ROBOT CONTROL BY USING HUMAN HAND GESTURES

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Abstract - *In recent years, robotics is a demanding technology in the field of science. .To increase the use of robots where conditions are not certain such as security operations, robots can be made such that it will follow the instruction of human operator & execute the task. This paper describes about the gesture control robot which can be controlled by your normal hand gesture.. The accelerometer controls the movement of the car. Accelerometers are used to measure the angular displacement of human hand motion. It consists of mainly two parts, one is transmitter part and another is receiver part. The transmitter will transmit the signal according to the position of accelerometer attached on your hand and the receiver will receive the signal and make the robot move in respective direction. Here, the program is designed by using Arduino. Any robot can be controlled by using Arduino, and not only we can control it, but we can use it to do minimum 256 different functions.*

Key Words: *Robot, Hand Gesture, RF Transmitter & Receiver, Accelerometer, Arduino.*

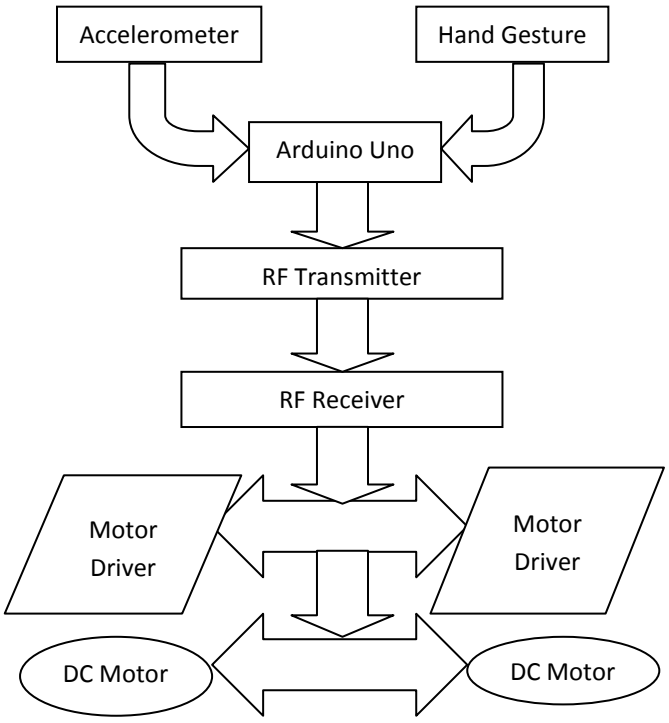
1. INTRODUCTION

Robots are controlled using hand gesture because robots need a helping hand whether it may be any function, without human robots cannot be operated. The main purpose of using hand gestures is that it provides a more schematic way of controlling the robot and with this feature robot can be used as a wheelchair or as a spy robot or for vigilance. As human hand gestures are natural, with the help of wireless communication, it is easier to interact with the robot in a more-friendly way. The robot's movement depends on the gestures made by hand. The objective of this paper is to build a wireless, hand gesture controlled robot using an Arduino Uno, an accelerometer, and a RF transmitter and a RF receiver set. The Arduino Uno microcontroller reads the analog output values i.e., x-axis and y-axis values of the accelerometer and converts that analog value to respective digital value. The values are given a specific function by the use of the Arduino software. The digital values are processed by the Arduino Uno microcontroller and according to the tilt of the accelerometer sensor mounted on the hand, it sends the commands to the RF transmitter which sends the signal to the receiver and there these signals are processed by the receiver end which drives the motor to a particular direction in which we have set it to move. The robot moves forward, backward, right and left when we tilt our palm to forward, backward, right and left respectively and the robot stops when our palm is parallel to the ground.

1.1 Proposed Work

The whole project is divided into two sections one is transmitter section and other is receiver section. The circuit diagram and the transmitter prototype is shown in figure 2, and figure 3 respectively, and the transmitter section consists of one Arduino Uno, one 3-axis accelerometer and one RF transmitter module. The circuit diagram of receiver module and the receiver prototype is shown in figure 4 and figure 5 respectively. The receiver section consists of one RF receiver module, one motor driver IC, two PMDC motor, two wheels. Here, two separate 5 volt power supply is applied to both the sections. Finally, the Arduino Uno reads the analog output values i.e., x-axis and y-axis values from the 3 axis accelerometer and converts the analog value to respective digital value. The digital values are processed by the Arduino Uno and send to the RF transmitter which is received by the Receiver and is processed at the receiver end which drives the motor to a particular direction. The robot moves forward, backward, right and left when there is tilt in the palm of user in forward, backward, right and left respectively.

1.2 Block Diagram



2.1 Types of Components

2.2.1 Arduino

Arduino Uno It is a microcontroller board based on ATmega328 which has 14 digital I/O and 6 analog pins. It has everything that is needed to support the microcontroller. Simply connect it to the computer with a USB cable to get started with the Arduino Uno board. It is flexible, easy to use hardware and software. Arduino Uno can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators.

2.2.2 Accelerometer (ADXL335)

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. It has 6 pins. 3 pins is for X, Y, Z axis. First pin for power supply (VCC), second pin for ground (GND) and the last one for self-test (ST). It operates on 3.3V from the Arduino Uno board. X and Y axis pins are connected to A0 and A1 pin of Arduino Uno board respectively. It can measure the static acceleration of gravity from tilt sensing applications as well as dynamic acceleration resulting from motion, shock or vibration and gives corresponding analog values through X, Y, Z axis pins. The ADXL335 is available in a small, low profile, 4mm x 4mm x 1.45 mm, 16-lead, plastic lead frame chip scale package.

