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Gesture Controlled Robot

[1]GADI ARVINDH, [2]MURIKIPUDI VENKATA SAI AVINASH, [3]DASARI HEMANTH SAI VENKAT REDDY, [4]MULAM AKHIL TEJA, [5]VBSS Indira Dutt

[1,2,3,4]UGScholar, [5]Professor

[1,2,3,4,5]Department of Electronics & Communication Engineering

[1,2,3,4,5]GITAM (Deemed to be University), Visakhapatnam, India

Abstract: The basic idea of our project is to develop a system (Robot) that can recognise the human interaction with it to accomplish the specific tasks assigned to it. A wearable hand glove that will contain the sensors mounted on it to capture the movement of the hand and convert the raw mechanical data into electrical form is designed.

Gesture recognition can be explained as a method by which a computer can understand the language of the human body, thereby creating a communication bridge between humans and machines than standard text-based or terminal user interfaces or even graphical user interfaces (GUIs) that still restrict most of the mouse and keyboard inputs. The gestures can be interpreted from any kind of physical movement or condition but usually arise from a person.

It will allow the user to drive the robot car forward, backward, even in the left and right directions. Different mechanisms can control this. This mechanism involves the rotation of the car's wheels in the clockwise direction or the anticlockwise direction. By using this technique, we can rotate the car without any difficulty.

Keywords **- Arduino board, Transmitter module, Receiver module, Motion control**

I. INTRODUCTION

Nowadays, we can see that robots have become the most advanced feature of technology. A robot is a computer system in which controlled by the humans
Like inserting a program to it for the functioning. The computer program can efficiently operate these. Generally, robots can be autonomous and semi-autonomous.
These autonomous robots are controlled by humans like in which decisions are taken on their own concerning the environment. Generally, we see this type of robots are seen in the industries because they have to operate at high speed and accuracy. However, some applications require semi-autonomous robots which work according to the commands given to them—some of the systems like voice-controlled, touch-controlled and motion-controlled.

A gesture-controlled robot is controlled by using the hand in place of any other method like buttons or joystick. Here one only needs to move the hand to operate the robot. A transmitting device is placed in the user's hand, which contains the RF Transmitter and accelerometer to transmit a command to the robot so that it can perform the required task of moving forward, back, turning left, right and stop. These tasks will be identified using the hand gesture.

Here the most crucial component is an accelerometer. An accelerometer is a 3-axis acceleration measurement device with +-3g range. This device is made by using a polysilicon surface sensor and signal conditioning circuit to measure acceleration. The output of this device is in Analog and also proportional to the acceleration. The device measures the static acceleration of gravity when tilted and gives a result in terms of 'g'. The transmitting device has an ADC for analogue to digital conversion. The sketch starts by declaring Arduino's analogue input pins to which the sensor's X, Y and Z output pins are connected. Then an RF Transmitter module will transmit it. And at the receiving end, an RF Receiver module receives the data. This data is then processed by a microcontroller and, finally, our motor driver to control the motors of the robot car.

The applications for this are automobiles, defence, medical and also in some cases we use fire-fighting robots also to save the humans from the accidents.
So, controlling the robot with the remote is quite complicated. Developing a gesture-controlled robot that can be operated with gesture controls is relatively easy. These types of robots are semi-autonomous which can perform the work very efficiently. Some robots require some guidance, which may be done using a remote control or a computer interface. Robots can be autonomous, semi-autonomous or remotely controlled. Robots have evolved so much and are capable of mimicking humans that they seem to have a mind of their own.

II. OBJECTIVE

The aim of the project is to develop a human and a machine interface used for controlling robots with the gesture. Our objective is to make this device so cheap and straightforward to produce and use for many purposes. For example, in this project, the user can also control the motions of the car by wearing a controller glove and performing the given gestures.

III. LITERATURE SURVEY

In this section, for example, we work on the gesture-controlled cars motions robot.
Hand-gesture-based interface for navigating a robot. A robot can be controlled by a user using hand gestures. A 3- axis accelerometer is used to record a user's hand trajectories. The trajectory data is transmitted wirelessly to the RF module to a computer. The received trajectories are classified into six control commands for navigating a robot.

Over the past 30 years, a history of studies reported in this paper suggests that Gesture Controlled User Interfaces (GCUI) now provide realistic and affordable opportunities, which may be appropriate for older and disabled people. They have developed a GCUI prototype application, called Open Gesture, to help users carry out everyday activities such as making phone calls, controlling their television and performing mathematical calculations.

IV. SCOPE

- These hand gesture robots are used for persons who are sitting in wheelchairs.
- These can also develop hand gesture robot arms for the industrial purpose
- For also video game purposes, we use a hand gesture robot
- This makes life so simple for disabled persons also.

