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Implementation of Sixth Sense Technology for Control Purpose

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ABSTRACT: Micro-electromechanical Systems technology addresses to the most innovative features. MEMS based Accelerometers are used to generate signals of gestures of human beings. These signals are used further to control any devices. In this project the Home appliances such a light or fan can be controlled by gesture movement which is a sixth sense.

KEYWORDS: Micro-electromechanical Systems, MEMS

I. INTRODUCTION

MEMS (Micro-electromechanical Systems) technology addresses and caters to the most innovative features required on the market, ranging from mobile and consumer applications to the innovative needs of the health care and automotive markets. It is housed in ultra-compact packages that can even be placed on your finger, MEMS achieves a high level of motion-control detection, embedding the most useful smart functions and minimizing the power consumption. It is for this very reason that we have chosen this sensor technology as the basis for our current project.

The main aim of this project is to be able to control to perform some electrical peripherals like controlling Lights and controlling electric FAN with required controls by just our finger movements (hand gestures). Our project has high possibilities to control all the things used in our day-today life by just our hand gestures. The universal control unit may be as a form of wearable one. With the sensors placed in the form of rings on our fingers, any motion made by a finger will be detected by these sensors and relayed to a control unit (through Radio Frequency) to take the required actions. The receiver unit would be interfaced with the computer, car control unit and electrical load control unit.

This project has high possibilities to control he functions of all Electronic and Electrical Products which are used in our day-today life by just our hand gestures.

II. SYSTEM MODULES

Mems have system modules of Hand Gesture Movement Detection, Electrical Switching Circuit, Microcontroller, Wireless Communication modules [1].

1. REQUIREMENTS

MAT89C51 Microcontroller, ATMEL flash Programmer- to load program, KEIL IDE converts assembly language into machine language are use to create Mems.

2. MEMS SIDES

MEMS have divided into two side with base of working functionality. Those are wearable side and base side.

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A. Wearable Side

It and gives output in binary form to encoder. The output of encoder in the form of pulse signal is transmitted through RF medium [2]. In this wearable side contains adxl202 ,lm324 comparator ,ht 12e comparator and rf transmitter.adxl202 mems accelerometer x axis connected to the comparator.

The comparator design predict the weather x or –x axis with appropriate reference voltage. The comparator output given to the ht12 encoder data lines and the accelerometer values are transmitted through rf transmitter at the frequency rate of 433khz. is a device that measure the proper acceleration. The MEMS based Accelerometer detects the finger angle and relayed to control devices. Accelerometer gives two output x and y comparator gets position signals from accelerometers [3-4].

PURPOSE: This is basically designed to find the position of finger(s)

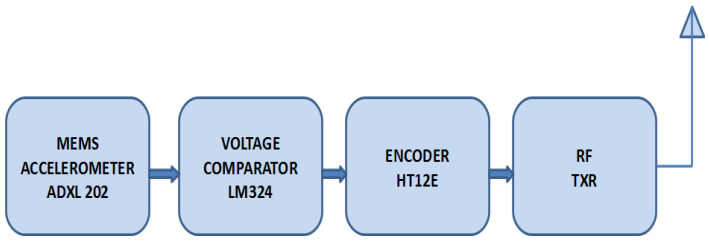

Fig.1. Block Diagram of Wearable Side

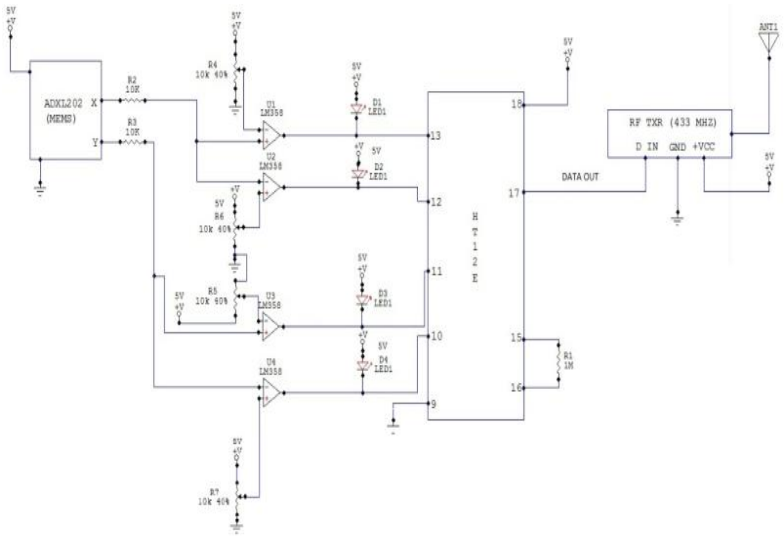

Fig.2. Circuit Diagram of Wearable Module

B.1 Hardwares used in Wearable Side Module

Accelerometer: This module is used to find the exact hand or finger position exactly by using accelerometer based on MEMS technology. ADI's broad MEMS-based accelerometer portfolio detects and measures motion in a wide range of I&I, healthcare, and automotive applications. These inertial sensing devices are available in 1-, 2-, and 3-axis configurations, with analog or digital output, in low g or high g ranges. In this project we are using the device number ADXL202

