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TOUCH SCREEN BASED INDUSTRIAL LOAD SWITCHING

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Abstract

This project is electrical load control in hazardous industrial environment with touch screen based switching system. Conventional switches produce sparks which is potentially dangerous for industries where inflammable gases are present. In such a scenario it is always advisable to go for a control system involving touch screen based switches. Owners familiar with the icon system appreciate touch screens that make industrial load control user friendly. This kind of system makes operations simpler and thus reduces errors.

In order to achieve this, a touch screen panel is interfaced to the microcontroller. By touching a specific portion of this module the loads can be turned ON/OFF. The microcontroller used here is of 8051 family. This kind of technology gives control over various loads thus providing comfort, security and efficiency for the users.

Further the project can be enhanced by using RF technology. A touch panel is connected to a RF transmitter. So, instead of using a standalone control unit, by using RF technology the switching of the loads can be done wirelessly.

Keyword: Touch screen, Automation, Interfacing, LCD and Microcontroller (MC).

Introduction

Our aims in designing completely automated switch with the help of touch screen sensor to control the industrial switching to operate the loads in industry effectively to provide a user friendly environment. It majorly aims in providing a reliable system in industry which reduces the human efforts.

Touch screen based devices can be easily reachable to the common man due to its simpler operation, and at the same time it challenges the designers of the device .These touch screen sensors can be used as a replacement of the existing switches in industry which produces sparks and also may results in fire accidents in few situations.[1]

Considering the advantage of touch screen sensors an advanced automation system was developed to control the industrial loads applications. The device consist of a microcontroller, which is input interfaced with the input and output modules, the controller acts as an intermediate medium between both of them. So the controller can be termed as a control unit. The input module is a touch screen sensor, which takes the input from the user and feed it to the microcontroller. The output module is the loads to be controlled.

In my circuit a touch panel is interfaced to the microcontroller which sends ON/OFF commands to the microcontroller where loads are connected .By touching the specified portion on the touch screen panel, the loads can be turned ON and OFF. The microcontroller used here is AT89S52, which is a typical 8051 microcontroller from the big family 8051, manufactured by ATMEL. The loads are interfaced to the microcontroller using the opto-isolators and triacs.

About touch screen based industrial load switching:

The main objective of this paper is to develop a automated industrial system with a touch screen based control panel.

As technology is advancing so industries are also getting smarter. Modern industries are gradually shifted from conventional switches to centralized control system, involving touch screen switches. Touch screen control panels are also designed for commercial, home automation, and medical system.

This automated industrial switch is the extension of

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"building automation" this system also include the comfort, energy efficiency and security.

Need of automation:

In future automation devices are the face to the world, which could do anything on instigation of a controller, but today it has become a reality.

An automated device can replace a good amount of human working force, moreover humans are more prone to errors and in intensive situations the probability to errors increased whereas, an automated device can work with diligence, versatility and with almost zero error. Replacing human operators in tasks that involve hard physical or monotonous work.

Replacing humans in tasks done in dangerous environments (i.e. fire, space, volcanoes, nuclear, facilities, underwater, etc). Performing those tasks which are beyond the capabilities of human efforts.

Economy Improvement:

Automation can help in improving the enterprise of economy, society or most of humankind. As an example we can say when an enterprise recovers its investment from automation technology.

That is why this paper is in the process of constructing and developing a system which involves hardware and software to control variety of electronic and electrical system.

Touch Screen:

Touch screen is an electronic visual device, which can be controlled by human simply by touch from one or more fingers. It can be also defined as the computer screen which work as input device. In touch screens, screens are pressure sensitive. Human touch the screen, on some specified picture or information and then screen reacts and gives result to the user. It provides a natural interaction between the user and the device which provide a greater result in business with the general public over traditional keyboards and mouse.

There are so many types of touch screens but in our system we have preferred resistive type touch screen, because it is comparatively faster and performs well than other touch screen types.[1]

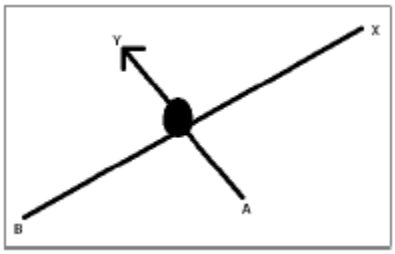

Figure 1:

Determination of XY-Coordinate of Touch screen:

