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Review Of Mems Accelerometer Based Hand Gesture Controlled Robot

Ms.Poonam Rindhe[1],Ms.Samiksha Saitwal[2],
Ms.Priyanka Nimbalkar[3], Ms.Pooja Naphade[4],Prof A. S. Bendmali[5]
Student of Dept. of Electronics and Telecommunication[1,2,3,4]
Assistant professor, Dept of Electronis and Tellecommunication[5]
PankajLaddhad Institute Of Technology & Management Studies, Buldana[1,2,3,4,5]
Email:poonamrindhe0393@gmail.com[1],samikshasaitwal@gmail.com[2],
priyankanimbalkar92@gmail,com[3],poojanaphade1393@gmail.com Amolsb143@gmail.com[4]

Abstract-Now-a-days, the work of human is replaced by the robot. Generally, robots are programmed to perform specific tasks which humans cannot. To increase the use of robots where conditions are not certain such as fire fighting or rescue operations, robots can be made which follow the instruction of human operator and perform the task. In this way decisions are taken according to the working conditions by the operator and the task is performed by the robots. Thus, we can use these robots to perform those tasks that may be harmful for humans. This paper describes about the gesture control robot which can be controlled by your normal hand gesture. A MEMS Sensor was used to carry out this and also an Ultrasonic sensor for convinced operation. In order to full-fill our requirement a program has been written and executed using a microcontroller system. Upon noticing the results of experimentation proves that our gesture formula is very competent and it's also enhance the natural way of intelligence and also assembled in a simple hardware circuit.

Keywords- Arduino Uno; Accelerometer; RF Modules; Gesture recognition; MEMS accelerometer; Liquid CrystalDisplay.

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1. INTRODUCTION

Technology is the word coined for the practical application of scientific knowledge in the industry. The advancement in technology cannot be justified unless it is used for leveraging the user's purpose. Technology, is today, imbibed for accomplishment of several tasks of varied complexity, in almost all walks of life. In recent years, robotics is a current emerging technology in the field of science. A number of universities in the world are developing new things in this field. Robotics is the new booming field, which will be of great use to society in the coming years. Though robots can be a replacement to humans, they still need to be controlled by humans itself. Robots can be wired or wireless, both having a controller device. Gesture recognition has been a research area which received much attention from many research communities such as human computer interaction and image processing. The increase in human-machine interactions in our daily lives has made user interface technology progressively more important. Physical gestures as intuitive expressions will greatly ease the interaction process and enable humans to more naturally command computers or machines. For example, in tele-robotics, slave robots have been demonstrated to follow the master's hand motions remotely. Other proposed applications of recognizing hand gestures include character-recognition in 3-D space using inertial sensors gesture recognition to control a television set remotely enabling a hand as a 3-D mouse and using hand gestures as a control mechanism in virtual reality. It can also be used for the improvement of interaction between two humans.

The robot moves depending on the gesture made by your hand and from a distance. The objective of this paper is to build a wireless gesture control robot using Arduino, accelerometer, RF transmitter and receiver module. 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 digital values are processed by the Arduino Uno microcontroller and according to the tilt of the accelerometer sensor mounted on hand, it sends the commands to the

RF transmitter which is received by the transmitter and is processed at the receiver end which drives the motor to a particular direction. The robot moves forward, backward, right and left when we tilt our palm to forward, backward, right and left respectively. The robot stops when it is parallel to the ground.

2. LITERATURE SURVEY

2.1 Land mine detection

Humanitarian landmine detection and removal has become a serious global issue. In order to make this mission successful, landmine detection and removal rate should be nearly 100%. The manual landmine detection and removal is still carried out for reasons of the reliability, however it is very slow method. In addition, the detection rate is very poor and at the same time, it is very dangerous for the life of the operating personnel. Our research team has developed a robot assisted mine detection method that is safe, more accurate and faster than manual method (Nonami, K. et al. 2003). Metal detectors are considered as the most reliable sensors for mine detection work. However, landmine detection performance of the metal detectors is highly dependent on the distance between the sensor heads and the buried landmines.

