HAND MOTION CONTROL ROBOTIC VEHICLE

[1]Nikita Makvana, [2]Sima Chavda, [3]Asari Radha, [4]Prajapati Hina, [5]Ronak Patel
[1,2,3,4] UG Students, [5]Assistant Professor
Electrical Department
Grow More Faculty of Engineering, Himmatnagar, Gujarat, India

Abstract— This paper represents hardware implementation of controlling a robotic vehicle wirelessly with the help of hand gestures. Accelerometer based hand gesture control system depends on the hand movement of the user. For different types of hand movement the Robot works in different directions. A robot which can be controlled wirelessly with the help of hand gesture is much easier than other controlling methods. The gesture control system gives a new dimension in the world of controller. The focus of the paper was to sense the hand gesture wirelessly. Different types of gesture can give the different value to the sensor, so by observing various data of sensor for hand gesture we tried to implement it on a gesture sensing wireless robot. A robot which gives an idea of the hand movement controlling with the help of accelerometer. The argument proposed in the paper was that wireless Hand gesture movement can response faster and also can give accurate direction in the receiver side.

Keywords— Hand, Motion, Vehicle, Control

I. INTRODUCTION

A gesture driven robotic vehicle is developed, which also includes ultrasonic sensors which prevents the robotic vehicle from colliding with any obstacle. The vehicular movements i.e. handling and control, depends on the gesture of the user. In this system, gesture is captured by accelerometer which is mounted on person's hand and is forwarded to micro-controller and encoder circuit. This encoded signal is transmitted by RF transmitter. In the receiver section, the RF receiver holds down the received signal and after decoding it is processed with microcontroller and gives those parameters to the robotic vehicle so that it acts accordingly to the gesture. After the revolution of robots in various sectors, people are trying to control them more accurately and easily. Over the past few years people are finding simpler way to communicate with robots in order to enhance their contribution in our daily life. Humans and robots are combining more than ever before to overcome the new challenges. From the very early stages it was one of the main objectives to control the robot smoothly and comfortably. So rather using traditional remote or keyboard it's better to control a robot with the help of our hand gesture. Because hand gesture is very natural way of communication in our human history. Hand gesture technology being used more spontaneously in many sectors nowadays. It's becoming very popular also in the robotic industry as well. There are many hand gesture technologies available

nowadays but one of the most popular forms is accelerometer based hand gesture technology. The accelerometer can measure the static acceleration of gravity in tilt sensing application, as well as dynamic acceleration due to motion, shock or vibration. Accelerometer is used to capture human hand gestures. By sensing the gesture its works accordingly. Our paper is not an invention; it is a modified version and the inexpensive one. Before we started the paper we studied about a lot of hand gesture controlled car and understood the operation of their paper. Our main objective was to reduce the delay and make the response time faster. On the other hand we made this such an inexpensive that it's cheaper than the traditional gesture control robotic car.

II. WORKING PRINCIPLE

This was a paper based on hand gesture technology in order to control a robotic car wirelessly. At first the hand movement was sensed by the accelerometer than the analog data was passed to microcontroller in the transmitting side. After processing the data from accelerometer microcontroller passed the data to wireless module and the signal than goes to the receiver part. And from receiver end microcontroller sense it via wireless module in the receiving antenna and pass it to the motors via motor driver. Than the wheels than started to in the direction where the hand gesture commanded it to move. The accelerometer basically moves in three axis. For movement in X, Y and Z axis the robot gets accurate direction. But the main part of the robot basically was to sense the gesture from our hand to try to make it a medium to control the robot. Robotics is a current emerging technology in the field of science. A number of universities in world are working in this field. Robotics is the new emerging booming field, which will be of great use to society in the coming years. These days many types of wireless robots are being developed and are put to varied applications and uses. The author has developed a robotic arm, with his own learning and resources, which is operated & controlled wirelessly with the help of hand gestures which transmits signals to the robot through an auto device fixed on the gloves put on hands rather than controlling it manually through a conventional remote controller. The Robot moves and acts in the manner depending on the gestures made by the fingers and hand from a distance. The robot moves in up, down, left or right directions and picks up objects from one place and keeps at another desired place as directed by the movements of fingers and hand. It is a TYPE – C Robot, Programmable, servo controlled with continuous or point to point trajectories.
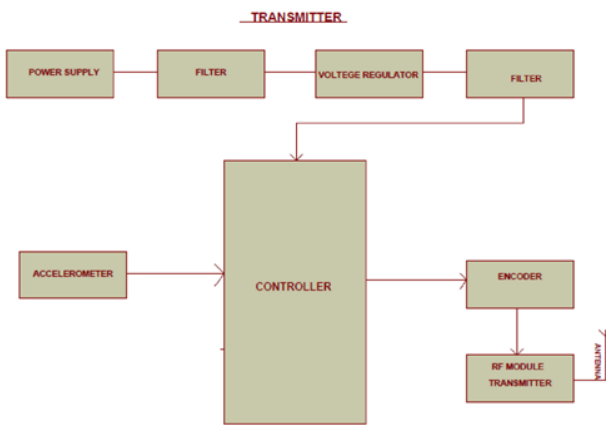
www.ijtre.com