A touch panel is a thin sheet or panel placed over a LCD screen. The touch panel is of resistive type so we ll be discussing resistive here:
Resistive type touch screen is consist of two flexible sheets coated with resistive material and separated by microdots and we can say by air. The two sheets are different type of metallic layers, one is known as "matrix" normally is of glass and second one is known as "Analogue" generally consist of transparent electrodes with no patterning facing each other.[1]

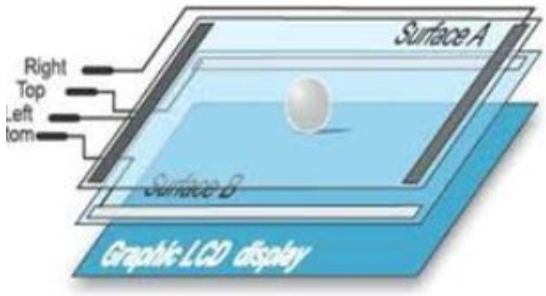

Figure 2:

Principle of Working

A resistive touch panel is consisting of two foils creating a sandwich and inside of these two foils there is a resistive layer. A resistance of a resistive layer should not be more than a 1KΩ. On the opposite direction of foils there are flat cables available to make contacts. The process of determining coordinates of that point which has been touched by user can be broken up into two steps. First step is to find X coordinate and second step is to find Y coordinates of the point been touched. To find out X coordinate it is necessary to connect the left contact on the X surface to the ground and the right contact with the power supply. This results in generating a voltage divider obtained by pressing touch panel. The value of the voltage divider can be

read from the bottom contact of the Y surface. The value will be ranging from 0V upto the power supply depending upon the X coordinate. If the point is closer to the left contact of X surface then value will be closer to 0V. In order to find out Y coordinate it is suggested to connect the bottom contact of Y surface to the ground and the upper contact to power supply. [1]

Interfacing of Touch screen with microcontroller:

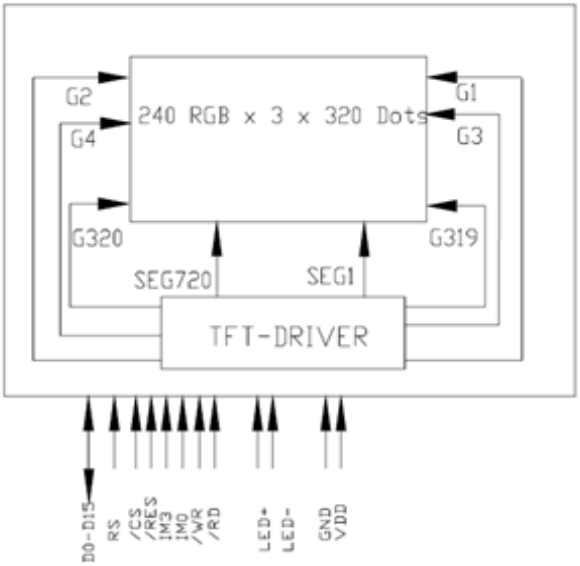

Figure 3:

SSD1289 TFT is all in one driver that integrated RAM, Power circuits, gate driver and source driver into a single chip. It can drive a 262k color a-TFT panel with resolution of 240 RGB×320. It also integrated the controller function and consists of up to 172,800 bytes. Graphic display data RAM such that it integrated with common MCU through 8/9/16/18-bit 6800- series/8080- series compatible parallel or serial interface and stored the data in the GDRAM. Auxiliary 18-bits video interface are integrated into SSD1289 for displays animated image. SSD1289 embeds DC-DC converter and voltage generator to provide all necessary voltage required by the driver with minimum external components. A common voltage generation circuit is included to drive the TFT–display counter electrode. An integrated Gamma control circuit is also included that can be adjusted by software commands to provide maximum flexibility and optimal display quality. SSD1289 can operated down to 1.16V and provide different power save modes. It is suitable for portable battery driven application requiring long operation period with compact size.[2][3]

