Hand Gesture Controlled Vehicle

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Abstract: Gesture controlled vehicle is a type of robot which can operated by human hand movements. The user needs to wear a glove which consists of transmitter and sensors like IR sensor. These sensors help in recording the movement of hand in a desired direction which ultimately results in the motion of robot or vehicle. It will be very easy for user to interact with car or robot more easily due to wire free connectivity. Vehicle can be controlled with the help of accelerometer sensor which is connected to hand glove. This will help the applicant to control the forward, backward and sideways movements. We have made the cross connections of motors which will help in the movement of tyres so that vehicle can take a sharp turn without any difficulty. Hand gesture controlled driverless vehicle is developed with the help of Arduino Nano, three-axis accelerometer, RF transmitter and receiver module.

Keywords: Gesture controlled, sensor, RF module, robot, accelerometer

I. INTRODUCTION

In past few years, robot IC is a very fast developing technology in the area of science. This emerging technology will provide great advantages to the society in upcoming years. We can say that robots could be the replacement of human beings, but it requires to be handled by human beings itself. Robots can be classified in two categories wired and wireless. They both have their own advantages and disadvantages. Beyond operating the robots through physical medium, a new method of controlling a robot through hand gestures becoming very popular now a days. Now, it is very easy to control a robot by using hand gestures which provides a better interaction with robotic devices. Now a days more wire free robots are being developed and are applied on various types of applications. It becomes more friendly to use robot or a car by the mean of hand gesture which is a more natural way. The vehicle or a robot moves accordingly to the hand gesture. The main aim of making our project which is to generate a gesture-controlled car with the help of arduino nano, three-axis accelerometer, RF receiver and transmitter module. We had developed a gesture-controlled car instead of a robot. Arduino nano converts all analog values into digital values of accelerometer which is further processed in accordance to the tilting of accelerometer sensor, which is placed on the hand, sends command to RF transmitter and further processed at receiver section which helps in driving the motor to a given direction. This is how a driveless car moves in respective direction.

II. INNOVATION AND HIGHLIGHTS OF THE PROJECT

The name itself proposes that it is a driverless vehicle that can be controlled remotely just by identifying the hand gesture movement. If the hand is tilted in reverse the car moves in reverse similarly when the hand is tilted in left and right, the car moves left and right accordingly. Essentially it has two segments ie: Transmitter (Tx) and Receiver (Rx). Beginning with transmitter segment Arduino nano consistently screens and recognizes information from the accelerometer (ADXL-335) and afterward it

is sent to encoder (HT12-E) where the information is changed over from parallel to sequential information. Further it is transmitted to beneficiary area through radio frequency transmitter.

At the recipient segment i. e. the vehicle, the sequential information received through radio frequency collector is sent to the decoder IC(HT12-D) and is changed over once again from sequential to parallel information. The data is decoded and as per the received information, further the command for different activities is sent to the driver module (L293D). The driver module triggers distinctive motors located at various positions in design as per the hand movement and subsequently, moving the vehicle according to the hand signal. Another thing which was added in project for safety is IR sensors, which prevent the vehicle from damage by detecting obstacles and blockages in case the hand gesture control does not operate it properly.

