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Design of Intelligent Home System Based on MEMS and Flex Sensors

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Abstract— The aim of this project is to control the home appliances such as light, fan, etc., by hand gesture recognition using flex and MEMS sensor. The application of the wireless communication technologies are very extensive and smart home is one of those important application area. There was a need to automate home so that users can take technological advancement in such a way that the person can control their home appliances simply by their hand gesture. This project has been considered very much useful for elders and disabled people.

Keywords-MEMS sensor, Flex sensor, LM339, PICF877A.

I. TRANSMITTER SECTION

The transmitter section consists of Power Supply, flex sensor, MEMS, level comparator, RF transmitter, on board antenna.

TRANSMITTER

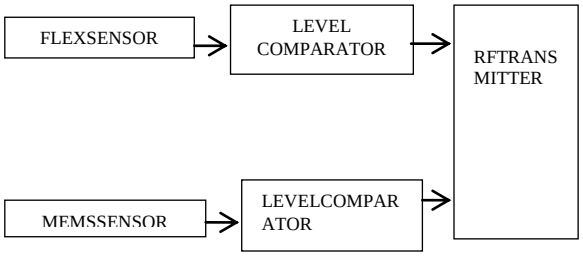

fig. 1 Transmitter section

Power Supply:

A power supply unit (PSU) converts mains AC to low-voltage regulated DC power for the internal components of the internal components of the computer. Modern personal computers universally use a switched mode power supply. Some power supplies have a manual selector for input voltage, while others automatically adapt to the supply voltage.

Flex sensor:

Flex sensors are sensors that change in resistance depending on the amount of touch on the sensor. Flex sensors are analog resistors which translates to a quantitative value.

MEMS Sensor:Micro Electro Mechanical System (MEMS) is the technology of very small mechanical devices driven by electricity. MEMS are also referred to as micro machines (in Japan), or micro systems technology –MST (in Europe). MEMS are made up of components between 1 to 100 micrometers in size (i.e. 0.001 to 0.1 mm) and MEMS devices generally range in size from 20 micrometers (20 millionths of a meter) to a millimeter. It works based on the change in position of the IC in x, y and z directions. MEMS application is categorized by type of use as Sensor and Actuator.

Level comparator:LM339 comparator chip can operate from a single or dual power supply of upto 32V maximum. These are high precision comparators which consists of four operational amplifiers.

RF Transmitter: The RF transmitter allows users to easily send serial data, robot control or other information wirelessly. When paired with the matched RF Receiver, reliable wireless communication is as effortless as sending serial data.

II. RECEIVER SECTION

RECEIVER

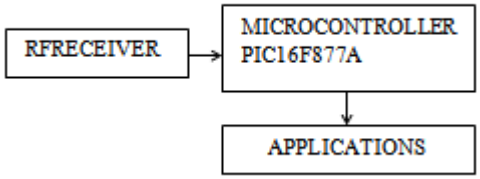

fig. 2 Receiver section

The receiver section consists of power supply, RF Receiver, PIC16F877A microcontroller, relay.

RF Receiver:

It receives the signal from RF transmitter based upon the frequency to which it is tuned and also demodulates it.

PIC Microcontroller:

It is very popular because it is very cheap. Apart from that it is also easy to assemble. An additional component that is needed to make this IC can be reprogrammed and erased up to 1,00,000 times. It uses EEPROM. Inbuilt ADC is an additional feature of PIC microcontroller.

Relay:

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts.

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III. SENSORS

Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. A sensor (also called detector is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an electronic instrument.

This project uses Flex sensor, MEMS sensor and Light Dependent Resistor

The flex sensor is a unique component that changes resistance when bent. As the flex sensor is bent in either direction the resistance gradually decreases. The flex sensor operating temperature is -45F to 125F.

The MEMS MMA7341L is a low power, low profile capacitive micromachined accelerometer featuring signal conditioning, a pole low pass filter, temperature compensation, slf-test, 0g-detect which detects linear free-fall and g-select which allows for the selection between 2 sensitivities.