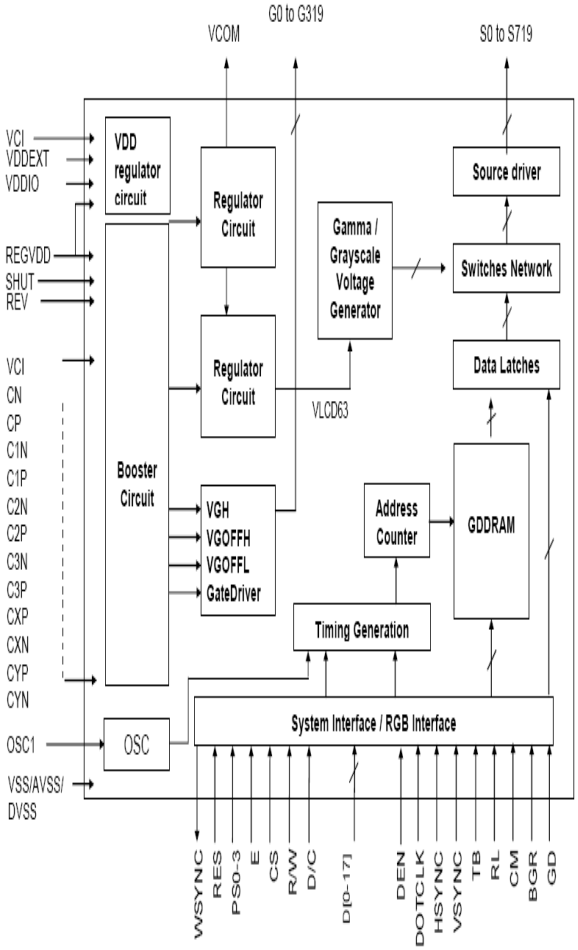

Figure 4:

PIC MICROCONTROLLER

- Very lean instruction set – only 35 instructions
- All instructions are single cycle instructions except the branching instructions which are two.
- Crystal frequency: DC – 20 MHz clock frequency DC – 200 ns instruction cycle

Analog Features:

- It has 8 channel 10- bit formatted A to D converter.
- There are two analog comparators
- Programmable on chip voltage references.
- Input and output voltage references
- Comparators outputs are externally accessible.[2]

CIRCUIT OPERATION

Connections:

The output of the power supply which is +5V is connected to the 40 pin of Microcontroller and GND is connected to 20th pin. RST button is connected to 9th pin and 18, 19 pin is connected with crystal of 11.059 MHz and 31 Pin is connected to +5V. Pin 1.0 is connected to pin no. 15 in touch screen. 2, 4, 6 and 7 pins of MC are connected to optoisolators pin no. 2**.** Pin 3, 4 and 8 of MC is connected to Graphical touch screen pins 17, 30 and 29 respectively. The first 8 data pins of Graphical LCD are connected to the port0 of MC to port2 of MC pins 21 to 28 respectively. 10, 11 and 14 pins of port3 are connected to 31, 33 and 34 pins of graphical touch screen respectively and 15, 16 and 17 pins of MC are connected to graphical touch pad pins of 4, 5 and 6 respectively. Load and AC supply are connected through the triacs and opto-isolators of the MC.

Working:

The main objective of the project is automation of the industrial loads using a graphical touch panel. In order to achieve this, a touch panel is interfaced to the MC. By touching the specified position of this module the loads can be turned on and turned off. When touch screen is touched anywhere, then the X coordinates and Y coordinates of that specific position is fed to MC, which specifies which loads is to turned ON/OFF. The AC loads is connected to MC through opto- isolators and triac. When any load has to switch ON respective opto- isolators pin 2 is given low from MC output port pin which makes LED to glow in opto. As the light falls on triac inside the opto IC the traic is getting triggered and it starts conducting and load is switched ON.

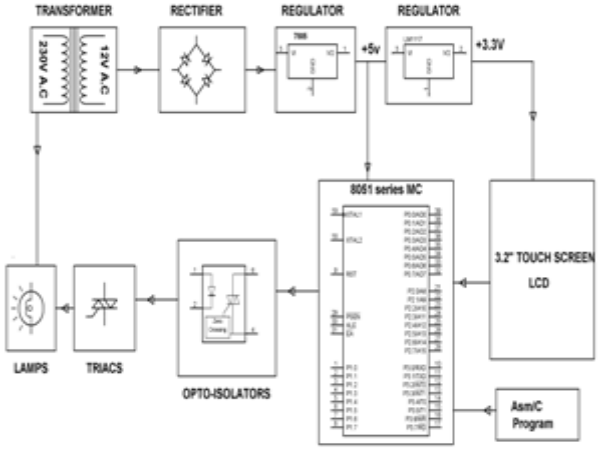

Figure 5:

CONCLUSION

Automation in industrial load integrates electrical devices to each other in any industry. This automation technique can lead our industry to a next level of technology. It can reduce the probability of losses that occurs in industry because of mishandling with industrial instruments. It is a reliable system which works with greater efficiency.

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