III. CIRCUIT DIAGRAM AND BLOCK DIAGRAM

A. Circuit Diagram

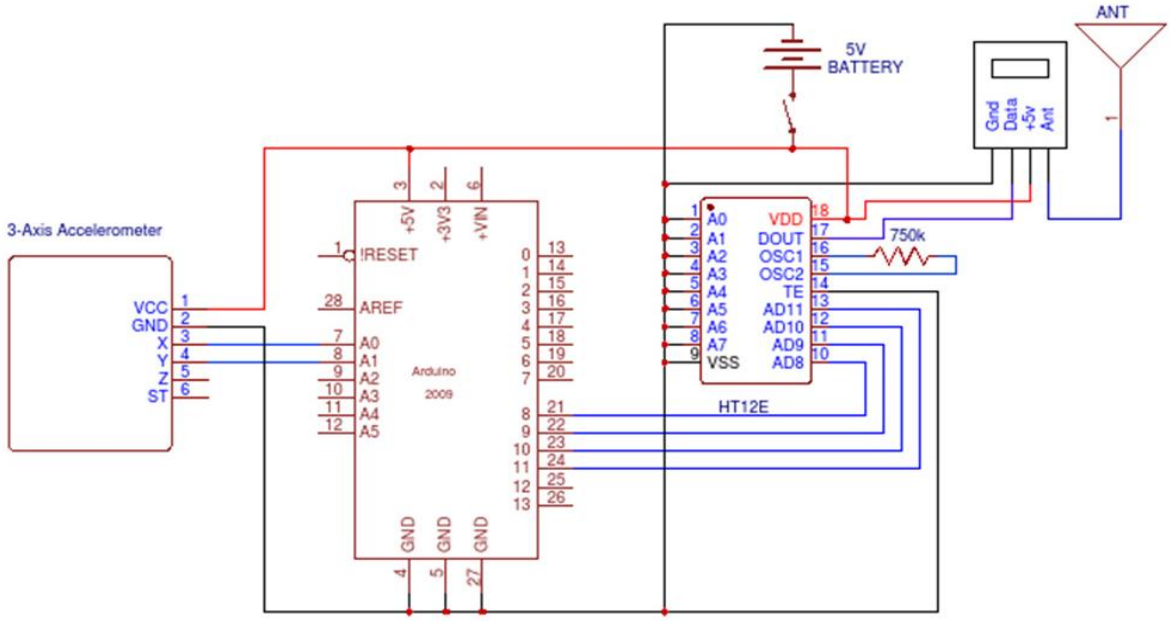


Figure 1. Transmitter Circuit Diagram

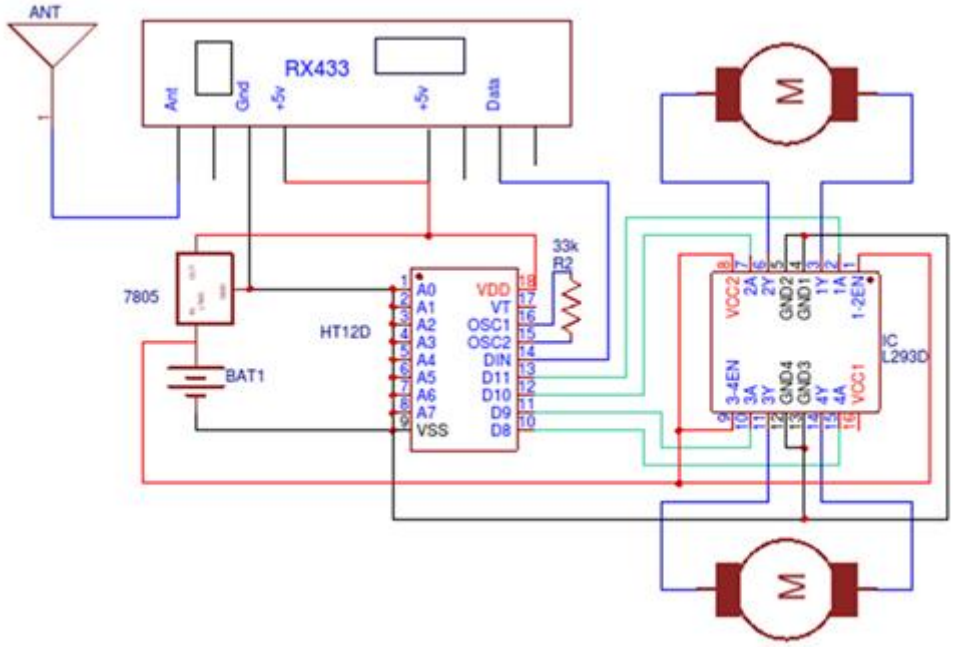


Figure 2. Receiver Circuit Diagram

B. Block diagram

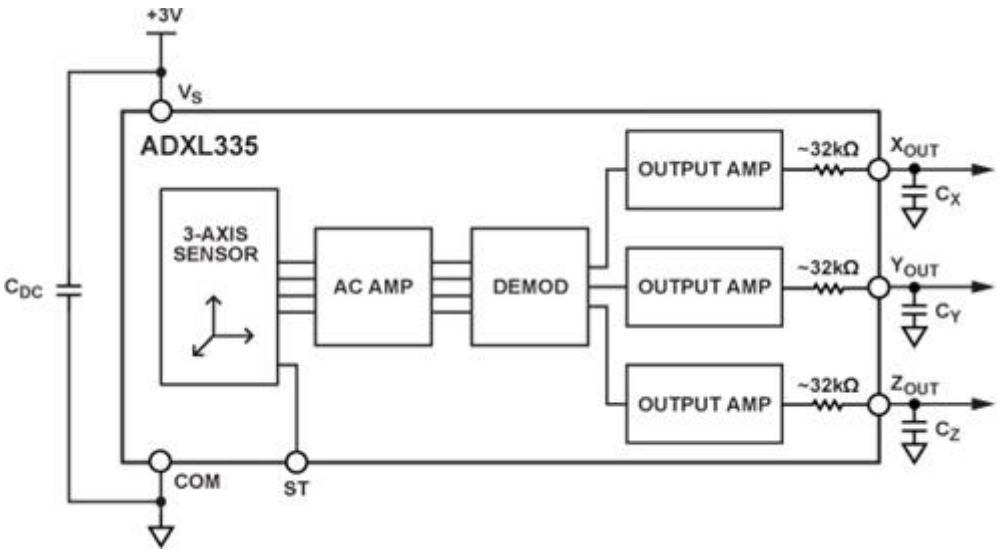


Figure 3. Block Diagram of Driverless Vehicle Assembly

The Tx area of the CAR comprises of Ardiuno Nano kit, 3 AXIS accelerometer, HT-12E Encoder IC & a RADIO FREQUENCY Tx the correspondence among Arduino and 3-axis accelerometer Sensor happens through I2C Interadio frequency ace. HT/12E is an encoder Integrated Circuit (IC) that is regularly connected with RADIO FREQUENCY Tx module. It changes over the twelve-bit parallel information to sequential information. The 12-bit information is isolated into location & information bit. From A0 to A7 that is (Pin 1 to Pin8) are the location bit & could be utilized for secret trans missioning.

Recipient area of car comprises of a RADIO FREQUENCY Receiver (RX), (HT/12D) Decoder Integrated circuit, L293-D Motor-Driver IC & a robot case with four (4) engines associated with

wheels. HT12/D is the decoder Integrated Circuit (IC) that is frequently connected with RADIO FREQUENCY Receiver (RX). It changed over the sequential information given for the RADIO FREQUENCY connect in the paralleled information. The A0 to A7 which is (Pin 1 to Pin 8) are the location sticks & should be contact with the location pin of the encoders the location pins of the encoder (HT12/E) are GND (grounded), the location pin of decoders should likewise be GND (grounded). Subsequently, which are the pin 1 to 9 (A0– A7 & Vss) are associated with ground. The sequential information from the RADIO FREQUENCY Receivers (RX) is given to Din (Pin 14) of the decoder IC. HT12/D IC had an inner oscillators & an outside resistor® of 333KΩ is associated somewhere in the range of OSC1 & OSC2 (Pins 16 & 15). Stick which is 17 (VT) demonstrates a legitimate trans-missioning of information & that is stick would be high when a substantial information is available on the information pins. A LED in arrangement with a 330ω resistor is associated with this stick to demonstrate a substantial information trans-missioning.

