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A Smart Automatic Energy Saving System for Libraries and Institutions

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Abstract: **One stop solution for ever demanding energy requirement is quite difficult to achieve, but optimization and proper management of existing resources could be done quite smartly. There is need to understand those area and to innovate mechanism to short it out. Negligence has its significant contribution in terms of above mentioned problem. Libraries and institutions are the frequently visited places where the use of the electricity is much important to give the proper illumination and the comfort to the visitor, on the contrary the traditional use of mechanical switches adds on more power loss because of the ignorance. To overcome this power loss and maintain the proper illumination and comfort facility, a new algorithm has been developed as an intelligent Smart Automatic Energy Saving system with an LCD display using PIC16F72 which will first check the entry of a person to the room using PIR sensor, monitoring the room temperature and illumination of the room and based on this the illumination of the light and adjusting the speed of the fan to provide better comfort and environment for the reader and will save the over use of power by shutting down the complete system in the absence of individual in the room.**

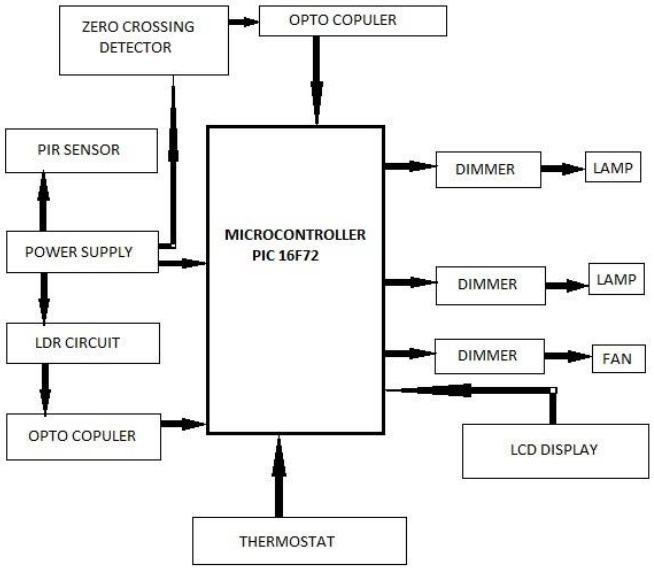
Keywords—one stop solution; optimization; negligence; schools and library; mechanical switches; powe loss; proper illumination; smart automatic energy saving system; LCD; PIC16F72; PIR Sensor; power saving

I. INTRODUCTION

Energy efficient campus buildings not only save money, but are also comfortable and have an abundance of natural light. These features contribute to a more effective learning environment [1], Mechanical switches have made the human comfort much tougher and has increased the negligence, maximum power loss has been observed for such cases which intern is adding a great shortage to the productivity and the development [2], an effort towards the automation is the one stop solution towards such negligence. The aim of this project is to save the energy or power used in important places like libraries and institutions where proper lighting is very essential for the people who come to read and write, several cases have been reported regarding the eye problem due to the inadequate facility of the light [3] and hence the room needs to be illuminated with proper lighting facilities of desired value. Caring these points a system named "**A smart automatic system** "has been developed which when detects a person entering the place. The LCD display will display a WELCOME message. Next will check the room lightening, and it takes the condition when the light is sufficient the lamp will be in OFF mode and when light is insufficient the lamp will be in ON mode adjusting the proper illumination. With the help temperature sensor the room temperature is measured and the speed of the fan varies according to the temperature of the temperature sensor. The LCD will display the room temperature in Degree Centigrade and the arrival of a person. The complete system shut down itself when a person leaves the room providing the smart automation and power saving system with the proper comfort to the visitors.

II. ARCHITECTURE

The entry of the person will be governed using PIR sensor which absorbs the black body radiation emitted by that person and activates it, the LDR sensor will check the lightning condition and a thermostat sensor will check for the room temperature



1. Block Diagram

Getting the information from both the situation of the lightning and the room temperature the microcontroller PIC16F72 a brain behind the system has been programmed in such a way that will adjust the proper illumination of the light and will control the fan speed as per the temperature variation of the room using a dimmer circuit.