LDR is a two terminal device also known as photoconductive cell or photodetector. It is made of thin layer of semiconductor material cadmium sulphide. It is two cadmium cells (CdS) photoconductive cells with spectral responses similar to that of the human eye.

Comparator is an electronic device that compares two voltages or currents and switches its output to indicate which is larger. They are commonly used in devices such as analog to digital convertors.

The comparator used in this project is LM339 which is also called as Quad-comparator since it consists of four operational amplifiers.

PIC 16F877A is used in this project because it is having many number of ports. Any port can be used for any other applications. If using of the PIC micro controller will avoid of connecting extra peripheral devices. That is in the PIC micro controller ADC, DAC are in built compare with other micro controller. The micro controller will allow only parallel inputs for converting serial data's to parallel data's, the micro controller need USART/UART. But in PIC micro controller there is no need of USART/UART externally. It is already in built. This is the main part of this project. The PIC micro controller will perform all the task. Here the port E is used as the input and transfer the output through RS232 cable.

IV. SOFTWARE COMPONENTS

MPLAB IDE v8 is the current version of MPLAB IDE is version 8.90. It is a 32-bit application on Microsoft Windows and includes several free software components for application development, hardware emulation and debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third-party software and hardware development tools. Both Assembly and C programming languages can be used with MPLAB IDE v8. Others may be supported through the use of third-party programs.

The features of this software are

- Integration with the MPLAB IDE allows for easy-to-use project management and source-level debugging.
- Generation of re-locatable object modules for enhanced code reuse.
- Compatibility with object modules generated by the MPASM assembler, allowing complete freedom in mixing assembly and C programming in a single project.
- Transparent read/write access to external memory.
- Efficient code generator engine with multi-level optimization.
- Extensive library support, including PWM, SPI, I2C, USART, UART, string manipulation and math libraries.
- Full user-level control over data and code memory allocation.

VISUAL BASIC - VB6.0

Visual Basic is a third-generation event-driven programming language and integrated development environment (IDE) from Microsoft for its COM programming model first released in 1991. Visual Basic is designed to be relatively easy to learn and use. Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects. The scripting language VBScript is a subset of Visual Basic.

A programmer can create an application using the components provided by the Visual Basic program itself. Programs written in Visual Basic can also use the Windows API, but doing so requires external function declarations.

The final release was version 6 in 1998. Microsoft's extended support ended in March 2008 and the designated successor was Visual Basic .NET (now known simply as Visual Basic).

ACKNOWLEDGMENT

The users can control their home appliances by touching the flex sensor and moving the MEMS sensor in either X or Y direction. By touching the flex sensor the light can be switched ON and OFF and by moving MEMS sensor the light can be switched ON and OFF. The flex and MEMS sensors are placed in the transmitter section. The level comparator compares the voltage from the sensors with the reference voltage and the output of the comparator is given to the transmitter. The transmitter encodes and modulates the signal and the signal is transmitted via the antenna

The transmitted signal is received by the receiver which is demodulated and decoded. This project is accomplished with PIC16F877A microcontroller. The microcontroller is used to control the appliances. It is coded using MPLAB tool software.

REFERENCES

[1] Amos, S. W.; Roger Amos (2002). Newnes Dictionary of Electronics, 4th Ed.. US: Newnes. pp. 76. ISBN 0750656425.
[2] S. Beeby, G. Ensell, M. Kraft, N.White, MEMS mechanical sensors (Artech house inc.,USA, 2004)
[3] F. Egan, William (2003). Practical RF System Design. Wiley-IEEE Press. ISBN 978-0-471-20023-9.
[4] Jerry C. Whitaker (23 December 1996). The electronics handbook. CRC Press. pp. 198–. ISBN 978-0-8493-8345-8. Retrieved 26 April 2011.
[5] Lawrence, Tony (1992). "Serial Wiring". A.P. Lawrence. Retrieved 28 July 2011.
[6] Ron Mancini, "Designing with comparators," EDN, March 29, 2001.