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A Unique Home Automation System through MEMS

Neha Surin[1], Dr. R. P. Gupta[2]

[1]*Department of Electrical Engineering, BIT, Sindri, (DHANBAD)*

[2]*Assistant professor, Department of Electrical Engineering, BIT, Sindri, (DHANBAD)*

ABSTRACT

This project has been developed to design a system that facilitates a user to securely control multiple home appliances using hand gesture. The project uses the MEMS technology to read hand gesture and provides an analog input signal to the ATmega16 microcontroller. The hand gesture movement thus recorded controls the circuit to turn it on or off. The microcontroller processes the input data from the sensor and makes use of a Relay driver to control the on/off operation of the home appliances. The system communicates with the appliances using RF technology within the range of 3Hz to 300GHz. Energy consumption can be reduced by 20-30% with this technology thus optimizing the power consumption in a home automation system. Furthermore, the system is secured with a gesture based password, through MEMS, to ensure security and protection from unauthorized usage.

Keyword: *ATmega16 microcontroller, MEMS (MicroElectroMechanicalSystem), RF Technology,security , Relay*

I.INTRODUCTION

Usage of technology has increased manifold in recent times to enhance our experience and make our life easier. Home automation system is one such scenario where this phenomenon can be easily seen. A large no of electrical appliances are used in home to help us with various work. Most of these appliances work independently on their own. But the recent trend in making these appliances smart and connected to each other has further made it easier operating them.

With the home environment becoming more automated, there is a need for better and efficient system of controlling it. This project proposes a home automation system which is gesture controlled and password protected for a secure home environment. The project is based on MEMS (micro electro mechanical system), which is used to control the home appliances using hand gesture. When a user moves the device, the mechanical movement is recorded and converted to electrical signal in X, Y and Z coordinates. This signal is then sent to the microcontroller. In this project microcontroller ATmega16 act as a master and the MEMS act as a slave. The command is given by the MEMS is displayed in the LCD. RF technology is used for the communication within the range about 3Hz to 300GHz.

This project is uses the +5v, 500mA power supply. Here bridge rectifier is used to rectify the AC supply of secondary of 230v/12v step down transformer. Capacitor is used as the filtering circuit. 12v unregulated voltage is used for the relay. For the voltage regulation 7805 three terminal voltage regulator is used.

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There are various mehods to control the home automation system which is related to PI based home automation system which is controlled by the ip network, the main component is AVR microcontroller to control the home appliancesAdeel Ahmed, Ibrahim Siddiqui, Muhammad Mujtaba Khan [23 june 2016,IEEE],D.Vijendra Babu, Dipeshwar Kumar Yadav, Niteshwar Kumar Yadav, Vivek Kumar Verma,[ICRAMET'15] designed a smart and secured home automation system using smart phone and voice recognisation,H. ElKamchouchi, Ahmed ElShafee(2012 IEEE) aimed to designed and implementadaptable and secure home automation based on SMS

technology,[Prof. Vishal V. Pande, Nikita S.Ubale, Darshana P. Masurkar, Nikita R. Ingole,Pragati P. Mane, [April 2014]] ,used the system to develop a wheelchair, useful for the physically disabled people to control wheelchair with his hand gesture using acceleration technology,Artee Kunal Dalsaniya, Dhanashri H. Gawali,7-8 Jan 2016[2016 IEEE] ,Introduced the system for disabled people which serve two main purpose, a)wheelchair can be navigated through voice command and hand gesture using accelerometer b)obstacles were detected using 4 IR sensors to avoid the risk of collision and injury by detecting objects at some distance.

II. PROPOSED SCHEME

The proposed system is aimed at designing a cost effective control of home appliances through Hand Gestures. In this project the appliances are controlled using MEMS. This system consist accelerometer which is used to measure the hand gesture, microcontroller, RF technology for transmitting and receiving the signals following through the system. The whole system is the password protected for the secure home which is stored in the microcontroller Atmega16.

