used to their full potential. This robotic car might be improved to work in military surveillance, where it could be dispatched to enemy camps and monitored through the Internet. The possibilities are endless when you have a mind full of creativity. The design and implementation of a Gesture Controlled Robot using an Arduino microcontroller and an Android Smartphone are presented and developed in this paper. An algorithm has been provided, and its operation is thoroughly described. Because there are so many ways to update the system, it has been set aside for the future. The constructed device is inexpensive and simple to transport from one location to another. It will be more productive if some extra sensors or a camera are added. The amount of hardware that can be associated with a system has been greatly reduced. In the end, the system will allow the user to manage it in a way that bridges the gap between the real and digital worlds, resulting in a more intuitive output.

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