ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

An ISO 3297: 2007 Certified Organization *Vol. 4, Special Issue 1, March 2015*

National Conference on Recent Advances in Electrical & Electronics Engineering (NCREEE 2015)

Organized by

Dept. of EEE, Mar Baselios Institute of Technology & Science (MBITS), Kothamangalam, Kerala-686693, India

On 26th & 27th March 2015

MEMS Based Gesture Controlled Robot

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ABSTRACT: MEMS based gesture controlled robot aims to build a gesture controlled robot that can be controlled by gesture wirelessly. User is able to control motions of the robot by wearing the controller glove and performing predefined gestures. This robot can detect block objects and stop automatically; in addition, feedback messages are sent to the controller and warn the user.

KEYWORDS: MEMS (Micro electromehanical system)

I. 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. The society as a whole is exquisitely dependent on science and technology. Technology has played a very significant role in improving the quality of life. One way through which this is done is by automating several tasks using complex logic to simplify the work. 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. Now a day's robots are controlled by remote or cell phone or by direct wired connection. If we thinking about cost and required hardware's all this things increases the complexity, especially for low level application .

The objective of this paper is to build a gesture controlled robot that can be controlled by gesture wirelessly. User is able to control motions of the Robot by wearing the controller glove and performing predefined gestures. This Robot can detect block objects and stop automatically; in addition, feedback messages are sent to the controller and warn the user. The robot also senses surrounding temperature and human presence .This project provides a basic platform for many potential applications such as wireless controlled car racing games, gesture human-machine interfacing, and etc.

II.SYSTEM MODEL

It has transmitter and receiver section. The transmitter side is designed with microcontroller PIC, Zigbee and MEMS accelerometer. In the receiver side there are Zigbee , PIC and ultra sonic sensor.

In the transmitter, the signals sensed by the tilt sensor (MEMS accelerometer) are inputted to the microcontroller. The ADC in the microcontroller converts these sensors input to digital code and fed to Zigbee module via UART which triggers the Zigbee module to transmit the signals to remote robot. At Robot side the Zigbee receiver captures these signals; micro controller will decode and analyze it. Thus, according to the movement of hand, robot will move, front,

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back, left or right. In the robot there is used an ultrasonic sensor for obstacle detection. When any obstacle is detected, it will alert the user. There is a warning LED on the user hand glove which is glow when any obstacle is detected. Robot side is also provided with a temperature sensor and PIR sensor for sensing surrounding temperature and human presence respectively. Fig1 shows the block diagram of tramsimitter,Fig2: shows the block diagram of receiver.

