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HAND GESTURE CONTROLLED ROBOT

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ABSTRACT

The evolution of robot control systems has accelerated over time, and is one of the most recent innovations developed in the robot control system is for the gesture controlled robot. In this project we are going to design a gesture controlled robot using modern technologies and techniques. This project is a real-time monitoring system that uses gestures to allow humans to engage with robots. This is also a huge help for individuals who have difficulty moving around.
The three stages of gesture recognition are image capture, image processing, and data extraction. The implementation is carried out by using various motions to guide the robot. Rather than using a joystick or a physical controller with buttons, this technology uses physical changes such as hand tilting to act as a conduit between the human and the robot.
Hand gesture robots are commonly used in the defence field, industrial robotics, civil car part assembly, and the medical field for surgery. If we use remote controllers and buttons in these fields, the process will become more difficult. Switch control and button control can be confusing for the operator at times. It will benefit in military and high security bases. Soldiers would carry this equipment during combat.

Keywords
Gesture recognition, hand tilting, defence, surgery, military Security.

1. INTRODUCTION

The five senses are used by humans to interact with the physical environment. However, even before the formation of any language, gestures have been an important means of communication in the physical world. In this era, not only the communication between humans but interaction with machines is essential since machines are taking over every complex works. Humans interact with several distinct sorts of robots. They are autonomous robots such as line-sensing or edge-sensing robots, as well as remote-controlled robots such as gesture-controlled robots. Because gesture controlled robots are our core issue, the focus will be solely on remotely controlled robots. Without a doubt, machine production and operation will be more efficient.
A gesture is a nonverbal type of communication that uses observable body motions or activities to communicate messages. It is possible to capture a gesture that a machine can comprehend. Using a camera or a data glove, the gesture might be collected. Acoustic, tactile, optical, or motion-capture technology can all be used to record gestures, as well as Bluetooth or infrared waves. Specific control functions of embedded systems can be modified to minimise the device's size and cost while boosting its dependability and performance. Operating machines have become more flexible as a result of the introduction of Smartphones and other current technologies. The Smartphone has an accelerometer built in, which can be utilized for gesture detection and other functions. Even Flex sensors are being used as one of means for gesture recognition.
Once the robot is able to understand the gesture of humans, it acts accordingly and fulfill the requirements of humans.

2. LITERATURE SURVEY

[1] This paper discusses a proposed hand gesture-based control design for mobile robots. Mobile robots can move in response to hand gestures that convey control signals. Image processing, image counter processing, and other techniques are used to recognize gestures. The control of a mobile robot is based on information that has been recognized and decoded.
[2] The user's gestures direct the movement of the mobile robot in this project. This model consists of transmitter unit with PIC Microcontroller for recognition of gestures. The instructions will be followed by the receiver unit (mobile robot) with PIC Microcontroller. This system was created at a low cost and with a high level of efficiency.
[3] The goal of this project is to use hand gestures to operate a

mobile robot. To do this, the recorded hand pictures are processed using a circular Hough transform-based method to determine the appropriate targets. Then, to regulate the robot's motion, control signals are supplied to the receiver unit.

[4] This paper describes how humans can communicate with robots using basic hand gestures. This can be done using a Leap motion sensor. We suppose that the robot is capable of emotional interaction in this scenario. This study helps us to understand how human can interact with a robot using effective hand gestures.

[5] In this paper, they show a hand-gesture-based control interface for navigating a car-robot. A three-axis accelerometer records the user's hand motions. Any form of connection is used to provide data wirelessly to a microcontroller. The received signals are then converted into one of six car-robot navigational control commands.

[6] This paper presents a method of controlling an automata with hand gestures using the Arduino Lilypad. A motion device attached on the hand gloves is used to control the projected model. This style's major goal is to control the robot victimisation hand gesture.

[7] The main purpose of this project is to control the robotic arm's movement using an accelerometer/gyroscope-based gesture controller, that's far more convenient than using a joystick or keyboard. This paper's main contribution is the development of a simple and effective object detection system on the robot's physical model. The experimental results are used to assess the suggested object detection algorithm and gesture controller.

[8] In this paper, hand gestures are used to operate a robot. They proposed a new user hand detection method, as well as hand gesture detection that relies on the robot's camera to recognize the hand in successive frames. They were able to get the robot to follow the detected hand. In future study subjects, the detection rate of the hand will be raised.