III. HARDWARE DESCRIPTION

I

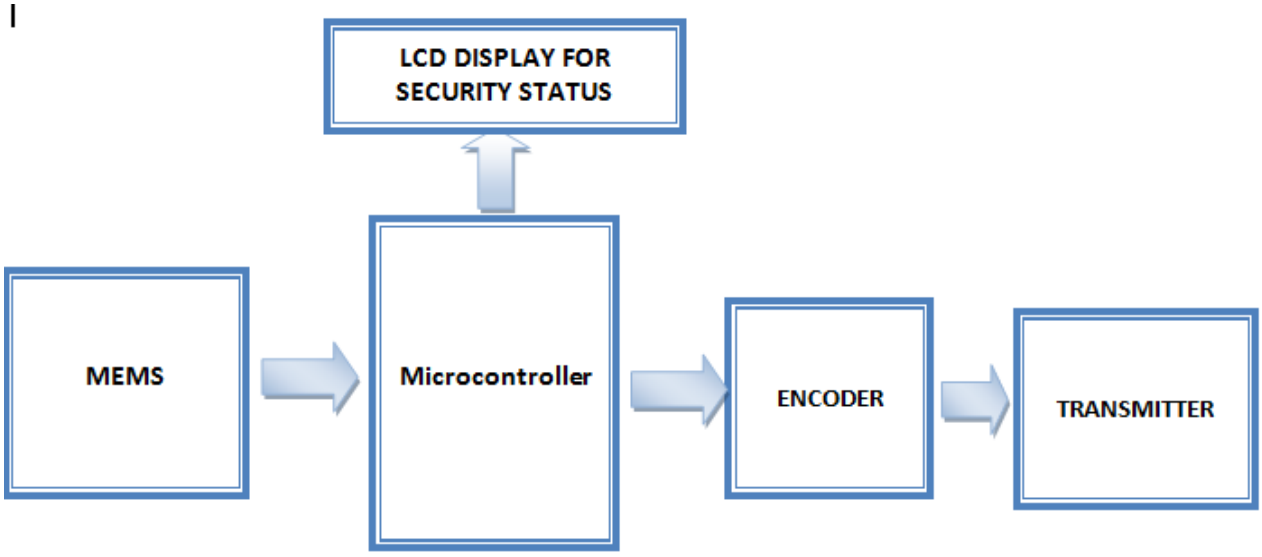

Fig 1: Block diagram of Transmitter part

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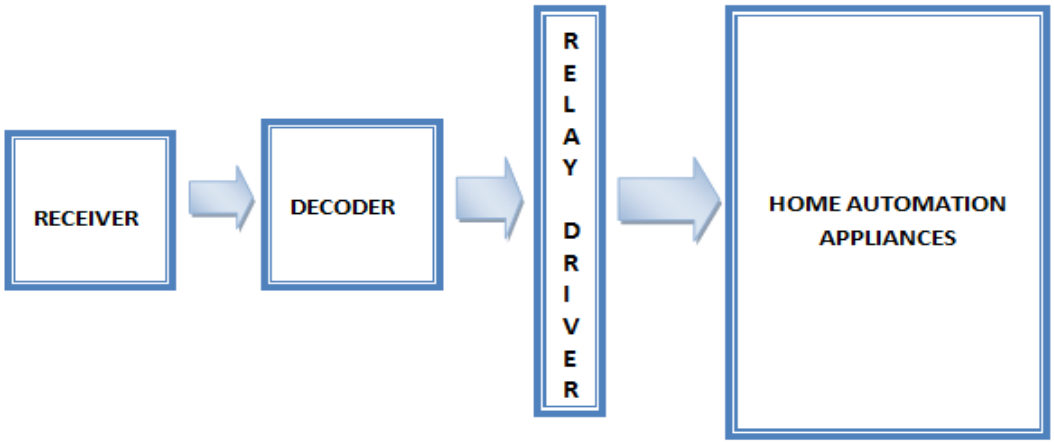

Fig 2: Block diagram of Receiver part

Figure1. shows the block diagram of transmitter part of the system. It consist a various component. MEMS accelerometer is used for sensing the hand gesture movement of the person. Atmega16 microcontroller is used as the master component of the system which is used to control the whole system .the movement of the hand is already store in the microcontroller. All the status of the appliances is displayed in the LCD. All the conclusions drown by the microcontroller is transmitted by the RF transmitter to the RF Receiver. The operating rang of the transmitter is 434 MHz.

Figure2.shows the block diagram of the receiver part of the system. The signal transmitted into the air is received by the RF Receiver from the antenna. Similarly the operating range of the receiver is same as the transmitter 434 MHz.receiver and microcontroller Atmega16 is communicate through the decoder. The output of the decoder is given to the microcontroller and then home appliances are process according to the received and stored hand movement.

A brief description of the various component used in the system.