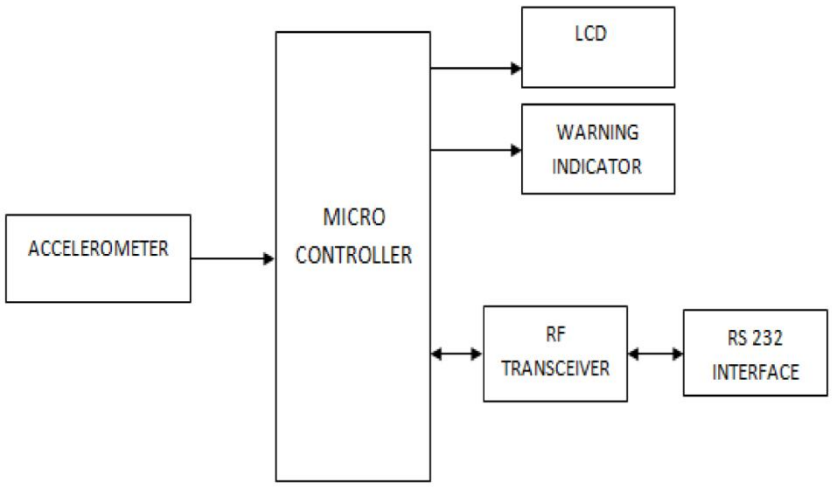

Fig1:Block diagram of transmitter

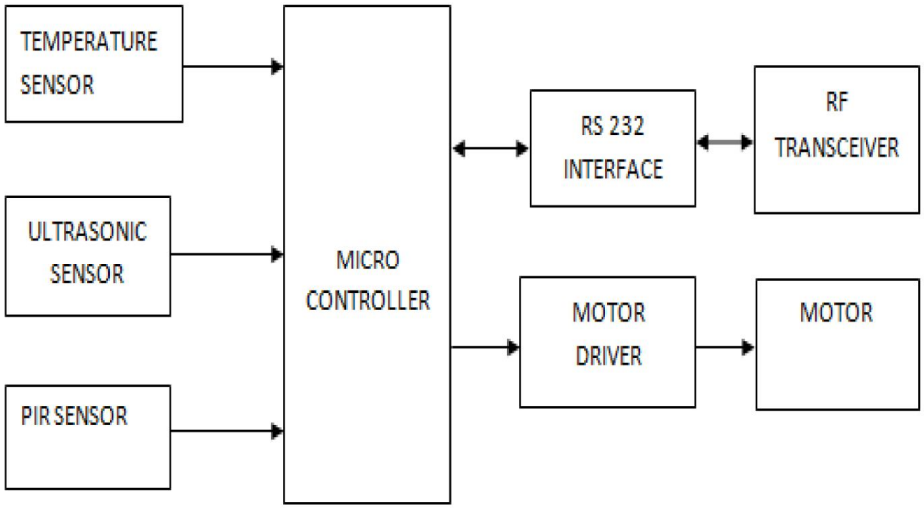

Fig2:Block diagram of receiver

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Zigbee was designed to allow high bandwidth wireless connections to become so simple to use that they seamlessly integrate into your daily life. Zigbee is a proprietary open wireless technology standard for exchanging data over medium distances (using short wavelength radio transmissions is the ISM band from 2400-2480 MHz) creating personal area networks (PANs) with high levels of security.

III. CIRCUIT DIAGRAM

The entire system is divided into two sections, one is transmitter and other is receiver.The transmitter side consist of PIC microcontroller, MEMS accelerometer, Zigbee transceiver , LCD and power supply unit. In the power supply unit 230V AC supply is stepped down to 12V AC using a transformer . This 12V AC is converted to 12V DC using bridge rectifier. Using LM7805 regulator it is coverted to 5V. This 5V is fed to the microcontroller. Using MEMS accelerometer hand gestures are sensed and motion in X and Y direction is converted into analog electrical signals. This analog signal is converted to digital signal by using ADC in the microcontroller. The digital signal is then send to the Zigbee module via USART. [1] [2].Fig3 shows the circuit diagram of transmitter