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B.2 Comparators

A comparator compares the voltages at the + and – inputs. If the + input is at a higher voltage than the – input the comparator output will be high. If the – input is at a higher voltage than the + input the comparator output will be low. We have designed our comparator circuit by the chip called LM324.The LM324 consist of four independent, high gains, internally frequency Compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide voltage range. Application areas include transducer amplifier, DC gain blocks and all the conventional OP Amp circuits which now can be easily implemented in single power supply systems [5].

Encoder: An encoder is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another, for the purposes of standardization, speed, secrecy, security, or saving space by shrinking size. The HT 12E Encoder ICs are series of CMOS LSIs for Remote Control system applications. They are capable of Encoding 12 bit of information which consists of N address bits and 12-N data bits. Each address/data input is externally trinary programmable if bonded out [6].

RF-Transmitter: Devices designed to exchange data without using wires require two basic components: a wireless transmitter and paired receiver. The wireless transmitter might broadcast using radio frequency (RF) waves, or it might transmit data on the infrared (IR) wavelength. The paired receiver listens for the signal accordingly [7]. Some examples of products that use a wireless transmitter include routers, computers, cell phones, personal digital assistants (PDAs) and wireless headphones.

*Antenna***:** This is a highly sensitive, efficient antenna for receiving GPS satellite waves. The antenna element can be supplied separately, and so it optimum for small sets, such as portable equipment. The features are small antenna element (12mm, thickness t=4 or 6mm) [8]. Thickness can be selected to suit the desired gain (t=4 or 6mm).

C. Receiver Side:

Load is controlled by the E.M.R (Electro Magnetic Relay).E.M.R is controlled by the Microcontroller by using Driver. Driver is giving the sufficient current and voltage depends on the command (Logic 1 or 0) received by the M.C

Purpose: This is basically designed to turn ON/ OFF the electrical loads

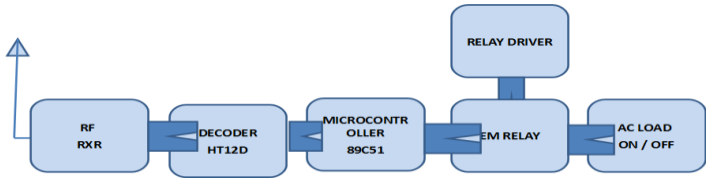

Fig.3. Receiver Side Block Diagram

D. Base Side Module:

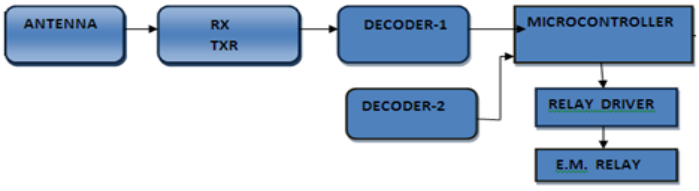

Fig.4. Base Side Module Block Diagram

HT12D is a 212 series decoder IC (Integrated Circuit) for remote control applications manufactured by Holtek. It is commonly used for radio frequency (RF) wireless applications [9]. By using the paired **HT12E** encoder and HT12D

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decoder we can transmit 12 bits of parallel data serially. **HT12D** simply converts serial data to its input (may be received through RF receiver) to 12 bit parallel data. These 12 bit parallel data is divided into 8 address bits and 4 data bits. Using 8 address bits we can provide 8 bit security code for 4 bit data and can be used to address multiple receivers by using the same transmitter [10]. In this base side circuit ht 12 d decoder data lines connected to the 89C51 input ports. The transmitted data received by the decoder and the data will be passed to the 89C51 microcontroller. If the data valid 89C51 switching circuit on/off the electrical load. The switching circuit contains relay and bc547 npn transistor.