IV. MAIN COMPONENTS AND WORKING

A. Arduino

Arduino is a platform used to build electronic projects. It consists of a programmable circuit (often called a microcontroller) and software which is also called an IDE i.e Integrated Development Environment that runs on the PC, to load, compile and execute code on the arduino board. It has now become very famous among beginners in electronics's. Not like most earlier circuit boards that can be programmed, it does not even need any exernal hardware to compile or write new code on the board. We can use a conventional USB cable for connection. In addition, it uses a simple C++, which makes learning programming easier. Finally, Arduino gives a standard that divides the microcontroller's features into a more accessible package. The various control of arduino nano are:

USB: Connect the scaled down USB jack to a telephone Lead or PC via a link & it will control the board to work.

Vin-Pin: The Vin stick can be provided with an unregulated between 6 to 12V to control board. The on-board voltage controller direct it to +5V.

+5V-Pin: If you have a managed + 5Volts supply then you can specifically give this to the +5 Volts to Arduino.

In total there are absolutely fourteen computerized Pins and 8-Analog sticks on the Nano board. The advanced pins can be used to interface sensors by utilizing them as the info sticks by utilizing mentioned as yield pins. A straightforward capacity like pinMode and digital Write can be utilized to control the activity. The working voltage is 0V to 5V for computerized pins. The simple pins can qualify simple voltage from 0-5Volts using any of the analog pins utilizing a straightforward capacity compare analogRead().

The pins utilized for common purpose are talked about beneath:

•Serial Pins o(Rx) & 1(Tx): R x & T x pins are utilized for transmitting TTL sequential info. These are associated with the Atmega-328P (USB to TTL) sequential chips.

•PWM Pins i.e 3, 5, 6, 9 & 11: These give a 8-bit Pulse Width Modulation yield by utilizing analogWrite() work.

•SPI Pins.they can used for spi correspondence

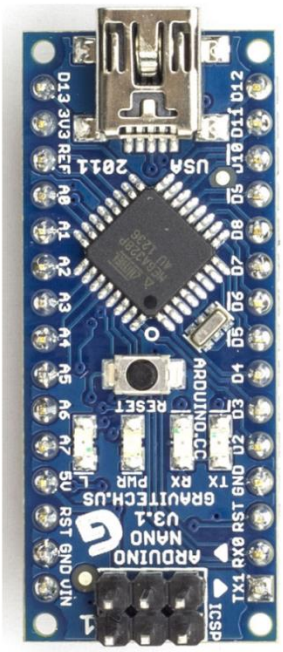
•In-manufactured light emiting diode slot no.13:

•I2C-A-4 (SDA) & A-5-(SCA): Used in IIC correspondence utilizing Wire library.

•AREF: Used to give a reference voltage to simple contributions with using analogReference() work.

•Reset Pin: Making it stick LOW, resets microcontroller.

Microcontroller : ATmega168/ ATmega328
Operating Voltage : 5 V
Input Voltage : 7-12 V
Digital IO/PWM : 14 /6
Analog In/Out : 8
DC Current per I/O Pin : 40 mA
Flash Memory : 16 KB/32 KB
SRAM : 1 KB/2 KB
EEPROM : 512 bytes/1 KB
Clock Speed : 16 MHz



Arduino	Microcontroller
1(TX) -	PD1(TXD)
0(RX) -	PD0(RXD)
D2 -	PD2(INT0)
D3 -	PD3(INT1)
D4 -	PD4
D5 -	PD5
D6 -	PD6
D7 -	PD7
D8 -	PB0
D9 -	PB1
D10 -	PB2(SS')
D11 -	PB3(MOSI)
D12 -	PB4(MISO)
D13 -	PB5(SCK)
A0 -	PC0
A1 -	PC1
A2 -	PC2
A3 -	PC3
A4 -	PC4(SDA)
A5 -	PC5(SCL)
A6 -	ADC6
A7 -	ADC7

Figure 4. Pin Diagram of Arduino nano

B. Encoder and Decoder IC

The radio frequency transmission framework which uses Amplitude Shift Keying i.e ASK with trans receiver combine work at 435 MHz. The Tx module takes sequential info and transmits these signs through the radio frequency. Framework will only permit 1 path corresponding with between 2 hubs, to be specific, transmission and gathering. The RF module has been utilized related to an arrangement of 4 channel encoder or decoder IC's. Here HT12-E and HT12-D had been used as encoder and the decoder individually. Encoder's change on the parallel contributions in sequential preparation of the sign. The sign are sequentially interchanged through the RF to the 267athering point. Decoder get used after the RF receiver to unravel the sequential organization and recover the 1'st flag as yields. Transmitter, after accepting sequential info from encoder IC (HT12-E), transmit it remotely to RF recipient. The beneficiary, after getting signs, send them to decoder IC (HT12-D) through pin-2.