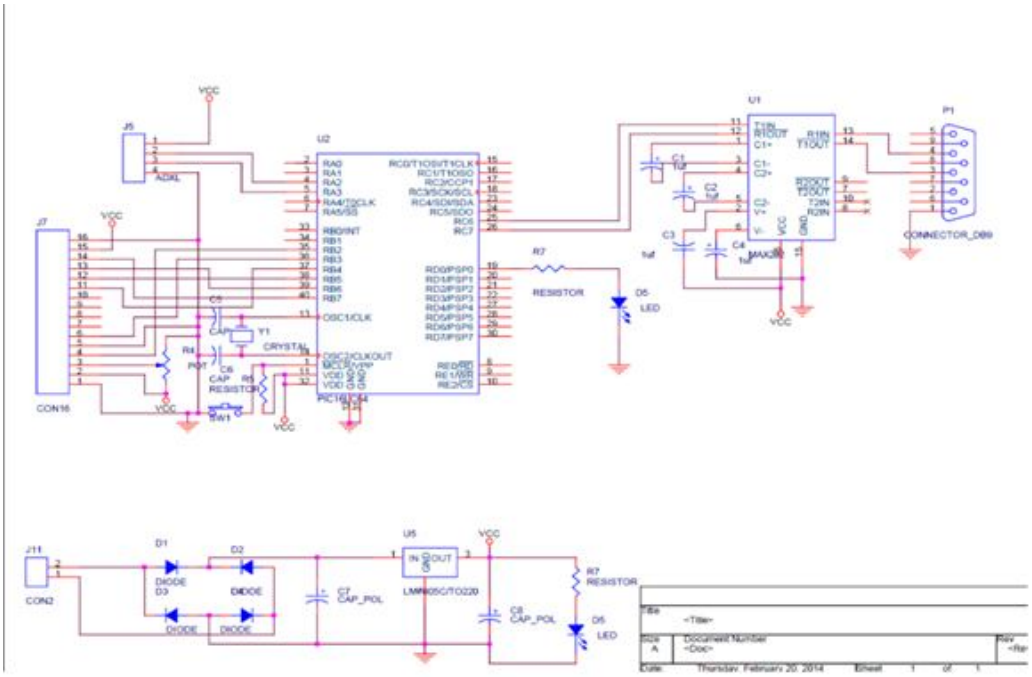

Fig:3 Circuit diagram of transmitter

The receiver side consist of PIC microcontroller, Zigbee transceiver, temperature sensor, PIR sensor, ultrasonic sensor, motor , motor driver and battery. The 12V DC supply is fed to the motor driver that drives the motor. Using a LM7805 regulator 12V DC from battery is converted to 5V DC to power the microcontroller. The Zigbee receiver captures the signal sent from the transmitter side; micro controller will decode and analyze it. Thus, according to the movement of hand, robot will move, front, back, left or right. In the robot there is used an ultrasonic sensor for obstacle detection. When any obstacle is detected, it will alert the user. There is a warning LED on the user hand glove which is glow when any obstacle is detected. Robot side is also provided with a temperature sensor and PIR sensor for sensing surrounding temperature and human presence respectively. Fig4 shows the circuit diagram of receiver.

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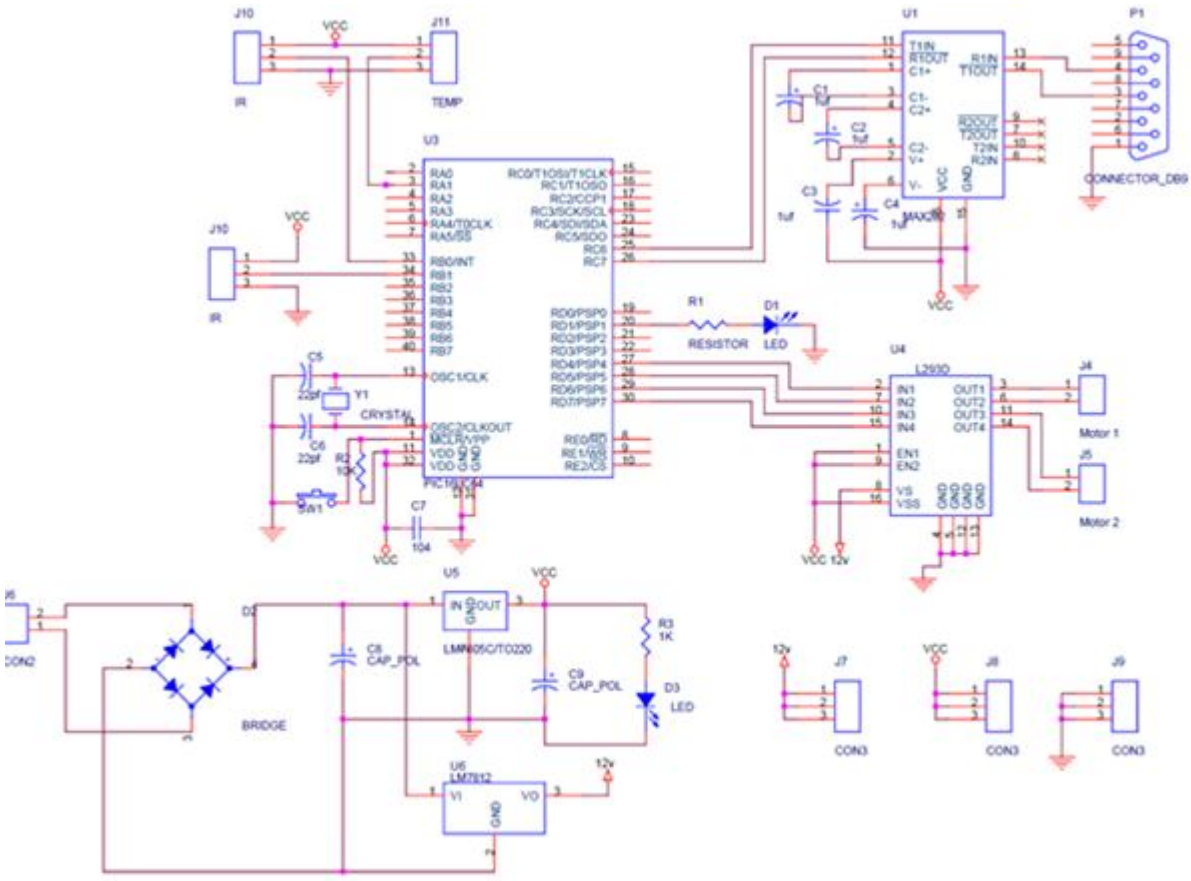