3. OBJECTIVE AND SCOPE

The main goal is to create a hand-controlled robotic model that can be used in military applications. Coding & implementation of transmission section. Coding & implementation of receiver section. Establishing communication b/w transmitter & reciever. Construction of hand gesture controlled robot using esp8266 mc.Mounting of gas sensor, temperature/humidity sensor & surveillance camera on the robot.

The scope of the work in this project has a greater potential for military applications. Additional features could be added to the robot to increase its performance and extend the range of communication between the transmitter and receiver.

4. METHODOLOGY

4.1 TRANSMITTER BLOCK DIAGRAM

The transmitter component of the robot is made up of an Arduino uno, four Flex sensors, a HC-05 Bluetooth module, and a power source. The flex sensor is used to navigate the robot to the right, left, forward, and backward positions. These flex sensors detect movement and send a signal to the Arduino. When the robot is turned on, the transmitter. The flex sensor will be continuously monitored by the Arduino and flex sensors. The data is used to define the movement of the motors, and hence the movement of the robot. The Hc-05 Bluetooth module controls the wireless part's communication channel. Using two devices, the Bluetooth module may transmit and receive data wirelessly.

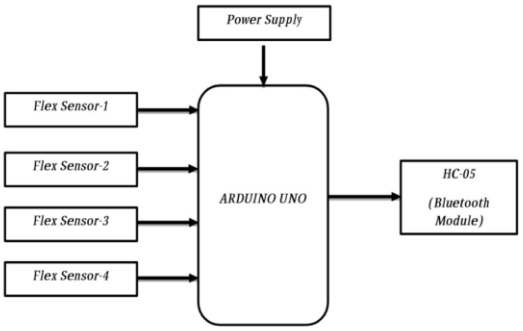

Figure 1: Transmitter block diagram

4.2 RECEIVER BLOCK DIAGRAM

The receiver is made up of an ESP 8266 controller, a gas sensor, a dht-11 (Temperature Humidity Sensor), a hc-05 Bluetooth module, a mobile camera, a battery, an L293d driving circuit, and two dc motors. We integrate a camera for live visual and a gas sensor to detect toxic substances in the course of the robot; these sensors will provide data to the ESP 8266 controller. The controller is used since it can interface with other systems to provide wifi and Bluetooth functionality. The controller sends the signal to the l293d driver circuit which controls the dc motors.

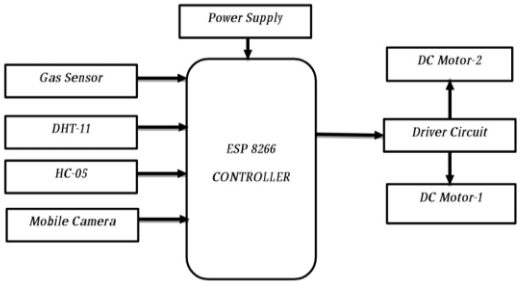

Figure 2: Receiver block diagram

4.3 FLOWCHART

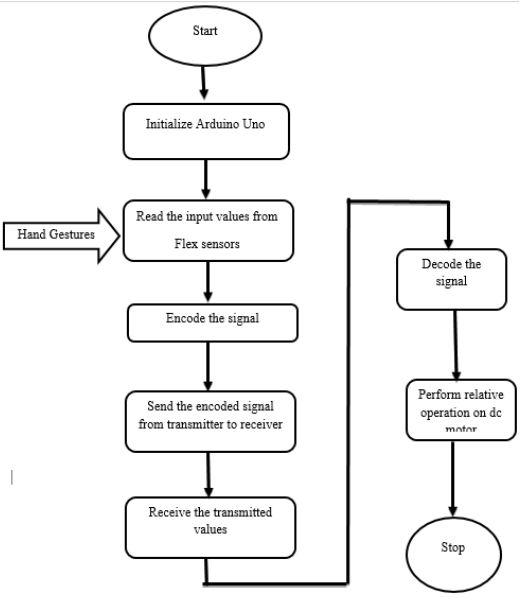

Figure 3: Flowchart

The flex sensor does its function by communicating the degree of finger movement to the arduino. The module gets

the feedback from the arm and delivers the updated processed signals to it. The handheld controller is a three-dimensional rigid body that recognizes hand motions by rotating along three orthogonal axes. In our research, all of the expected hand motions for robot navigation are simple gestures that only include one of the three elemental rotations.