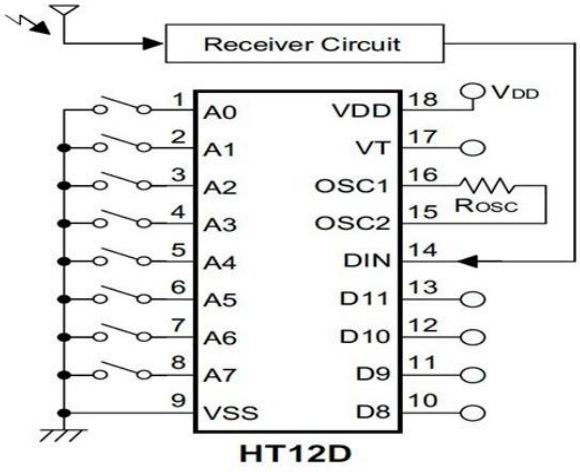


Figure 5. HT12D Module pin diagram

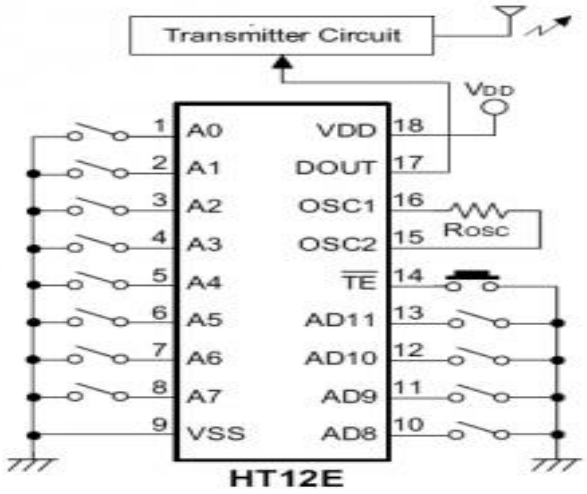


Figure 6. HT 2 E module pin diagram

C. Geared D.C. Motor and Driver Module

DC motor usually operates in reasonable low voltage range in this vehicle. The higher the i/p voltage, the greater the RPM i.e rotations/minute of motor. In DC motors, the speed and the torque are always inversely proportional. Therefore, the Gear that has the most torque will provide a lower RPM. The concept of pulse width modulation is applied in a direct current motor with gearbox. The motor driver works as a frequency station between the Arduino station and the engines. The most used driver engines are of the L293 arrangement, for example, L293D, L293NE, and so on. These integrated circuits are designed to control DC motors all the time. The L293D includes two H-connects. H-connect is the direct circuit to control the low-current motor. The L293D motor driver has 16 pins.

D. 3-Axis Accelerometer

The ADXL-335 is a compact, less power, 3-axes accelerometer with signal with outputs as signal conditioned. The acceleration is measured with a min ranges of ±3G. Static acceleration of gravity can also be measured where tilt sensing applications are to be used, as well as dynamic acceleration that can be there by a movement, or a vibration. Bandwidth of the accelerometer is set by the user here using the C-X, C-Y, & C-Z Xout ,Yout & Zout pins are of the capacitor. BW could be further selected in accordance with the features and from the range (0.5Hertz-1600 Hertz) for the X & Y axis, & also in range of 0.5Hertz-550Hertz for the Z axis.

V. APPLICATIONS

1. Security: The vehicle can be used for remote surveillance.

2. Transportation: It can be used for very short distance transportation in various industries being efficient and price effective than earlier means.