17

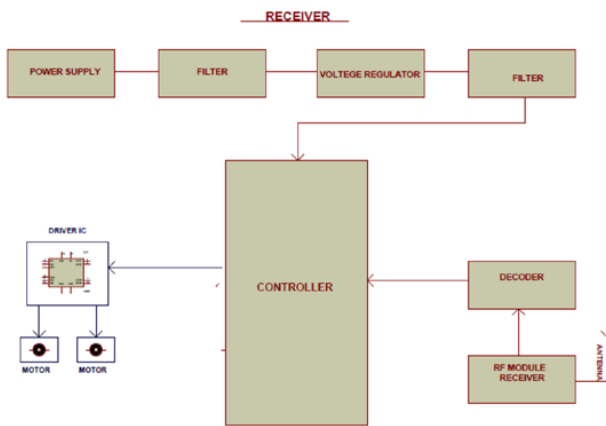Fig. 1.Block diagram of Transmitter

Fig. 2. Block diagram of Receiver

III.   HARDWARE DISCRIPTION

1) Micro Pic16f73: A microcontroller is a compact microcomputer which was designed to control robot, office machine and many more useful devices. The name PIC initially referred to "Peripheral Interface Controller". A typical microcontroller includes a processor, memory, and peripherals.. PIC microcontrollers are electronics circuit that can be programmed accordingly to the particular task. It has 28 Pin, 35 instruction set, operating speed DC – 20MHz clock input, operating speed DC – 200 ns instruction cycle. Low power high speed CMOS Flash technology is also used in this microcontroller.

2) RF Module: RF module is a small electronics device which is used to receive, transmit or transceiver radio wave on one of a number of carrier frequencies. It covers a certain amount of area depend on bandwidth frequency. When RF module gets any motion signal then converts it to motion signal to electrical signal then transmitter transmit it through receiver end, a decoder is connected through receiver end to decode the signal. It's one way communication type and working frequency is around 433.875MHz to 434.650MHz. Frequency response of the device is150Hz to 2.4 KHz and baud rate is 300 to 4800bps.

3) Accelerometer (ADXL335): ADXL335 Accelerometer It can measure the static acceleration due to gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The sensor works on power between 1.8V to 3.6VDC (3.3V optimal), and typically consumes just 350µA of current. It's a low power Accelerometer, thin 3-axis accelerometer with signal conditioned voltage outputs device which sense the tilt and gesture movement of human. The user selects the bandwidth. Accelerometer using the Cx, Cy and Cz capacitors at the Xout, Yout and Zout pins. Bandwidth can be selected to suit the application, with a range of 0.5Hz to 1500Hz for the X and Y axes, and a range of 0.5 Hz to 550Hz for the Z axis. The Operating voltage of ADXL335 is 3V & it operates within 1.8-3.6V and sensitivity at Xout, Yout, Zout is 3V. It has no external filter to consume signals noise. Operating Temperature range is -40 to 85°

4) Motor Driver (L293d): The L293D is quadruple high-current half-H drivers. It can provide bidirectional drive current of up to 600-mA at voltages from 4.5V to 36V. It is also designed to drive inductive loads such as inductive relays, solenoids, dc and bipolar stepping motors, as well as other high current/high voltage loads in positive-supply applications. All inputs are TTL compatible, each output is a complete totem-pole Drive circuit, with a Darlington transistor and a Pseudo Darlington source.

5) Voltage Regulator (L7805): The voltage regulator is a device which controls the voltage in the electrical equipment's. These devices are also used as current limiting device.

6) Power Supply/SMPS: A 12 volt power adapter is used here which acts as power Supply. It is an important part of a circuit. It provides required supply to different blocks of the circuit from input 230V AC. The main blocks include transformer, rectifier circuit, filter circuit, and regulator circuit. Voltage regulator IC LM7805 is used as a voltage regulator. The microcontroller and other devices get power supply from AC to DC adapter through7805, 5V regulator. The adapter output voltage will be 12V DC no regulated. The 7805/7812 voltage regulators are used to convert 12 V to 5V/12VDC.

7) Gear Motor: In a Gear motor, the magnetic current (which can be produced by either permanent magnetic or electromagnets) turns gears that are either in a gear reduction unit or in an integrated box. A second shaft is connected to those gears. The result is that the gears greatly increase the amount of torque the motor is capable of producing while simultaneously slowing down the motors output speed. The motor will not need to draw as much current to function and will move more slowly, but will provide greater torque.

8) Heat Sinker: The combination of a heat sink and fan (HSF) is referred to as an active heat sink. It absorb the extra heat in the circuit which helps to overcome the overheat problem.