A. Microcontroller

The PIC16F72 is a brain behind the entire system, it is an 8-bit single chip microcontroller with a powerful CPU optimized for the control applications. It also provides a significantly more powerful architecture, a more powerful instruction set and a full serial port.

B. Passive Infrared Sensor (PIR)

A PIR detector is a motion detector sensor that senses the heat emitted by a living body. These are very sensitive toward the living body switching the on automatically if approached and hence is used mostly for the security system.

C. Light Dependent Resistor (LDR)

As the name suggests an LDR sensor depends upon the light for the variation of the resistance, when light falls on it the resistance decreases. In the absence of light the resistance can be in the order of 10K ohm to 15 K ohm and is called the dark resistance

D. Digital Thermometer and Thermostat (DS1621)

The DS1621 Digital Thermometer and Thermostat provides 9-bit temperature reading which indicate the temperature of the device. The thermal output, TOUT is active when the temperature of the device exceeds a user defined temperature TH: The output is kept high until the temperature drops below user defined temperature TL, allowing the necessary hysteresis.

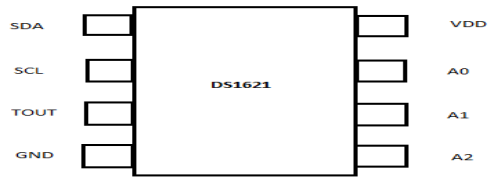


Fig D.1

E. Dimmerer

Dimmers are the devices used to vary the brightness of a light. By decreasing or increasing the RMS voltage (fig.E.2-4) and hence the mean power to the lamp it is possible to vary the intensity of the light output in terms of the luminance [4].

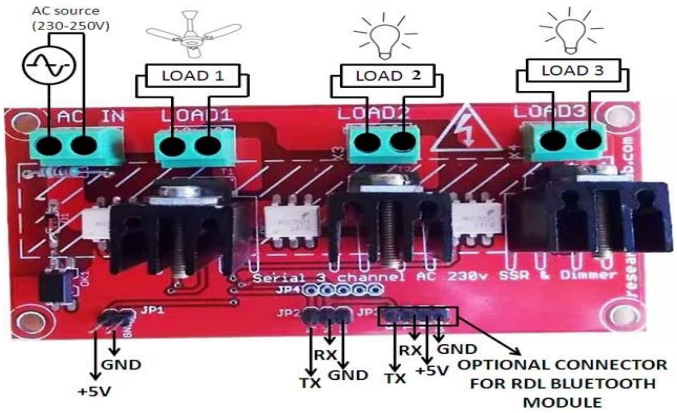


Fig E.1

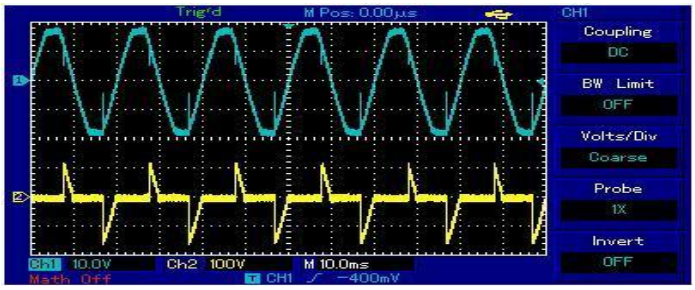


Fig.E.2

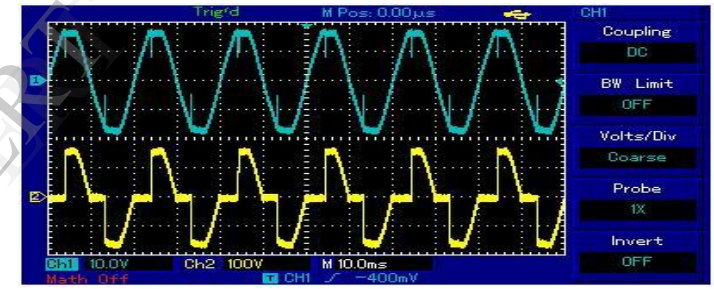


Fig.E.3

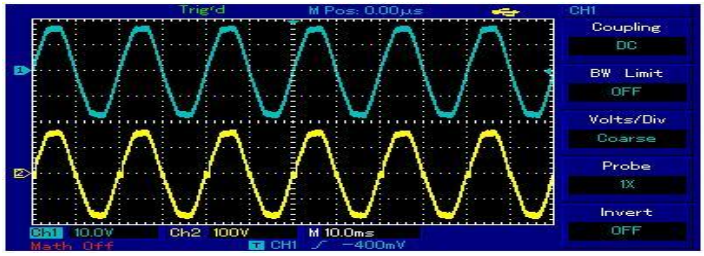


Fig.E.4

F. Power Supply

The block designed to power the entire systems with various units have been mentioned here