3.1MEMS (Micro electro mechanical systems)

Micro electro mechanical systems (MEMS) (also written as micro-electro-mechanical, MicroElectroMechanical or microelectronic and micro electro mechanical system) is the technology of very small mechanical devices driven by electricity and it merges at the Nano scale into nanoelectromechanical systems (NEMS) and nanotechnology. It is a mechanical device driven by electricity. It converts mechanical hand movements into equivalent electric signals. Among many of the MEMS devices 3-Axis accelerometer is one.

3.2 ACCELEROMETER-ADXL335:

An accelerometer is a device that measures the vibration, or acceleration of motion of a structure. It is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant

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force of gravity pulling at your feet, or they could be Dynamic - caused by moving or vibrating the accelerometer.

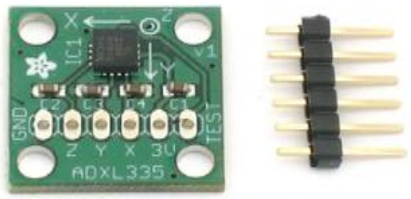

Fig3: ACCELEROMETER-ADXL335:

3.3 ATmega16 MICROCONTROLLER:

Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. ATmega16 has 16 KB programmable flash memory, static RAM of

1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.

Fig 4: ATmega 16

3.4 RF TECHNOLOGY

Radio frequency (**RF**) is a frequency or rate of oscillation within the range of about 3 Hz to 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in electrical circuits or electromagnetic radiation.

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RF module comprises of an RF Transmitter and RF Receiver, both operates at the frequency range of 434 MHz. An RF Transmitter receives serial data and transmits it wirelessly through its antenna connected at pin 4. Transmission occurs at the rate of 1Kbps-10Kbps. The transmitted data is received by an RF Receiver.

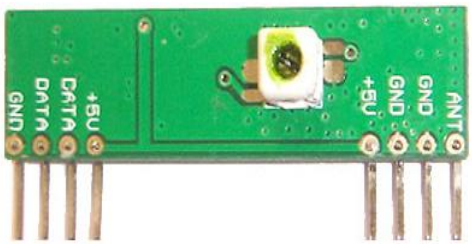

Fig 5(1):RF TRANSMITTER STT-433MHz **Fig 5(2): RF RECEIVER STR-433 MHz**

3.5 RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. Relays are used for switching purpose of the home appliances.

Fig 6: Relay

3.6 LIQUID CRYSTAL DISPLAY:

LIQUID CRYSTAL DISPLAY (LCD) is an electronic display module.**16x2 LCD display** is used for is system.**16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

Fig 7: 16x2 LCD display

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3.7POWER SUPPLY UNITS

A power supply is an electronic device that can use to supply the electric energy to the load. This project uses regulated +5V, 500mA power supply.

Power supply block diagram:

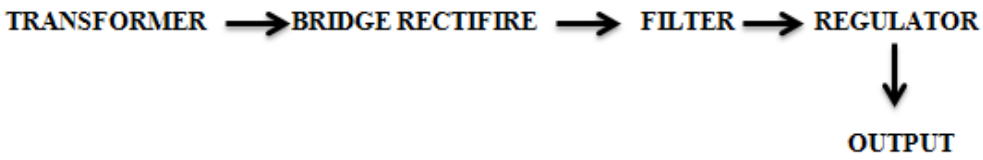

Fig: power supply unit

IV. SYSTEM IMPLIMENTATION AND EXPERIMENTAL RESULT

The system is composed of two main parts:- (1) transmitter (2) receiver.

The transmitter has a major component 'Microcontroller' i.e AT mega16. Accelerometer is a device that measures the vibration or acceleration of motion of structure that works on hand gesture.

Accelerometer can move in major direction-right, left, down and up.

HAND MOVEMENT GESTURE (Direction)	LOAD OPERATION
Right	Load 1 on
Left	Load 2 on
Down	Load 3 on
Up	Load 4 on

Tabale No.1: Functions of accelerometer

If the direction of hand movement is completely towards right, then all the four load will turn on.And if the direction of hand movement is completely towards left then all the four load will turn off.Usually, accelerometer works in 3-axis X,Y and Z but my system works in 2-axis X and Y.

SL No.	VALUES	LOAD
1	3V<x<5V	Load 1 on
2	2V<x<2.5V	Load 2 on
3	3V<y<5V	Load 3 on
4	2V<y<2.5V	Load 4 on
5	x = 5V	All loads on
6	x = 0V	All loads off

Table no.2- Relation between values and load used in system.

