A Design of Motion Controlled Spying Device via Arduino

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***Abstract*- Motion controlled robot is a car which can controlled simple by human hand gestures. In the project the sensor plays a key role that will record the movement of hand in required direction which will result in the motion of the robot in all directions. The robot and the gesture both are connected without wire through radio waves (sensor waves). User can communicate with the robot in a friendly way because of wireless communication. I this project we can control the car using accelerometer sensors attached to a hand gloves. The sensors are able to replace the remote control that is generally used to run the car. The sensors will allow to controlling the robot in forward, backward, leftward and rightward movements. There are different mechanisms to control the movement of the robot. The mechanism involves the rotation of both forth & rear wheels of left or right side to move in the anticlockwise direction and the other pair to rotate in the clockwise direction which makes the car to rotate about its own axis without any kind of forward or backward motion. The advantage of this mechanism is the car able to move freely with any difficulty. The design and implementation of gesture control robotic arm using ardiuno is proposed. The robotic arm is made to imitate the human hand movements using a hand glove.**

Index Terms- arduino, Robotic arm, flex sensor, transmitter and receiver modules, and accelerometer

INTRODUCTION

In present days, robotics growing as one of the most advanced in the field of technology. robot is an electro-mechanical device which is operated by a computer program. Robots can be autonomous or semi-autonomous.an autonomous robot is not controlled by human and acts on its own decision by sensing its environment. Majority of the industrial robots are autonomous as they are required to operate with high accuracy and speed. In some applications require semi-autonomous robots which are controlled by human commands. Many of commonly used control systems are voice identification, touch controlled and motion controlled. A Gesture control robot is one of the robot which can be controlled by your hand gestures. You just need to wear a transmitter device on your hand which included an acceleration meter. This will transmitter gives command to the receiver module so that it can move according to the command. The transmitting device included a ADC module which can convert analog to digital conversion and an encoder which is used to encode the four bit binary after that the data will transmit by RF transmitter module. At the receiving end RF receiver module is placed to receive the encoded data and decodes it by using decoder. Finally the data is processed by a microcontroller. Now it's time to break to make the work easy and simple any project become without error if it is done by using different modules. As our project is already divided into two different part transmitter and receiver. The applications of robotics mainly involve in automobiles, medical construction, defense and also used as a firefighting robot to help the people from the fire accident. We are all know that controlling of car or robot using remote or switches is quite complicated, so we decided to introduce a project that is the robot which controlled by hand gesture using aurdiuno. The main motive to introduction of this project of this project is to control the movement of robot by using accelerometer. The robot is usually an electro-mechanical machine that can perform tasks automatically. Some of the robots require set of guidelines to work perfectly like remote controlled robots

OBJECTIVES

- The main aim of this project is to develop a human machine interface used for control robot arm. The main of the objective of this project is

to produce a human controlled machine which is low cost and high accuracy.

- Another objective of this project is to build a car which can be controlled by human gesture wirelessly. In this project user is also able to control movements of the car by wearing controller glove which is connected with ardiuno and transmitting module.

SCOPE

- These sensor controlled ardiuno based robots have many applications like remote surveillance, military etc.
- The hand gesture controlled robots are mostly helpful to those who are physically challenged, like people who are didn't able walk they are moving with help of wheelchairs. Those people can easily control their wheel chair by using this controlling technique.
- Nowadays most of the videogames are played by the different people are used this controlling technique.
- In home automation system and offices, transport vehicles scope of using this hand gesture controlled technique.
- One of the main scope is to help the people those who are facing handicapped problems. People those who are suffering from without legs they must use this technique to move the wheelchair as they like by using their hand gestures.
- This project brings a small revolution in communication sector because the interaction between human and machine is done without any language.

So far you came to know about Hand Gesture Controlled Robot that completely moves according to moments of your hand (sign of input to the device).

METHODOLOGY FOR COMMUNICATION SIGNAL SYSTEM

The methodology for communication system is completely depends upon two modules that are given below.

1. Transmitter module
2. Receiver module

TRANSMITTER MODULE

A RF transmitter is a printed circuit board as shown in below fig it is capable transmitting a radio wave and later modulating it as carry data. It is connected along with micro controllers which provide data to the module which is transmitted. It is subjected to regulatory requirements which sense the maximum allowable transmitter power output and harmonics.