Fig 4 Circuit diagram of receiver

IV. SIMULATION

PROTEUS DESIGN SUITE 7 is used for simulating the circuit. Proteus Design Suite 7 contains an application called ISIS 7 Professional is used for simulating purposes. [7]

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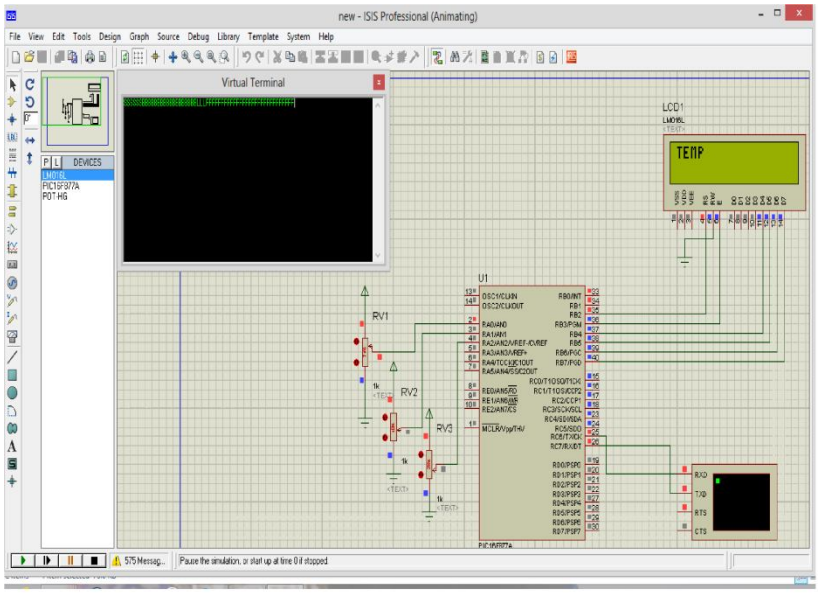

Fig7:Simulation result of transmitter

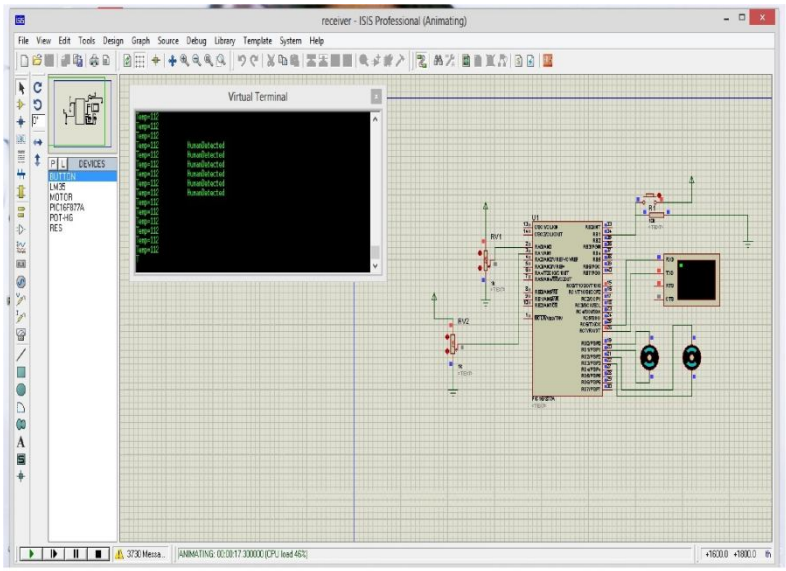

Fig8:Simulation result of receiver

V.CONCLUSION

MEMS based gesture controlled robot '' has a future enhancement, the MEMS accelerometer can be even programmed in Z axis so the robot can be made to move in Z direction with additional hardware equipments. Another improvement can be done in this , which enables the user to be used in high performance applications are by replacing the PIC microcontroller with ARM processor.

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