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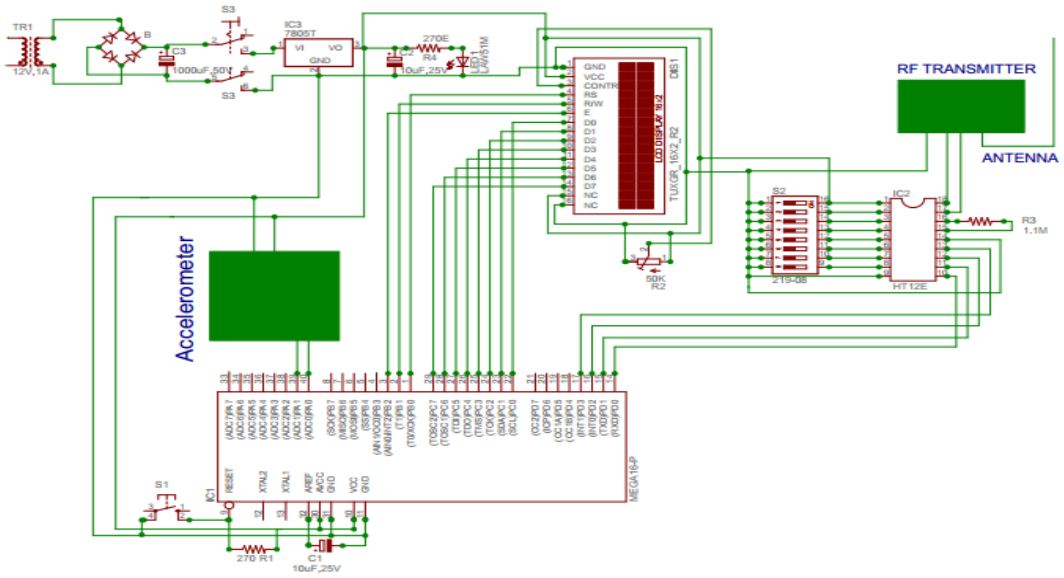