1. Methodology

1.1 For Communication Signal

1.1.1 Transmitter Module

The transmitter is an electronic device which converts measurements from a sensor into a signal, and sends it, via wired or wireless, to be received by a control device. The transmitter (Tx) operates at 434 MHz frequency which receives serial data and transmits it wirelessly through RF antenna. This transmission occurs at the rate of 1Kbps - 10Kbps

1.1.2 Receiver Module

RF receivers are one of the easiest ways to add wireless control. It receives the data sent by the gesture device whose working is similar to the transmitter. Any of the middle two Data-Out pins are connected to digital pin #11 on the Arduino.

1.1.3 Motion Control

The L289N motor driver can control the motion control of the robot.
It has two enable inputs to enable or disable the particular device attached at its output independently. It has an H-bridge inside the motor driver. Generally, H-Bridge is used to control the rotating direction in DC motors.

1.2 Simulation Work

A gesture-controlled robot is controlled by hand. In this, we only need hand motion to control. A transmitting device on hand which contains a RF433 module and the accelerometer (ADXL335) for transmitting the data to the car, which has receiver module such that receives the data and sends it to the L298N motor driver and works according to the direction like front, back, left, right rotate direction in which hand moves. This device measures the static acceleration of gravity when we tilt it. And gives a result in form of motion or vibration.

1.3 Hardware Requirements

- Arduino Nano board
- ADXL 335
- F434 Module
- L298N motor driver
- Robot car chassis
- Jumper wires
- Batteries

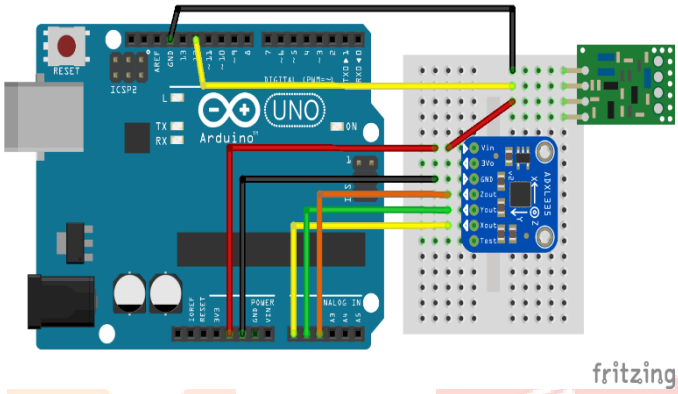
2. Working

Mainly it is divided into 2 parts

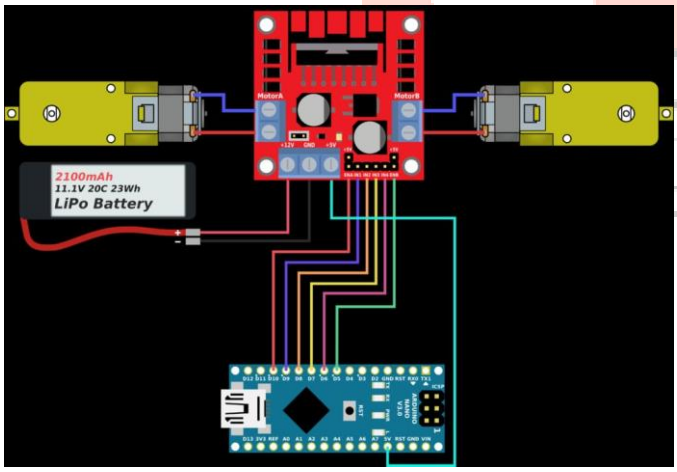
1. Transmitter part
2. Receiver part

In the transmitter part an accelerometer and a RF transmitter unit are used. The output of the transmitter is continuously collected by the receiver wirelessly. The output data of the receiver is then sent to the Arduino Nano. The Arduino Nano converts the analog data to digital and sends it to L298N motor driver. According to received data the robot has four DC motors in forward, reverse, left, right and stop direction. So, the robot moves according to the user's hand movement recognized by the device in our hand. When we tilt hand in front side, the robot starts to moving forward and continues moving forward until the next command is given. When we tilt hand in the backside, the robot changes its state and start moving in the backwards direction until another command is given. When we tilt it towards the left side, it will turn left till next command. When we tilt our hand in right side robot is turned to the right.

Modelling of gesture control



Transmitter circuit



Receiver circuit

3. Applications

- For entertainment purposes.
- For automation systems.
- For medical purposes.

4. RESULT AND CONCLUSIONS

4.1 Result

We have successfully implemented our idea of creating an interactive robot that understands the gestures of a human hand and moves accordingly using an RF module (RF 434) and an Arduino Nano, which is used as a microcontroller, one at transmitter and receiver to process the data. Along with an L298N motor driver that is used to control the robot's movement. Such that it moves according to the direction the hand moves.

4.2 Conclusion

The purpose of the project is to control a toy car using accelerometer sensors attached to a hand glove. The sensors are intended to replace the remote control that is generally used to run the car. It will allow us to control the forward and backward, and left and right movements, while using the same accelerometer sensor to control the throttle of the car. based on the hand movements. By using the above-mentioned components, the hardware was set up, thus resulting in the formation of a robot.

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