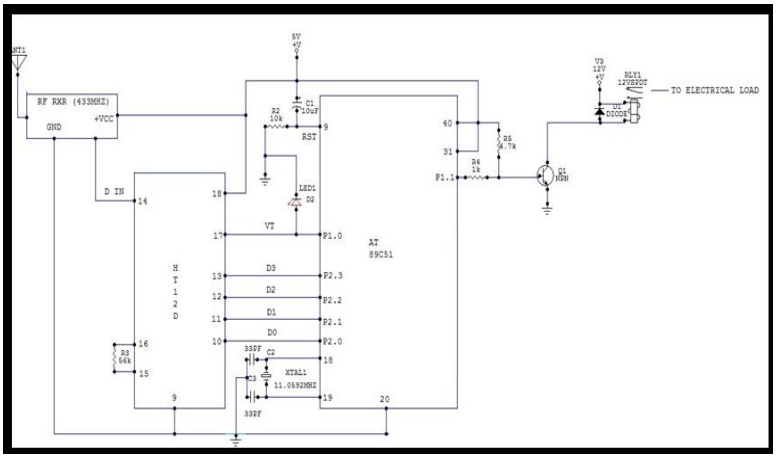

Fig.5. Circuit Diagram for Base Side Module

D.1 Hardwares used in Base Side Module

RF receiver: A tuned radio frequency receiver (TRF receiver) is a radio receiver that is usually composed of several tuned radio frequency amplifiers followed by circuits to detect and amplify the audio or data signal. RF Receiver is used to receive the gestures information sent by the wearable side module [11]. Receiver also works on FSK modulation and 315 MHZ of carrier frequency.

Decoder: A decoder is a device which does the reverse operation of an encoder, undoing the encoding so that the original information can be retrieved. The same method used to encode is usually just reversed in order to decode. It is a combinational circuit that converts binary information from n input lines to a maximum of 2n unique output lines. We have designed our decoder circuit by using the device called HT12D.

Microcontroller: Main component used by both the Consumer and the EB Station is the 89c51 Micro Controller [12]. The *ISSI* IS89C51 is a high-performance microcontroller fabricated using high-density CMOS technology. The CMOS IS89C51 is functionally compatible with the industry standard 80C51 microcontrollers.

The IS89C51 is designed with 4-Kbytes of Flash memory, 128 x 8 RAM; 32 programmable I/O lines; a serial I/O port for either multiprocessor communications, I/O expansion or full duplex UART; two 16-bit timer/counters; an six-source, two-priority-level, nested interrupt structure; and an on-chip oscillator and clock circuit. The IS89C51 can be expanded using standard TTL compatible memory [13].

E. Electrical switching circuit:

This module is basically designed to control loads. This is designed by transistor and an electromagnetic relay (EMR). EMR only takes main role in switching ON/OFF the electrical loads.

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal

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coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations [14]. This EMR will be driven by transistor, the command for transistor will be given by the microcontroller.

7805 Regulator: Fixed voltage Positive and Negative regulator ICs are used in circuits to give precise regulated voltage. 78 XX series regulator IC can handle maximum 1 ampere current. The Regulator ICs require minimum 1.5 higher input voltage than their voltage rating. For example 7805 IC requires minimum 6.5 volts to give 5 volt output. Here are some circuit designs of IC 7805 to monitor the output voltage.

F. Wireless Communication:

As we need to make it as a wearable device we also need to make it wireless. We are using Radio Frequency Communication between them.FSK Modulation and Demodulation is at 433 MHZ of carrier frequency. The distance is 100 Mtrs now. It can be increased by increasing the power of RF power amplifier. The term wireless is normally used to refer to any type of electrical or electronic operation which is accomplished without the use of a "hardwired" connection. Wireless communication is the transfer of information over a distance without the use of electrical conductors or "wires". The distances involved may be short (a few meters as in television remote control) or very long (thousands or even millions of kilometers for radio communications). When the context is clear the term is often simply shortened to "wireless". Wireless communications is generally considered to be a branch of telecommunications.

It encompasses various types of fixed, mobile, and portable two way radios, cellular telephones and wireless networking. Other examples of wireless technology include GPS units, garage door openers and or garage doors, wireless computer mice and keyboards, satellite television and cordless telephones.

Purpose: This is basically designed to make a wireless data communication between wearable side.

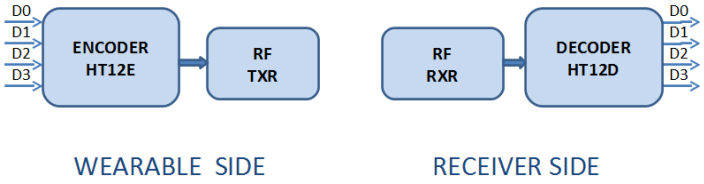

Fig.6. Wireless Communication Block Diagram

G. PCB Board Details:

A general purpose 40 pin 89C51 development board with on board power supply circuit, and reset switch, power status LED and a general purpose switch and LED. The board is compatible with the AT89S51/52 and the P89V51RD2 microcontrollers. The P89V51RD2 allows serial programming and can be programmed directly with this board through a serial connection to a PC without the need for an additional external programmer. This board is perfect if you are just starting out with 89C51 programming and also if you want a reliable tried and tested board for building advanced projects based on it.

IV. CONCLUSION

In this project the home appliance such as Light ON/OFF is controlled by gesture movement, thus the sixth sense technology is constructed as hardware results and implemented.

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