Dawson et al., propose the use of a sharpened probe but do not describe the approach in detail [1]. Shahri et al., describe a mechatronics solution for measuring the stiffness of soil using a bayonet attached to adexterous manipulator [2]. The most recent work on this method proposes the use of a robot to insert a comblike series of ultrasonically vibrating probes into the soil [3]. The probes are in the form of hollow tubes that not only measure the stiffness of the soil but also scratch the surface of the buried objects and transfer the dust to a miniature onboard mass spectrometer to determine whether the surface is a plastic, metal, wood, or other material that can be used in landmines.

2.2 Gesture controlled Wheelchair

Unfortunately, the number of disabled people is increasing by tragic accidents. Some victims of the accidents are suffering from abnormal life with serious spinal injuries. According to a recent study 5,596,000 people in the India live with paralysis. About one million, 16% of these people cannot carry out daily task without continuous help.

2.2.1 Head Motion Controlled Power Wheelchair

The Electric powered wheelchair is controlled by head control device. It uses head movements detected by the motion data obtained from the gyroscope of an Emotive sensor [4]. It has two control modes, one mode uses only one head movement ('up' or 'down') and the other one employs four head movements ('up', 'down', 'right'and 'left').

Fig.1. Head controller

2.2.2 Robot Wheelchair Using Eye Blink Sensors and Accelerometer

This technique is used for driving a wheelchair by using persons eye blinking. In this project Robotic wheelchair user's eye blink and head tilt movement to steer the wheelchair [5]. But for the detection of eye movement we need IR sensors and IR sensors can cause malfunctions some times to eyes since eye blinking cannot be controlled for a longtime. IR sensors are also said to damage the eye. Therefore this wheelchair is not comfortable to patient.

2.2.3 *Designing and Modeling of Voice Controlled Wheelchair*

The methodology of this technique is that, when user speaks commands, a microphone detects the vibration of vocal cord. This microphone is interfaced with PC and using user voice commands wheelchair is controlled. But this system couldbe unstable for powered wheelchair control in noisy environments [6].

Fig.2. Voice activated powered wheelchair

2.2.4 Heavy lifts and cranes

In household automation a gesture based system is developed in which we can control application in the house with the help of gestures [7]. This system is called as "Hand mote". It is useful for physically challenged people to access the household applications without moving to the actual location. The purpose behind development of this system is to control the heavy lifting equipments from a distance through which the operator can observe the loads. The control takes place through hand gesture. The controller person needs to input the gesture commands to which the crane response through actuators. There is a risk of life for operating cranes and other instruments at some places. Many people have lost their lives due to failure of the cranes. Due to such reasons remote controlling is necessary. Remote controlling is possible through wireless communication.

3. PROPOSED SYSTEM

The whole technology 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 1.and figure 2.

3.1 ***Transmitter***

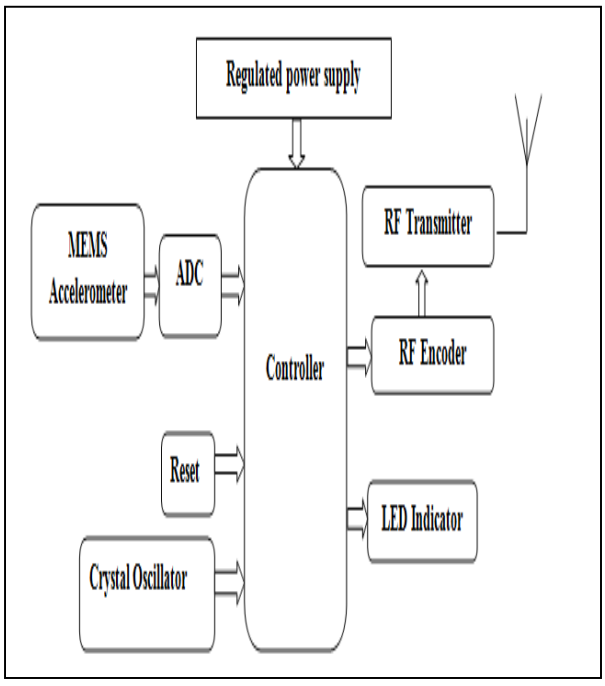

Fig.3. Block diagram of transmitter

The given above transmitting block diagram which contains the main blocks are:

a. MEMS Accelerometer
b. ADC
c. Crystal Oscillator
d. RF Transmitter
e. RF Encoder
f. LED Indicators

