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HAND GESTURE CONTROLLED WHEEL CHAIR

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***Abstract*:**

This paper presents real time monitoring system by which humans interacts with wheel chair through gestures. This is an immense aid for people for whom mobility is a great challenge. There is a dire need for vision based interface over speech recognition as it failed to mandate the robots because of modulation and varying frequency. Gesture recognition consists of three stages: capturing of image, image processing and data extraction. The implementation is achieved by navigation of the robot through various gestures. By the impact of this project, life of physically challenged people becomes less challenging. From further research it will benefit various areas including applications in military and high security bases. A robot is the system which deals with construction, design and operation. This system is related to robot and their design, manufacture, application. Robotics is currently focused on developing systems that modularity, flexibility, redundancy, fault tolerance and some other researchers are on completely automating a manufacturing process or a task, by providing sensor based to the robot arm. Recently developing industry and man power are critical constraints for completion of task. To save human efforts the automation playing important role in the system. This system is used for regular and frequently carried work. One of the major and most commonly performed works is picking and placing of jobs from source to destination. In the earlier systems, the motion of the human hand is sensed by the robot through sensors and it follow the same. As the human travels their hand, the accelerometer also start moving accordingly motion of the hand sensor displaces and this sensor senses object or parameter according to motion of hand

Keywords— ***Arduino, Radio frequency, motor driver, motors.***

I. INTRODUCTION

Recently, strong efforts have been carried out to develop intelligent and natural interfaces between users and computer based systems based on human gestures. Gestures provide an intuitive interface to both human and computer. Thus, such gesture-based interfaces can not only substitute the common interface devices, but can also be exploited to extend their functionality.

Robots are playing an important role in automation across all the sectors like construction, military, medical, manufacturing, etc. After making some basic robots like line follower robot, computer controlled robot, etc; we have developed this accelerometer based gesture controlled robot by using Arduino Uno. In this project we have used hand motion to drive the robot. For this purpose we have used accelerometer which works on acceleration.

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 contains RF Transmitter and accelero- meter. This will transmit command 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 the 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 a result in form of motn or vibration.

According to the datasheet of adxl335 polysilicon surface- micromachined 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 incorporate independent fixed plates and plates attached to the moving mass. The fixedplates are driven by 180° 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 then used to determine the magnitude and direction of the acceleration. An important aspect of a successful robotic system isthe Human-Machine interaction.

In the early years theonly way to communicate with a robot was to programwhich requiredextensive hard work. With thedevelopment in science and robotics, gesture based recognition came into life. Gestures originate from any bodily motion or state but commonly originate from the face or hand. Gesture recognition can be considered as a

way for computer to understand human body language. This has minimized the need for text interfaces and GUIs (Graphical User Interface) 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 continues moving forward until next command is given.

When we tilt hand in backward side, robot change its state and start moving in backwards direction until other command is given.When we tilt it 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..

II. LITERATURE SURVEY

Gesture recognition technologies are much younger in the world of today. At this time there is much active research in the field and little in the way of publicly available implementations. Several approaches have been developed for sensing gestures and controlling robots. Glove based technique is a well-known means of recognizing hand gestures. It utilizes a sensor attached to a glove that directly measures hand movements.

A Gesture Controlled robot is a kind of robot which can be controlled by hand gestures and not the old fashioned way by using buttons. The user just needs to wear a small transmitting device on his hand which includes a sensor which is an accelerometer in our case. Movement of the hand in a specific direction will transmit a command to the robot which will then move in a specific direction. The transmitting device includes a Comparator IC for assigning proper levels to the input voltages from the accelerometer and an Encoder IC which is used to encode the four bit data and then it will be transmitted by an RF Transmitter module.

At the receiving end an RF Receiver module will receive the encoded data and decode it by using a decoder IC. This data is then processed by a microcontroller and passed onto a motor driver to rotate the motors in a special configuration to make the robot move in the same direction as that of the hand.

