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GESTURE CONTOLLED ROBOTIC ARM USING WIRELESS NETWORKS

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ABSTRACT

Wireless gesture recognition and controlling is a developing and challenging field in electronics. Hence a wireless gesture controlled robot can find a good scope in Robotics. What if a robot can be controlled wirelessly from a distance to avoid human interaction with hazardous environment and to reduce human Risk. Our objective is to make a mobile robotic arm which is controlled by human gestures. It is also integrated with temperature and gas sensors to detect the internal condition of a working area. Without appearing in the working area a user can understand the condition and work with explosive or dangerous chemicals. This robotic vehicle can be send wirelessly and it imitates the human arm actions using gesture recognition control. Temperature value and poisonous gas presence in the room is send to the user.

Key Words-Flex Sensors, Zig Bee, Hand Gesture

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1. INTRODUCTION

Nowadays, machines plays an important role to assist human to reduce manpower. In Most of the industries and other working areas humans are facing difficulty in dealing things. It is a challenging task for humans to work in hazardeous environment. To protect human from such risk, many safety measurements are introduced[1].

The best and suitable solution for these problems is to design the robot with specification of human actions. To replace humans completely from dealing with dangerous environment the humanoid robots came into existence. But for developing a complete humanoid robots is difficult and costly, so it is better to design different part of humanoid robot with enhanced features for appropriate task[3].

2. METHODOLOGY AND PROPOSED SYSTEM

So here we designed and developed a gesture controlled robotic arm which can be operate wirelessly using zigbee technology. By using this robotic arm we can work and operate things in a dangerous working area without appearing physically but controlling the arm wirelesslly from the distant place. The designed robotic arm will help humans from dealing with hazardeous environment and it reduce risk.

Fig 1 consist of 809S52 microcontroller, flex sensor, accelerometer, lcd display, gloves, and zigbee transceiver[2].

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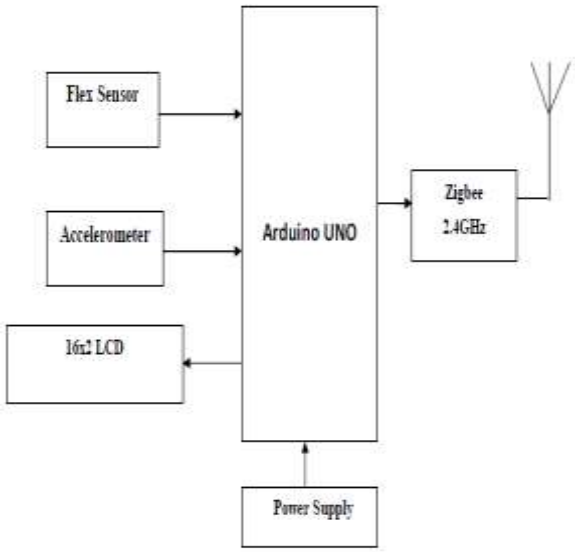

Fig 1: Block Diagram Of Transmitter Unit

Flex sensors and accelerometer are attached to gloves and interconnected to microcontroller and according to the hand gestures the signal from the transmitter unit is send to receiver by using zigbee tranceiver.

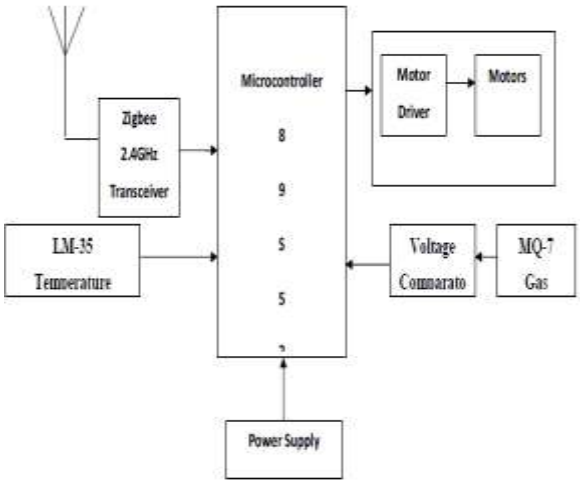

Fig 2: Block Diagram Of receiver Unit

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At the receiver side the signal from the zigbee is processed by microcontroller at robotc arm and according with the gesture signals the motors attached to the fingers will operate as shown in Fig 2[5]. The temperature sensor and gas sensor attached to receiver side will sense the gas and temperature present in the environment and detect the readings and send these values to display at LCD module present in transmitter side.