The diagram indicates the transmitting section which includes an accelerometer whose output is in continuous form as the encoder can only understands the digital data we are using the comparator for converting the analog data to digital data and this data is to be transmitted so we are using radio transmitter which transmits the serial data converted by the encoder from parallel data. For converting the analog data to digital data and this data is to be transmitted so we are using radio transmitter which transmits the serial data converted by the encoder from parallel data.

3.2 *Receiver*

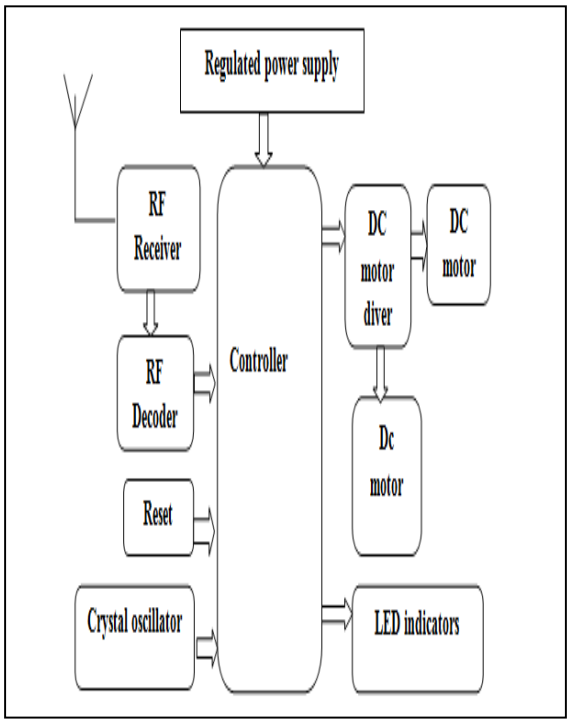

Fig.4. Block diagram of receiver

The above receiving block diagram which contains the main blocks are:

a. RF receiver
b. RF decoder
c. Crystal oscillator
d. DC motor
e. DC motor driver

It indicates the receiver section the transmitted data by the transmitter is received by the RF receiver and the serial data is given as input to the decoder which converts the serial data to parallel data and is given as input to the microcontroller which consists of a predefined program to fulfill our task, depending upon the data received the controller generates some signals to the motor driver LED etc. here the motor driver is to drive the motors and here LED is used for the purpose of some specific indications.

4. CONCLUSION

The main purpose behind this paper is the development of a portable device used to generate desired commands by hand gesture motions controlled by electronic devices without any limitations. In this paper we have shortly explained the different technologies that can be used to control the robot using hand gesture that includes the land mine detection that can be done by using metal detector sensor. Then the gesture controlled wheel chair can be controlled by head motions, eye blink and voice activated power. Finally the heavy lift cranes the main purpose is to control the heavy lifting equipments fr5m a distance through which the operator can observe the load. Now in order to overcome the certain limitations we have described a non specific person gesture recognition system using MEMS accelerometers. The sign sequence of the gesture is extracted as the classifying feature as the gesture code. In order to enhance the performance of recognition system the accuracy and more gesture methods will be investigated in future works.GPS system can be added to the robot by the help of which its location can be tracked.

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Prof. A. S. Bendmali, M.E.
(Communication Networking),
Assistant Professor Department
of E&TcEngg, PLITMS
Buldana(M.H)

Ms.Poonam Uttam Rindhe
Persuing in Final Year
E&TcEngg, PLITMS,
Buldana(M.H

Ms.Samiksha Arvind Saitwal
Persuing in Final Year
E&TcEngg, PLITMS,
Buldana(M.H)

Ms.Priyanka Sanjay Nimbalkar
Persuing in Final Year
E&TcEngg, PLITMS,
Buldana(M.H)

Ms.Pooja Vilas Naphade
Persuing in Final Year E&Tc,
PLITMS, Buldana(M.H)