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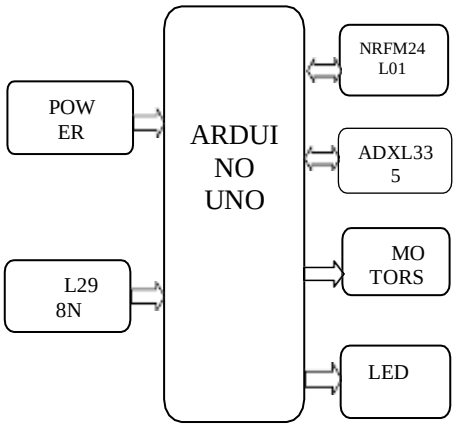
Our gesture controlled robot works on the principle of accelerometer which records hand movements and sends that data to the comparator which assigns proper voltage levels to the recorded movements. That information is then transferred to a encoder which makes it ready for RF transmission. On the receiving end, the information 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 in different configurations to make the robot move in a specific direction. The following block diagram helps to understand the working of the robot

1) BLOCK DIAGRAM:



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 comparator IC which compares it with the references voltages that we have set via variable resistors attached to the IC. The levels that we have set are 1.7V and 1.4V. Every voltage generated by the accelerometer is compared with these and an analog 1 or 0 signal is given out by the comparator IC. This analog signal is the input to the encoder IC. The input to the encoder is parallel while the output is a serial coded waveform which is suitable for RF transmission. A push button is attached to pin 14 of this IC which is the Transmission Enable (TE) pin. The coded data will be passed onto the RF module only when the button is pressed. This button makes sure no data is transmitted unless we want to.

The RF transmitter modulates the input signal using Amplitude Shift Keying (ASK) modulation. It is the form of modulation that represents digital data as variations in the amplitude of a carrier wave.

This transmitted signal is received by the RF receiver, demodulated and then passed onto the decoder IC. The decoder IC decodes the coded waveform 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 1of the microcontroller. This data is in the form of bits. The microcontroller reads these bits and takes decisions on the basis of these bits. What the 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 is used as the output port. Output bits from this port are forwarded to the motor driver IC which drives the motors in a special configuration based on the hand movements.

At a dead stop, a motor produces no voltage. If a voltage is applied and the motor begins to spin, it will act as a generator that will produce a voltage that opposes the external voltage applied to it. This is called Counter Electromotive Force (CEF) or Back Electromotive Force (Back EMF). If a load stops the motors from moving then the current may be high enough to burn out the motor coil windings. To prevent this, flyback diodes are used. They prevent the back emf from increasing and damaging the motors.

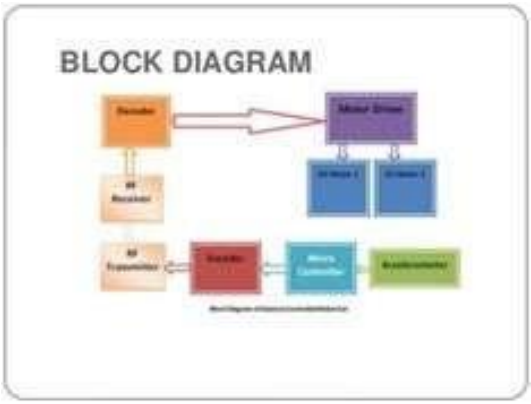


Figure:1 block diagram

2) FEATURES OF PROPOSED METHOD:

1. Traditional interfaces, keyboards and mice present a bottleneck in application that rely on heavy interaction of the user with the machine due to the unnaturalness of the interaction.
2. From reading lots of related articles, we have learnt that recent efforts have attempted to eliminate this bottleneck by developing different ways of interacting with computers, for example: speech, handwriting.
3. Through the use of gesture recognition, remote control with the wave of a hand of various devices is possible.
4. Gesture controlling is very helpful for handicapped and physically disabled people to achieve certain tasks, such as driving a vehicle.
5. Gestures can be used to control interactions for entertainment purposes such as gaming to make the game player's experience more interactive or immersive.

III OPERATION

Wireless Communication in any form has become an essential part of human life whether it may be short distance T.V Remote or long distance radio communication. Wireless communication is all about transmission of data wirelessly so that there is no hassle of any wires and no direct contact with the device itself.

B. The receiver part consists of Arduino UNO and the 434 MHz Receiver module. An external LED can be used along with a current limiting resistor but on board LED would be sufficient. The design of the Receiver part is as follows.

C. The RF Receiver Module consists of 4 – pins: VCC, GND, Data and Antenna. VCC and GND pins are connected to 3.3V pin of the Arduino and ground respectively.The data pin is connected to Pin 12 of the Arduino.

D. An antenna similar to the transmitter module is connected to the antenna pin of the 434 MHz Receiver module. The on board LED which is connected to the 13th pin of Arduino is used in the project although an external LED can always be used.

4) working

In this project, a simple demonstration of RF Communication with the help of Arduino UNO boards is given. The aim of the project is to successfully transmit data between the RF Transmitter – Receiver modules using two Arduino UNO microcontroller boards. The working of the project is explained here.