9) Crystal Oscillator: A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency

IV.   SOFTWARE DESCRIPTIONS

1) Arduino Uno Compiler: The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.
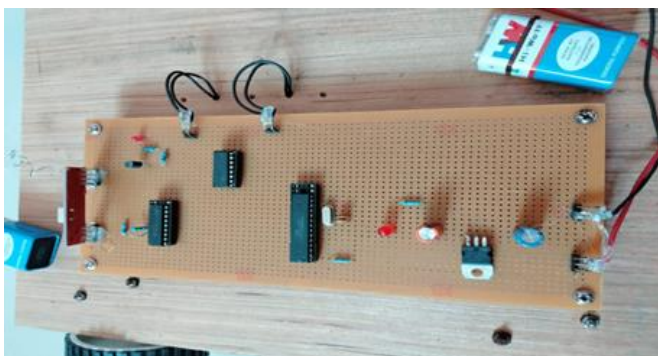

Fig 3. Hand Motion Control Robotic Vehicle

V.   WORKING

An RF transmitter module can transmit a radio wave and modulate that wave to carry data. Transmitter modules are usually implemented alongside a micro controller which will provide data to the RF module which is transmitted. RF transmitters are usually subject to regulatory requirements which dictate the maximum allowable transmitter power output.

An RF Receiver module receives the modulated RF signal, and then it demodulates. There are two types of RF receiver module. Super-regenerative modules are usually of low cost and low power designs using a series of amplifiers use to extract modulated data from a carrier wave. Super regenerative 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 regenerative; they offer increased in accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in turn leads to a comparatively more expensive product. Radio receiver which receives the transmitted coded signal from the transmitter are converted to digital format and output is available to the microcontroller. We based on the input coded signal, the input is given to motor driver IC and robot will behave as follows.
• Moves in forward direction
• Moves in reverse direction
• It can even turn left or right while moving forward or in reverse direction.
• In case of obstacle, 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

Movement of robotic vehicle: L293D is a dual H-bridge motor driver 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 reverse 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 outputs 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 paper controls a robotic vehicle through RF. AT89S52 microcontroller is used in this paper. It is radio controlled and can be operated at a radial distance of 100m radius.

Applications: Such types of robotic arms can be put to use in various types of applications as follows:
  i.   Control of various functions of robots in arduous and dusty atmospheres industrial jobs as in painting shops, shot blasting chambers etc. The operator controls the robotic functions from outside the hazardous chambers looking through a glass door.
  ii. Automatic picking of small objects (bottles, bags, tumblers etc) moving on a conveyor and placing at other desired location in industries manufacturing various types of cosmetics, food products, medicines etc.
  iii. Automatic metal cutting machines in particular desire profiles, which are located in high temperature zones.
  iv. Advanced robotic toys, operated with state-of-art hand operated control systems.
  v.   Robots controlled cranes, lifting forks etc operated from a distance with fingers/hands controlled remote system.

vi.   CONCLUSIONS
It's always a challenge for engineers to make the things simpler and cheaper the way they were before. We tried to emphasize on those concepts and that's why we built a wireless hand gesture control robot. People used PC or remote to control the robot car but controlling it via hand gesture makes it easier than ever before to control a robot.

Also our main target was to make it less expensive so we were more conscious about choosing the components. Although we tried to make it less expensive but we did not compromise on the quality. We tried to make it more reliable and simple. The biggest advantage of our paper is that it's very easy to control. The main problem of this system is that in order to collect the raw data from the hand gesture or from hand movement the transmitting glove must be worn by the user. Also when one trying to control a robot with the hand gesture even the mistaken hand gesture could result a wrong movement of the robot. It's also quite expensive compare to remote control system. Putting those gloves to control robot is time consuming also limit ones range of motion. Also human hand size and shape vary from human to human that's why angle movement for specific direction can also vary.

Acknowledgment

REFERENCES

[1] Riyaz Mansuri, sandhesh vakale, ashish shinde, Tanveer patel, Hand gesture control robotic vehicle, IJECT vol. 4, Issue spl-2, Jan-March2013.

[2] Mr.Pravin Vaishnav, Mrs.Shalini Tiwari, Accelerometer Based Hand Gesture Controlled Robot, International Journal of Science and Research(IJSR),

[3] Mr. Dineshkumar Bhusare, 2.Ms.Shilpa Karale, 3. Ms. Pooja Pawar, 4. Prof. R.K. Sarawale, International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 3, March 2015. The 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems October 18-22, 2010, Taipei,Taiwan.

[4] Gaurav Gautam, Abhijeet Ashish, Anil Kumar, Avdesh, "Wirelessly Hand Glove Operated Robot", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Volume-3, Issue-11,PP.-1546-1547, November 2014.

[5] Harish Kumar Kaura, Vipul Honrao, Sayali Patil, Pravish Shetty, "Gesture Controlled Robot using Image Processing", International Journal of Advanced Research in Artificial Intelligence (IJARECE), PP.-69-77, Vol. 2, No. 5[2013].

[6] Aditya Purkayastha, Akhil Devi Prasad, Arunav Bora, Akshaykumar Gupta, Pankaj Singh, "Hand Gestures Controlled Robotic Arm", Journal of International Academic Research For Multidisciplinary, Vol. 2, Issue-4, PP.-234-240, May 2014.

[7] Love Aggarwal, Varnika Gaur, Puneet Verma, "Design and Implementation of Wireless Gesture Controlled Robotic Arm with Vision", International Journal of Computer Application, Vol. 79, No.-13, PP.39-43, October 2013