RECEIVER MODULES

An RF receiver module RF433-RX IS 433MHz radio receiver receives the modulate RF signal, an d then it demodulates. There are two types of RF receiver's modules. Super re-generative modules are usually of low cost and low power designs using a series of amplifiers use to extract modulated data from carrier wave. Super re-generative modules are generally imprecise as their frequency of operation varies in a fair amount with temperature and power supply voltage. Super heterodyne receivers having a performance advantage over super re-generative; they offer increased an accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in turn leads to comparatively more expensive product. Radio receiver which receives the transmitted coded from the remote place these codes are converted to digital format and output is available to the pin no-2 of the ic2 master microcontroller; this is the pin of inbuilt art of the microcontroller. We based on the input codes master will give command to slave microcontroller and robot will behave as follows.

- Moves in forward direction.
- Moves in receiver direction.
- Speed controls in the both directions.
- It can even turn left or right while moving forward or in reverse direction.
- In case of bump, moves reverse turn left or right and wait for the next instruction.
- On the spot left or right turn to pass through the narrow space.
- We have also added head light, back light and turning light to left a right.

METHODOLOGY FOR MOTION CONTROL

L293D is a dual H-bridge motor drive integrated circuit(IC). Motor drivers act as current amplifiers as they take a low-current control signal and provide a higher current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In common mode of operation, two DC motors can be driven simultaneously, both in forward and backward direction. The motor operations of two motors can be controlled by input logic. When an enable input is high, the associated driver gets enabled. As a result the output become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state. This project controls a remote robot through RF. The ordinary 433 MHs RF modules are used in this project. AT89C1 microcontroller is used in this project.

This robot can perform their operations without direct human guidance. They are used basically for industrial application and can made laser guided. Navigation is achieved by on of the several means, including following a path defined by buried inductive wires, surface mounted magnetic or optical strips; or alternatively by the way of laser guidance. This is an improved version of my previous robot which we designed years ago. Intelligent spy robot project has been designed for the spying purpose. It is radio controlled and can be operated at a radial distance of 100m radius. Most probably our army youth need to venture into the enemy area just to track their activities.

Which is often a very risky job and may cost precious life? Such dangerous job could be done using small spy robot all the developed and advance nations are in the process of making it, a robot that against enemy. Our robot us just a step towards similar activity.

Heart of our robot is microcontroller 8051 family, we are using at89c51. In two microcontrollers where first microcontroller which acts as master controller, decodes all the commands received from the transmitter and gives commands to slave microcontroller. Slave microcontroller is responsible for executing all the commands received from the master and also generating pulse with modulation pulses for the speed control driver circuit which drives 4 nos. of motors. Two no bumper switch is added bmp1 and bmp2 so that in case of accident our battery dose not drains out.

Both the motors will stop instantly and after few seconds robots will move in opposite direction take turn to left or right direction and stops and stop. Transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at the pin4. The transmission occurs at the rate of 1kbps-10kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitted.

Transmission through RF (radio frequency) is better than IR (infrared) because many of reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources. This RF module comprises of an RF transmitter and an RF receiver. The transmitter receiver (TX/RX) pair operates at a frequency of 433MHz an RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. Transmission occurs at the rate of 1kbps – 10kbps.

Fig: Moments signs

SIMULATION WORK

RF PAIR

Fig: Picture of Object

A gesture controlled robot is controlled by using hand in place of any other method like buttons or joystick. Here one only needs to move hand to control the robot. A transmitting device is used in your hand which is RF transmitter and accelerometer. This will transmit commands to robot so that it can do the required task like moving forward, reverse, turning left, turning right and stop. All these tasks will be performed by using hand gesture. Here most important component is accelerometer. Accelerometer is a 3 axis acceleration measurement device with +-3g range. This device is made by using polysilicon surface sensor and signal conditioning circuit to measure acceleration. The output of this device is analog in nature and proportional to the acceleration. This device measures the static acceleration of gravity when we tilt it. And gives an result in form of motion or vibration.

According to the datasheet of adx1335 polysilicon surface micro machined structure placed on top of silicon wafer. Polysilicon springs suspend the structure over the surface of the wafer and provide a resistance against acceleration forces. Deflection of the structure is measured using a differential capacitor which incorporates independent fixed plates and plates attached to the moving mass. The fixed plates are driven by 180 degrees out-of-phase square waves. Acceleration deflects the moving mass and unbalances the differential capacitor resulting in a sensor output whose amplitude is proportional to acceleration. Phase-sensitive demodulation techniques are than used to determine the magnitude and direction of acceleration.