3. Medical: The assembly can be used for making wheel chairs for handicapped people which are control by gestures.

4. Commercial: This technology can be used in making gesture controlled robotic arms for various industrial purposes.

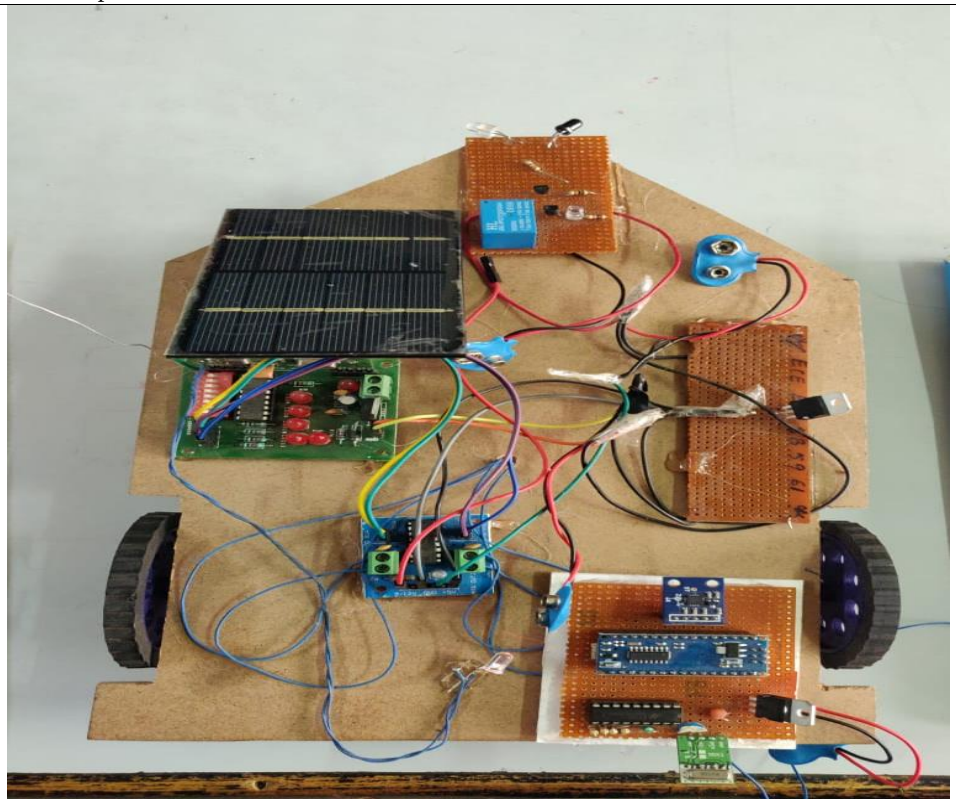


Figure 7. Assembly of Hand Gesture Controlled Driverless Vehicle

VI. CONCLUSION

The main motive of this project is to control a robotic vehicle with gesture of hand. This is done with the help of accelerometer sensor and arduino nano which is used because of its small size and makes this practical for use, further the transmitter can be stitched on a glove for easy use. This accelerometer is used to move the robot in forward, backward, right and left direction according to the orientation of the hand. Initially the robot is at rest position then if the hand is tilted downwards from front robot will move in forward direction, if tilted upwards from front it will move backward and if tilted at acute angles at left or right it will move in left and right directions respectively. So, the components mentioned above were placed on a chassis as per the connection diagram. After checking and compiling the program it was fed into arduino using Arduino IDE software. After successful working of the project further modifications were made like providing energy from a solar panel. As solar energy is in abundance and renewable which makes it environment friendly. Another thing which was added is IR sensors this prevents the robotic vehicle from damage by detecting obstacles and blockages in the path of vehicle.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical statement: The authors declare that they have followed ethical responsibilities

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This volume is dedicated to Late Sh. Ram Singh Phanden, father of Dr. Rakesh Kumar Phanden.

