

Home Automation System Using Capacitive Touchscreen

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Abstract

Technology has been constantly evolving and with the advent of touchscreen in human life, devices are much easier and simple to operate. This work is mainly focused on building home automation system which is more user friendly and thus can be operated by anyone. Earlier home automation systems were completely mechanically operated and thus required a lot of maintenance and were costly also. Now that human and computer interaction has been developed into a more wide and sophisticated field, designing and operating of intelligence system has been more user friendly than ever. Home automation is a system that helps a user to operate switching various appliances and lighting devices from a single input. The touchscreen used as input is much simpler to operate. Touchscreen has been widely accepted as the most comfortable input to be provided to the user. Not only they are easy to operate but they also give a sense of personal involvement which the user always appreciate. The materials used in this system are easily available in the local market so that the touch screen system is cost effective.

Index terms: Touchscreen, pic microcontroller, interfacing, sensor

I. Introduction

Home automation can be extended to operate electrical appliances like HVAC (heating, air conditioning and ventilation) security system for gates and doors. Thus it provides a convenient, comfort and energy efficient centralized controlling of all the major electrical system at home. In our project we use touchscreen to operate only four electrical equipment and primarily concentrate on showing how touchscreen can be used for home automation system. Its application can be extended thereafter. Before touchscreen, computer based intelligence system usually used speech recognition technique, SMS based control system, etc. With speech recognition comes many complexities as it fails to recognize user speech many a times which is quite frustrating for a user. Sometimes even noise interfered with speech controlled system, so it cannot be used in noisy environment. Also SMS provided an alternative but to control each system we had to send an sms which is costly and if there is no mobile network, it fails to operate. So SMS based system totally depend on mobile network. These were the few reasons we thought of developing a home automation system using touchscreen. The system is fully computer controlled with touchscreen hardware. In this work we first focussed on interfacing touchscreen with pic microcontroller and then internal software development of microcontroller to control the external electrical appliances connected. In this project we use non volatile memory to save the current position of different appliances and remain same after power resume.

II. System operation

Our system has both hardware and software component. As such data collection is done in hardware and processing of data and subsequent controlling are done in the software and output circuit which are connected to electrical appliances.

2.1 Touchscreen

There are two types of touchscreen currently available in market: capacitive touchscreen and resistive touchscreen. We are using a capacitive touchscreen for our project. Capacitive touchscreen rely on electrical properties of human body to detect where and when the user touches. Thus it has the advantage that capacitive displays can be controlled with very light finger touches and generally cannot be used with gloves or mechanical stylus. These touchscreen have been widely used for cell phone industry.

A capacitive touchscreen has an insulator such as glass which is coated with indium tin oxide. Since a human body also acts as an electrical conductance, touching the screen results in a distortion of screen's electrostatic field, measured as a change in capacitance.

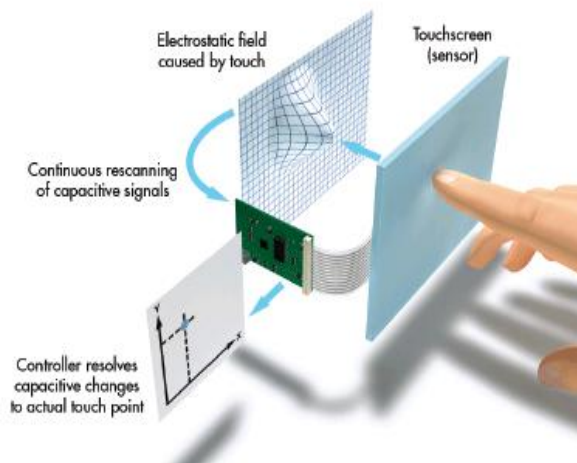


Fig. 1 capacitive touchscreen

2.2 Software development

The interfacing part is done with the help of pic 16f887. Since it has low price and wide range of application, high quality and is easily available, it is an ideal solution in applications such as: the control of different processes in industry, machine control devices, measurement of different values etc. Pic has internal a/d convertor which helps us to convert the analog coordinates from the touchscreen to digital so that it can be processed further. The x-y coordinates are supplied through 4 wires of touchscreen and the microcontroller process it to extract relevant information to determine whether a touch has occurred or not. This information helps us to determine the location of touch and make decision to send command to the output circuit.