Fig : accelerometer

PI N DISCRIPTION OF ACCELEROMETER

1. VCC 5 volt supply should connect at the pin
2. X-OUT This pin gives an analog output in x direction
3. Y-OUT This pin gives an analog output in y direction
4. Z-OUT this pin gives an analog output in z direction
5. GND ground
6. ST this pin used for sensitivity of sensor

CIRCUIT DIAGRAM AND EXPLANATION

Gesture controlled robot is divided into two sections:

1. Transmitter part
2. Receiver part

In transmitter part an accelerometer and RF transmitter unit is used as we have already discussed that accelerometer gives an analog output so here we need to convert this analog data into digital. For this purpose we have used 4 channel comparator circuits in place of any ADC. By setting reference voltage we gets a digital signal and then apply this signal to HT12E encoder to encode data or converting into serial form and then send this data by using RF transmitter into the environment. At the receiver end we have used RF receiver to receive data and then applied to HT12D decoder. This decoder IC converts received serial data to parallel and then read by using Adriano. According to received data we drive robot by using two DC motor in forward, reverse, left, right and stop direction.

WORKING MODEL

Gesture controlled robot moves according to hand movement as we place transmitter in our hand. When we tilt hand in front side, robot start to moving forward and continuous moving forward until next command is given. When we tilt hand in backward side, robot changes its state and start moving in backwards direction until other command is given. When we tilt in left side, robot get turn left till next command. When we tilt hand in right side robot turned to right. And for stopping robot we keeps hand in stable.

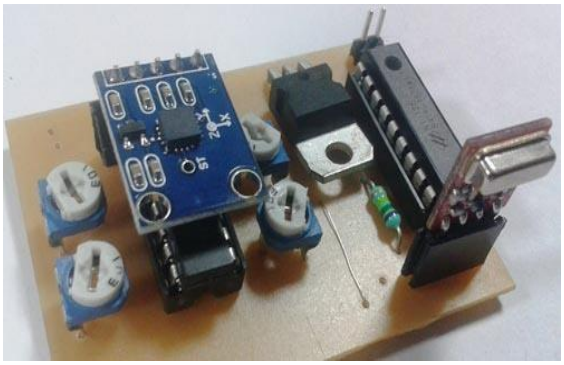
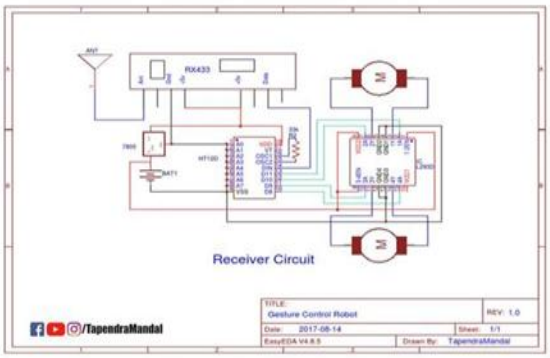
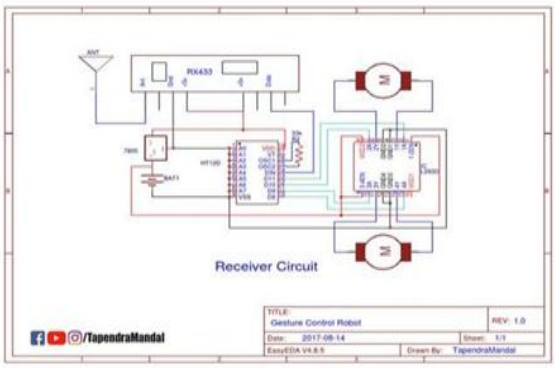


Fig: Transmitter

RECEIVER CIRCUIT:

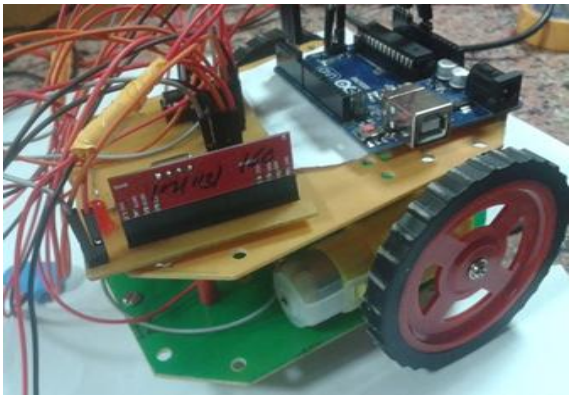


TRANSMITTER CIRCUIT:



This transmitted signal is received by the RF receiver, demodulated and then passed onto the decoder IC. Decodes the coded waveforms and the original data bits are recovered. The input is a serial coded modulated waveform while the output is parallel. The pin 17 of the decoder IC is the valid transmission (VT) pin. A led can be connected to this pin which will indicate the status of the transmission. In the case of a successful transmission, the led will blink. The parallel data from the encoder is fed to the port 1 of the microcontroller. This data is in the form of bits. The microcontroller reads these bits and takes decision on the basis of these bits. What microcontroller does is, it compares the input bits with the coded bits which are burnt into the program memory of the microcontroller and outputs on the basis of these bits. Port 2 of the microcontroller and output is used as the output port. Output bits from this port are forwarded to the motor driver IC which drives the motor in a special configuration. Gesture controlled robot works on the principle of accelerometer which records hand movements and sends the data to the comparator which assigns proper voltage levels to the recorded movements. That information is then transferred to an encoder which makes it ready for RF transmission. On the receiving end, the transformation is received wirelessly via RF, decoded and then passed onto the microcontroller which takes various decisions based on the received information. These decisions are passed to the motor driver IC which triggers the motors different configurations to make the robot move in a specific direction. Task was divided into two parts to make the task easy and simple and simple and to avoid complexity and make it error free. The first is the transmitting section which includes the following components:

Accelerometer, encoder IC, RF Transmitter Module. The second is the receiving end which comprises of following main components: RF Receiver Module, Decoder IC, Microcontroller, Motor Driver IC, DC Motors. The accelerometer records the hand movements in the X and Y directions only and outputs constant analog voltage levels. These voltages are fed to the microcontroller which processes the input and encodes the data into digital form which is suitable to be transmitted through the x be serial transmitter. Circuit for the hand gesture controlled robot is quite simple. As shown in above schematic diagrams, a RF pair is used for communication and connected with Ardunio. Motor driver is connected to ardunio to run the robot. Motor drivers input pin 2, 7, 10, and 15 is connected to arduino digital pin number 6, 5, 4 and 3 respectively. Here we have used two DC motors to drive robot in which one motor is connected at output pin of motor driver 3 and 6 and another motor is connected at 11andn 14. A9 volt Battery is also used to power the motor driver for driving motors.



CONCLUSION

The purpose of project is to control a toy car using accelerometer sensors attached to a hand glove. The sensors. The sensors are intended to replace the remote control that is generally used to run the car. It allows us to control the forward and backward, and left and right movements, while using the same accelerometer sensor to control y=the throttle of the car, based on the hand movements. By using the above mentioned components the hardware was setup, thus resulting in the formation of a robot. In order to implement the experiment a dell laptop was used, whose web camera acted as the input device for capturing video. The software part was developed the java code. The final movement of the robot can be concluded as follows: at the beginning the robot was in a stop mode. As the hand moved from bottom to top, the robot moved in the forward direction. As the moved from the top to bottom, the robot moved in the backward direction. As the hand was shown as a cute angle towards the left, the robot moved towards the right direction. As the hand kept stationary with respect to the environment, the robot was in stop mode. From the experiment, about 80% of the implementation worked according; the remaining was less due to background interference which is a negative marking to the implementation. Hand gesture controlled robot system gives a more natural way of controlling devices. The command for the robot to navigate in specific direction in the environment is based on technique of hand gestures provided by the user. Without using any external hardware support for gesture input unlike specified existing system, user can control a robot from his software station.

FUTURE SCOPE

1. The on board batteries occupy a lot of space and are also quite heavy. We can either use some alternate power source for the batteries or replace the current DC motors with ones which require less power.
2. The proposed system is applicable in hazardous environment where a camera can be attached to the robot and can be viewed by the user who is in the station. This system can also be employed medical field where miniature robots are created that can help doctors for efficient surgery operations. For more efficient response, threshold valves can be used to detect gesture and advanced features such as finger counts that provide different functional command can be used.
3. ENTERTAIMENT APPLICATIONS- most of videogames today are played either on game console, arcade units or PCs, and all require a combination of input devices. Gesture recognition can be used to truly immerse the players in the game world like never before.
4. AUTOMATION SYSTEM- In homes, offices, transport vehicles and more, gesture recognition can be incorporated to greatly increase usability and reduce the resources necessary to create primary or secondary input systems like remote controls, car entertainment systems with buttons or similar.

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