Fig 8: circuit diagram of the transmitter part of the system

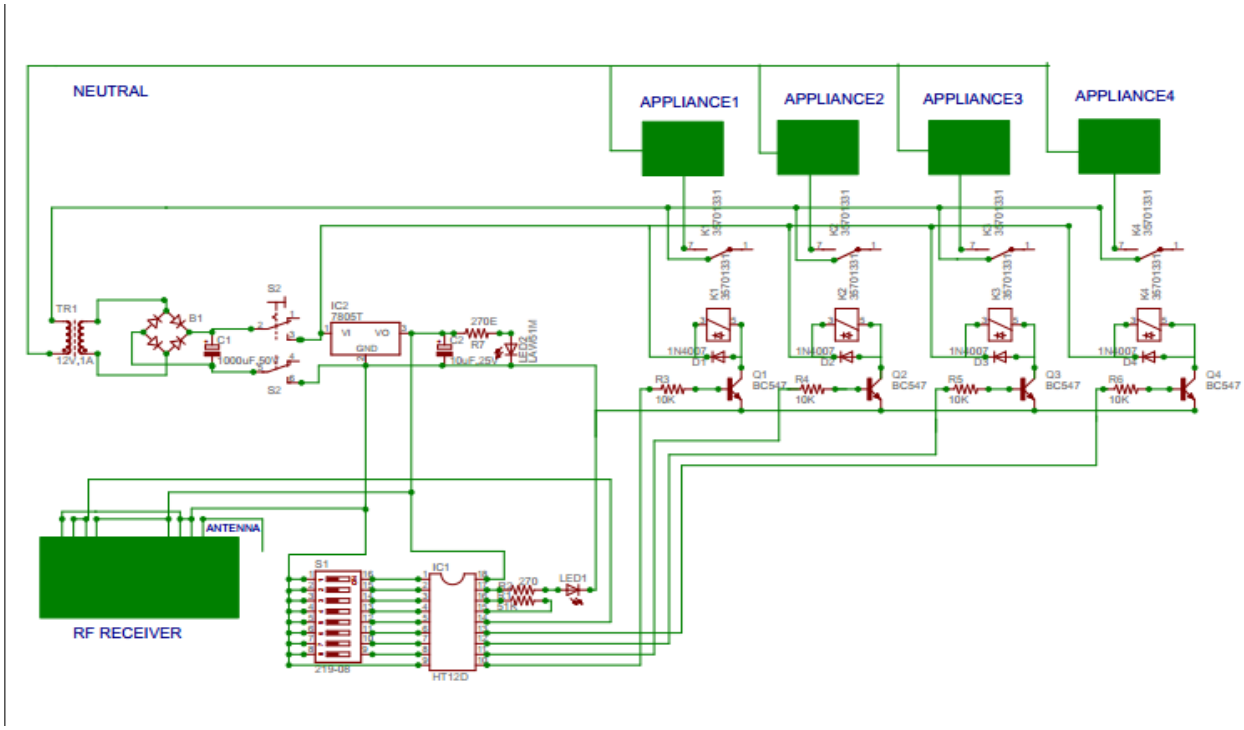

Fig 8(2): circuit diagram of receiver part of the system

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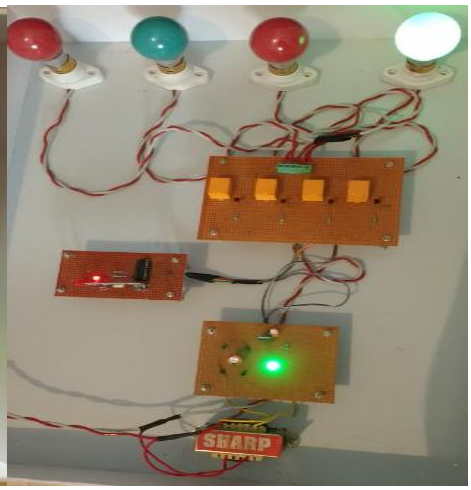

Fig 9(1): Experimental setup of transmitter (command: load1-ON)

Fig 9 (2): experimental setup of receiver (result: load1 turns ON)

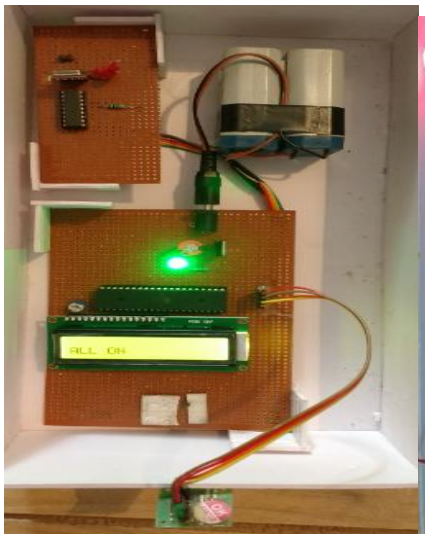

Fig 9(3): Experimental setup of transmitter (Command: load1-ON)

Fig 9 (2): experimental setup of receiver (Result: load1 turns ON)

V. CONCLUSION

The project has been developed with ease of use and accessibility in mind. The gesture controlled system provides an easy mechanism for people, specially people with special challenges, illness, old age etc. Using MEMS technology, the system is gesture controlled and password protected. The password protection ensures secure use of the technology. The password itself is gesture based for easy access. Using the device, home appliances in the range can be controlled easily and securely.

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REFERENCES

[1.] Adeel Ahmed, Ibrahim Siddiqui, Muhammad MujtabaKhan,"IP network based home automation system using AVR microcontroller",11-12 April 2016,(23 june 2016,IEEE).

[2.] D.Vijendra Babu, Dipeshwar Kumar Yadav, Niteshwar Kumar Yadav, Vivek Kumar Verma," MEMS based smart and secure home automation system with multi-way control and monitoring facility using smart phone", International conference on recent advancement in mechanical enginering and technology,(ICRAMET'15), ISSN:0974-2115.

[3.] Dhiraj Sunehra, Vemula Tejaswi," Implementation of speed based home automation system using bluetooth ans GSM",Int. confrence on signal processing, communication, power and embedded system(SCOPES)-2016

[4.]DhH. ElKamchouchi,Ahmed ElShafee,"Design and Prototype Implementation of SMS BasedHom e Automation System",2012 IEEE,International conference on electronics design,system and application(ICEDSA).

[5.]Prof. Vishal V. Pande, Nikita S.Ubale, Darshana P. Masurkar, Nikita R. Ingole,Pragati P. Mane, "Hand Gesture Based Wheelchair Movement Control for DisabledPerson Using MEMS",Int. Journal of Engineering Research and ApplicationsISSN : 22489622, Vol. 4, Issue 4(Version 4), April 20 14.

[6.] R. piyare, M.Tazil, "Bluetooth based home automation system using cell phone", 2011 IEEE 15th International symposium on consumer Electronics.

[7.] Shashank H, Pradyath Hehde,"MEMS based device for physically challenged" , Proceedings of 10th IRF International Conference, 04th October2014, Bengaluru, India, ISBN: 978-93-84209-56-8