- Step down transformer.
- Bridge rectifier circuit.
- Input filter.
- Voltage regulator.
- Output filter.
- Indicator Unit.

III. ALGORITHM

The microcontroller is the central unit of the entire system that has been assigned for the entire task, the port of the controller has been programmed for the various processes through the various pins through PORT A, B, C, and D used by the microcontroller16F72.

PORT A: Port A can act as both input as well as the output port. It has 6 pins (A0-A5). In these A0 is connected to the Dimmer1,A2 is connected to Dimmer , A3 to Dimmer 3 and A4 is connected to the Zero Crossing Detector (ZCD) output.

PORT B: Same as the Port A this port can also act as the both input and the output port. It is having 8 pins (B0-B7).In these B1 is connected to the register selection pin (R/S). B2 is connected to read/write (R/W) and B3 pin is connected to enable pin.

PORT C: Port C can also act as both the input and the output port. It is having 8 pins (C0-C7). In these RC3 and RC4 is connected to the thermostat pins. A 12M Hz Crystal Oscillator is connected in between 9th and the 10th pins of the microcontroller. Reset pin is connected to the pin number1 i.e., MCLR/VPP.

8th and the 19th pins are connected to ground (Vss).

1. I2c (master, sda=PIN_C4, scl=PIN_C3)
2. Int temph, templ
3. Define ZCD PIN=A4
4. Define PIR PIN=B0
5. Define LDR PIN=A2
6. Define Dimmer1 PIN=A0
7. Define Dimmer2 PIN=A1
8. Define Dimmer3 PIN=A2
9. If (! input (PIR)))
10. Output high (Dimmer1)
11. Loop ()
12. If (temph>=27 && temph<=28)
13. Templ=5
14. Back25, 26, 27 if (! input (zcd)) goto back 25, 26, 27
15. If (temph>=29 && temph<=31)
16. Back 20, 30, 32 if (! input (zcd)) goto back 20, 30, 32
17. If (temph>=31 && temph<=33)
18. Back 9, 10, 11 if (! Input (zcd)) goto back 9, 10, 11
19. If (temph>=33 && temph<=35)
20. Back 12, 13, 14 if (! Input (zcd)) goto back 12, 13, 14
21. If (temph>=35 && temph<=37)
22. Back 15, 16, 17 if (! Input (zcd) goto back 15, 16, 17
23. Output high (dimmer2, 3) if (input (ldr)
24. Output low (dimmer2, 3) if (! input (ldr)
25. Loop ()

For thermostat:

26. I2c_start ()
27. Temp_read (predefined as per the user)
28. I2c_stop ()

IV. CONCLUSION

This paper has thus proposed the idea of saving the energy at the most important places like Libraries and institutions taking care of the eyes for the various available lightning condition as the complete system starts by detecting the presence of human during the entrance and executing the various required processes of maintaining the intensity of light based on the presence of light inside the room and controlling the fan simultaneously based on the nearby temperature at the predefined temperature till the presence of the human inside and once the presence of the person is zero the complete system automatically switches off and hence saves the power loos and reduces the human involvement, therefore making the system intelligent.

ACKNOWLEDGEMENT

Idea comes from experience and observation which is the contribution from the experienced persons. Getting through the idea and bringing it to reality is a difficult job without the hand of the special persons who are always eager to help and ready to impart their knowledge, I thank **Mr.Srijan Chaurasiya (**Designation**: R&D** Engineer**, E.Code: SSTRN 073, SOFCON INDIA PVT. LTD)** for his contribution and guide throughout the generation and execution of this project.

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