5. RESULTS & ANALYSIS

5.1 TRANSMITTER SECTION WORKING PART

Figure 4: Transmitter Section of Robot

FUNCTIONING OF TRANSMITTER

We can see in the above image that the hand gloves transmitting model has been built and is fully functional. We can clearly see four flex sensors attached on the gloves here. The index finger's flex sensor is used to drive the robot forward, while the middle finger's flex sensor is used to move the robot backward. The ring finger's flex sensor is used to steer the robot left, while the little finger is used to steer the robot right. The battery that powers the hand gloves is visible. The signals from the flex sensors are received by the arduino uno and transmitted to the receiver part. In this case, Bluetooth serves as a signal carrier from the transmitter to the receiver.

RECEIVER SECTION WORKING PART

FUNCTIONING OF RECEIVER

The functioning model of the robot's receiver section, which consists mostly of ESP 8266, DHT11, HC-05, motor driver, gas sensor, and camera installed to the chassis, is shown above. As shown, we have a chassis with four wheels at each corner. The Bluetooth HC 05 receives signals from the transmitter and responds appropriately. We employ a gas sensor to identify any dangerous gases in order to prevent life losses. A dht 11 is a digital humidity and temperature sensor that delivers spontaneous measurements to guarantee that the environment is safe for humans. The camera has been positioned so that it may feed live video from the site.

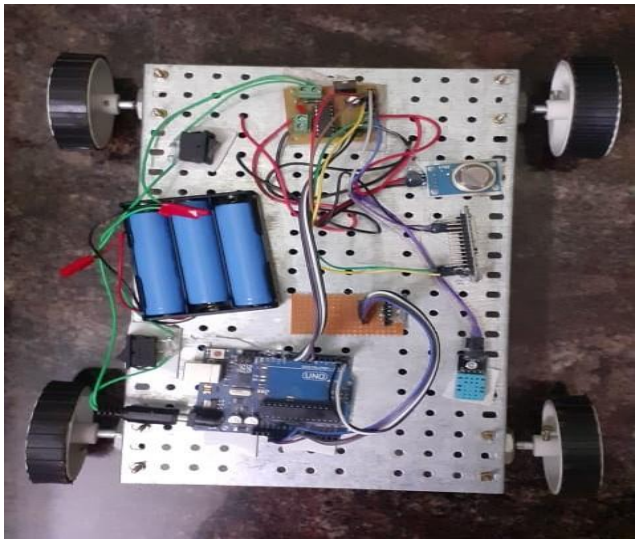

Figure 5: Receiver Section of Robot

The five movements of the hand as backward, forward, left, right and stop. The transmitter is placed on hand and receiver on the robot. The robot is moved by the hand gesture. Based on tilt of the human hand and its acceleration calculated using accelerometer sensor the values is passed to the Arduino board and respective actions are formed. Then the signal is transmitted through the transceiver to the receiving block of the robot.

At the receiving end the data signal is decoded and respective pins are made high using the code written in Arduino IDE. The result of motion of the hand the digital signals from Arduino is given to the motor driver for respective movement of the DC motors for movement of wheelchair in a desired direction of the hand gesture.

MOVEMENT OF FINGER	INPUT FOR ARDUINO FROM GESTURE				DIRECTION
SIDE	D3	D2	D1	D0	
INDEX	1	0	1	0	FORWARD
MIDDLE	0	1	0	1	BACKWARD
RING	0	1	1	0	LEFT
LITTLE	1	0	0	1	RIGHT

Figure 6: Conditions for the gesture controlled robot

6. CONCLUSION

This document will show you how to create a programmable component that responds to your hand signal. The system travels a considerable distance in response to a palm signal. The GPS system can widen the section, allowing the entire region to be tracked. The use of wireless gesture control to operate robots has received a lot of attention. As a result of current study in this field, wireless gesture control is becoming more common. It still demands more combined attention in critical domains of application, such as domestic appliances, wheelchairs, dummy nurses, table top screens, and so on. To navigate the wireless robot throughout the region, the user can utilise the proposed system's numerous gesture instructions. The major goal is to make it easier for a user to manage a wireless robot in the environment using gestures in a more dependable and natural way.

7. FUTURE WORK

Aside from the military applications outlined in the above article, gesture controlled robots have a wide range of uses in a variety of fields. The following are a few examples: Medical Applications - Advanced analytic systems that recognise gestures could be installed in hospitals and houses to detect and cure life-threatening diseases such as strokes and heart attacks.

The majority of today's computer games are played on game consoles, arcade machines, or desktops, and they all require several input devices. Hand gesture recognition has the potential to engage players in previously unimagined ways in the gaming environment.

Automation systems - Gesture recognition can be utilised in a variety of settings, including residences, workplaces, shipping containers, and more, to improve usability and save money on general and specific input devices such as remote controls, car entertainment systems with buttons, and other similar devices.

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