2.2.3 Motor Driver

Motor Driver works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to flow in either direction. As voltage need to change its direction for being able to rotate the motor in clockwise or anti-clockwise direction. Therefore H-bridge IC is ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due to its size it is very much used in robotic application for controlling DC motors.

2.2.4 DC Motor

DC motor is used for the conversion of direct current into mechanical motion. The mechanical motion could be rotary or linear. The operation of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. DC motors can be used for the movement of the robotic car.

2.2.5 Battery

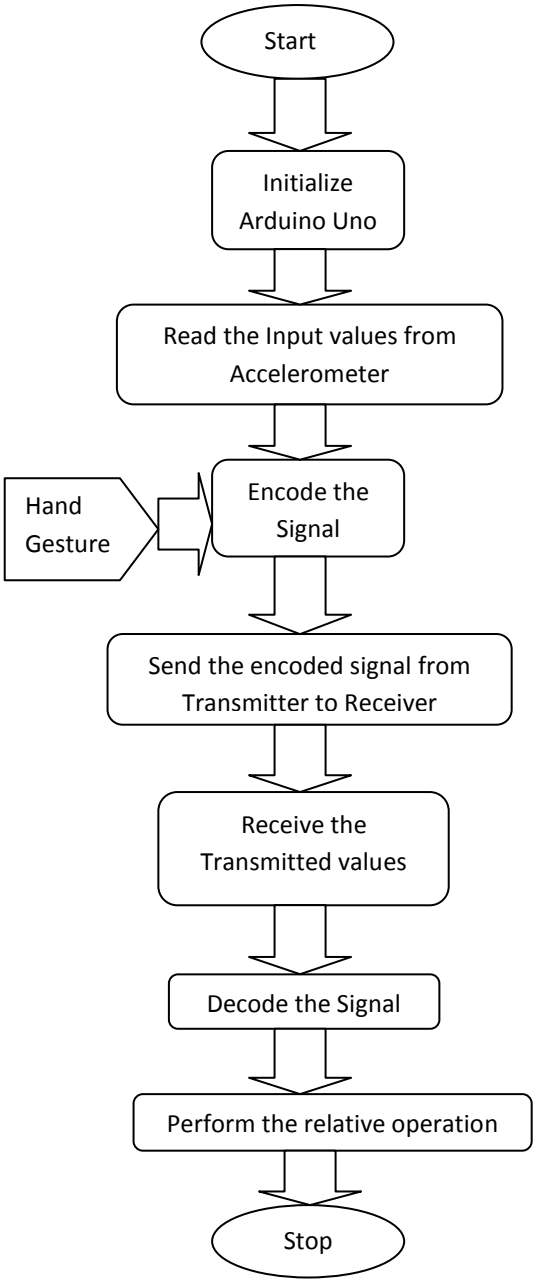
A battery is a device consisting of one or more electrochemical cells. A battery is device that directly converts chemical energy to the electrical energy. The purpose of battery is to supply 12 volts to operate DC motors.

1.2.6 RF Transmitter & Receiver

The transmitter module is working on the frequency of 433MHz. In the circuit, Vcc pin is connected to the + terminal. The data pin is connected to the HT12E (Encoder) that is transmitted or we can say that encoded data. The next pin is GND that is connected to the ground terminal. Now the last pin ANT this is connected to a small wire as an antenna.

The RF receiver module will receive the data which is transferred by the gesture device. It is also working as similar to the transmitter module- Connect the +Vcc pin to the 5volt terminal. Connect the ground pin to the ground terminal .The data pin is then connected to the HT12D (Decoder) .So that we can get the decoded 4 bit data.

2.2 Flowchart



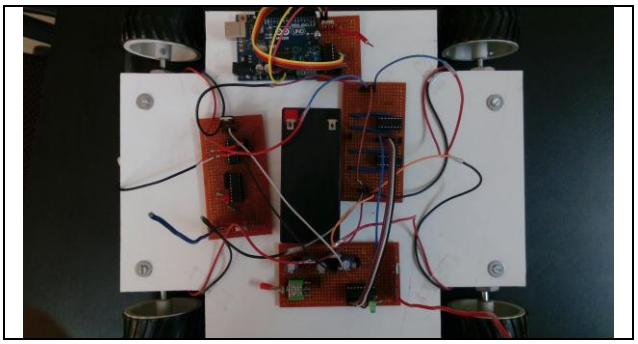


Fig -1: Model of Robot Control Using Human Hand Gesture

3. CONCLUSIONS

In this paper, I introduced a hand-gesture-based interface for navigating a car-robot. A user can control a car-robot directly by using his or her hand motions. In the future, I will directly use a mobile phone with an accelerometer to control a car-robot. I also want to add more hand gestures (such as the curve and slash) into the interface to control the car in a more natural and effectively way.

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BIOGRAPHY

Prajwal Ashwin Jawalekar Student of Final year pursuing Bachelor's Degree in Engineering from Prof. Ram Meghe College of Engineering & Management, Bandera Road, Amravati in the Department of Electronics & Telecommunication Engineering.