3. TECHNICAL SPECIFICATION

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (rec)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

4. IMPLEMENTATION

This part is the heart of the entire project. Without an effective and reliable communication system, no system / project can work. Similar is the case with this project also. The RF Module, details of which are mentioned. communication equipment required in this project. This Module is used to transmit the different hand and leg gestures made by the user (encoded in the form of 4-bit digital data) wirelessly to the receiver, which decodes the received 4-bit digital data and according to

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which the arm, gripper and platform moves. The block diagrams shown in Figure 4 to Figure 8 depicts the entire communication system of the project.

Step1: Initilization of Transmitter and Receiver

Step2: Checking for zigbee connectivity and sensors get activated

Step3: Imitating the gesture actions

Step4: Zigbee send the flex sensor and accelerometer values

Step4: Motor of robotic arm rotates according to the gesture

Step5: Gas and temperature values displayed on the LCD display

5. EXPERIMENTAL RESULTS

Figure 3 shows full project model with transmitter and receiver. We are using flex sensor technology for the controlling of arm and accelerometer for the tilting purpose. For transfering the information from transmitter to receiver and viceversa we use the help of zigbee techology. This can be controlled and operate wireleslly within 10m distance.

Fig 3:Top view of model

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Figure 4 shows the transmitter side with flex sensor and accelerometer sensor for gesture recognition. Flex sensors is used for the bending of fingers and accelerometer is for the tilting of hand[6]. LCD display is attached here for getting the process from the robotic arm. We use the help of arduino UNO for the contolling of signals.

Fig 4: Transmitter

Figure 5 shows the receiver part with robotic arm integrated with sensor network and information network. Here the arm is connected to 30rpm dc motor for the control and a LPG gas sensor is attached here for detecting the LPG present in the working environment. Zigbee tranceiver is connected here for the transmission of signals wirelessly[8].

Fig 5: Receiver

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Figure 6 shows the picking operation of arm. Arm is bend to ground by using the action from accelerometer and the fingers of arm are controlled by flex sensor and here the object is picked by the arm.

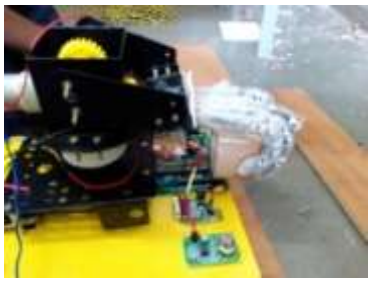

Fig 6: Grabbing the objects using hand gestures

Figure 7 shows the object lifting feature of the robotic arm. Here robotic arm picked the object from the ground and holding the object accordingly by the gesture used by human hand. The arm is moved up by the signal from accelerometer and the holding is done by the signal from the flex sensor.

Fig 7: Object lifting gesture

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Figure 8 shows the releasing operation of robotic arm accordingly with the gesture given by human arm. Here the robotic arm will bend by taking the signal getting from the bend of flex sensor which is attached to a glove.

Fig 8: Releasing the grabbed object

6. CONCLUSION

In this project work, a Robotic arm will imitate the human actions using gesture sensors through wireless connectivity. Here the sensors Recognise the movement of gestures and gives information to the Microcontoller. Robotic arm will operate based on the given code. So that user does not need to physically appear in the working area. This can be implemented in industries to reduce the human risk while dealing with high temperature components and also for commercial application as human assistance. In future it can be built commercially for mankind.

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