2.3 Interfacing of output circuit

For designing the output circuit we have employed relays. Relay is a switch that opens and closes under the influence of another electrical circuit. Buffers and encoders are also used to give us better driving capabilities. Along with touch we use infra red remote also. We control all the appliances with the help of touch and remote at the same time. In this project we use RC5 remote. PIC microcontroller provides an internal 10 bit adc and non volatile memory to save the data . We use triac to vary the speed with zero cross detector. Triac is a power electronic component that can conduct in both directions when triggered through gate. On touch screen we mark some place for on/off and for speed control. For on off electrical appliances we use four space on touch screen. For AC load we use Triac as a main components.. For Triac control we use MOC 3021 driver IC. MOC 3021 provide a proper control signal from microcontroller. On touch screen we use increment and decrement button to increment and decrement the firing angle of the Triac. Whenever we use Triac driver for AC load we must need a zero

cross over logic. The circuit diagram for the touchscreen control home automation is given below in Fig. 2. Output signal is available on the pin no 37,38,39,40 of the controller. On this pin we use LED as a output. On this LED output we use relay also.

III. Result and observation

The proposed touchscreen showed high accuracy with the system responding at 96 times out of 100 i.e system having an accuracy of 96%. Also it was observed that the system responded 5 times with a lag. Thus the system worked at an accuracy rate much higher than expected.

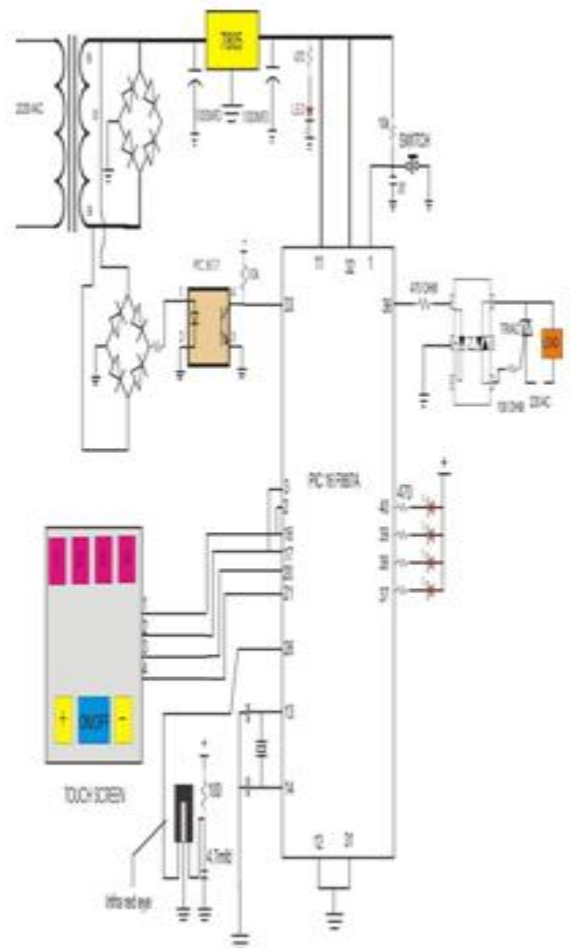


Fig 2. Circuit Diagram for Touchscreen Home Automation

IV. Conclusion

The proposed touchscreen and its interfaces are low cost and much easier to use than other input device. In this paper we have demonstrated how we can design a touchscreen to control the home appliances. The basic idea was to understand how touchscreen can be used as an input for controlling different electrical appliances at home.

In future we can improve this project with more flexibility along with more application based.

V. Acknowledgement

I would like to give my gratitude to everyone who helped us to complete this project.

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