The project can be implemented with or without the help of a special library called "VirtualWire.h". The project implemented here uses the library. If we want to implement the project without the library, then we need to change the receiverpart of the circuit.

DIRECTION	ACCELEROMETER ORIENTATION
Forward	+Y
Backward	-Y
Right	+X
Left	-X
Stop	Rest

Fig: 2 Operational directions

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 comparator IC which compares it with the references voltages that we have set via variable resistors attached to the IC. The levels that we have set are 1.7V and 1.4V. Every voltage generated by the accelerometer is compared with these and an analog 1 or 0 signal is given out by the comparator IC.

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The RF transmitter modulates the input signal using Amplitude Shift Keying (ASK) modulation. It is the form of modulation that represents digital data as variations in the amplitude of a carrier wave.

The RF modules works on the frequency of 315MHz. It means that the carrier frequency of the RF module is 315MHz. The RF module enables the user to control the robot wirelessly and with ease.

This transmitted signal is received by the RF receiver, demodulated and then passed onto the decoder IC. The decoder IC decodes the coded waveform and the original data bits are recovered. The input isa 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.

IV. RESULTS

We performed a simulation of our project in PROTEUS and the code was written in C language using KEIL MICROVISION. We wrote a code for the microcontroller to run DC motors using the H-Bridge IC (L293D). In the simulation we sent the relevant data to the Microcontroller (AT89C51) through switches. The Microcontroller processed the data and sent the information to the Actuator IC (L293D). The Actuator IC upon receiving information showed response by driving the DC motors. The simulation schematic is as follow:

Fig:3

Movement of hand	Input for Arduino from gesture				
Side	**D3**	**D2**	**D1**	**D0**	**Direction**
Stable	0	0	0	0	Stop
Tilt right	0	0	0	1	Turn Right
Tilt left	0	0	1	0	Turn Left
Tilt back	1	0	0	0	Backward
Tilt front	0	1	0	0	Forward

Fig 4

V. CONCLUSION

We achieved our objective without any hurdles i.e. the control of a robot (Wheel chair) using gestures. The robot is showing proper responses wheneverwe move our hand.

For controlling the robot remotely, Holteks' encoder-decoder pair(HT12E and HT12D) together with a 433MHz transmitter-receiver pair is used.

HT12E and HT12D are CMOS ICs with working voltage ranging from 2.4V to 12V. Encoder HT12E has eight address and another fouraddress/data lines. The data set on these twelve lines (address and address/data lines) is serially transmitted when transmit-enable pin TE is taken low. The data output appears serially on DOUT pin.

The data is transmitted four times in succession. It consists of differing lengths of positive-going pulses for '1' and '0,' the pulse- width for '0' being twice the pulse-width for '1.' The frequency of these pulses may lie between 1.5 and 7 kHz depending on the resistor value between OSC1 and OSC2 PINS.

Fig 5 transmitter

Fig 6 Receiver

REFERENCES

[1] Analysis of Induction Motor for Electric Vehicle application based on drive cycle analysis 2014 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES)
[2] Amit Kumar Baghel, Pawan Kumar, Praveen Kumar."Scenario of electric and hybrid electric vehicles by 2030", 2015 IEEE International Transportation ElectrificationConference (ITEC), 2015
[3] Omar Ellabban, Joeri Van Mierlo, Philippe Lataire. "Control of abidirectional Z-Source Inverter for hybrid electric vehicles in motoring, regenerative braking and grid interface operations", 2010 IEEE Electrical Power & Energy Conference, 2010
[4] F.Z. Peng. "Z-source inverter", Conference Record ofthe 2002 IEEE Industry Applications Conference 37th
IAS Annual Meeting (Cat No 02CH37344) IAS-02, 2002
[5] Fang zheng peng, *senior member*, *ieee*ieee transactions on industry applications, vol. 39, no. 2, march/april 2003
[6] Implementation of impedance source inverter system for photovoltaic applications nisha k.c. r1 & t.n.basavaraj2 1electrical & electronics department, sathyabama university, chennai, india 2electronics & communication department, new horizon college of engineering, bangalore, india e-mail: nishashaji2007@gmail.com
[7] F.z.peng,m.shen,a.joseph,l.m.tolbert,d.j.adams,"maxi mum constant boost control of the z-source inverter",in proc.ieee ias'04,2004
[8] International journal of scientific & technology research volume 4, issue 08, august 2015 motor torque calculations for electric vehicle saurabhchauhan.