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Model of Efficient Power Saving System Using Atmel

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ABSTRACT
In this work, we are interested in developing a prototype of smart room for energy saving. The prototype uses MCS 51 family microcontroller, IR sensors/LDR (Light Dependent Resister), 16X2 LCD (Liquid Crystalwith various sensors such as a temperature sensor, infrared sensor to control the lights, air conditions, as well as the fans appropriately etc. It detects the number of people in a room, adjusts a proper temperature for the air condition, turns on the fan if needed, and turns on and off the light appropriately. The simple measurement shows that using the sample prototype can save the electricity cost for every test case. The main aim of this paper is to design and employ of power saving in general public places like auditoriums, shopping malls, homes, offices and theatres.

Keywords-components MCS 51 Family Microcontroller (AT89S52), IR (infrared) sensors, LDR, LCD display, temperature sensor LM35.

INTRODUCTION

Today power/current is a most valuable thing in the world. So we have to save the power to give for our next generation. Automatic controlling systems are preferred over manual controlling. The design of power controlling and saving project can handle controlling of electrical and electronic devices, appliances etc. Through this project we are tried to show a smart way to control the power consumption and power saving in Auditoriums, Shopping malls, Rooms, Hospitals and Theatres etc. We employ the embedded microcontroller in our prototype and have a program to control the usage of electric appliances in the Room. Though it is not a novel idea in overall, it is a good start to show the employment of embedded system with the intelligent technique for building a smart room is not too complicate to be realistic. In fact, it can inexpensively be built while many existing commercial software is costly. Also, with the prototype, it is quite easy to show the cost saving using the proposed prototype.

PROPOSED METHODOLOGY

A creative approach is proposed to save the power consumption of electrical appliances generally used in the room like fan, bulb and ac. . It can be also use for the security system in auditorium , rooms, hospitals etc. This work is to control an automatic fan, light, heater regulation with temperature.

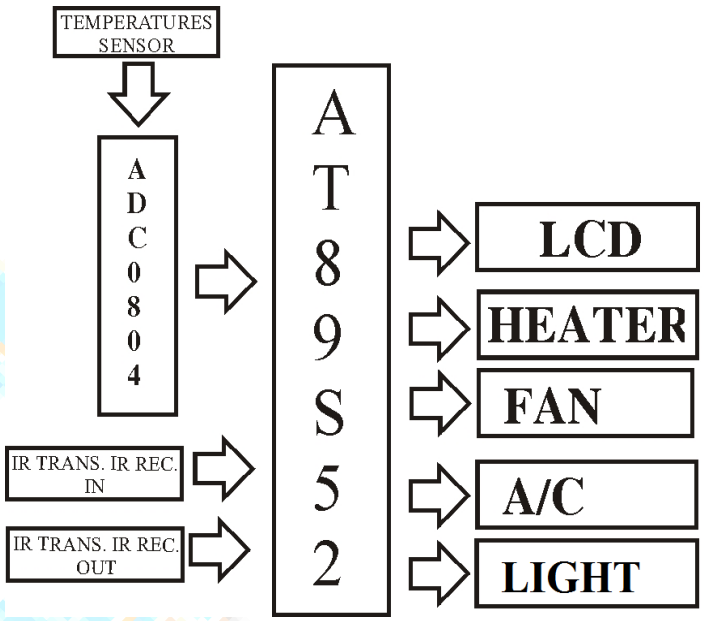


Fig1: Block Diagram of Proposed System

In the above system consists of different components with different functions. All the connections are performed on PCB using 40 pin microcontrollers AT89S52 .Temperature sensors uses analog input which takes place conversion through ADC and act as digital input for the microcontroller through this only the electrical appliances may get operated. DC main function is to convert analogy to digital signals.IR (infrared) sensors main function is to transmitting and receiving data.

OPERATION

The two IR sensors/LDRs are directly connected to the microcontroller. The output of the two sensors is applied as a high pulse and low pulse. These high and low pulses are considered as „set – 1" and „reset – 0 ". And this conditions are checked by the microcontroller as per the written code/dumped code in it. The code/program is written in C language. The IR sensor reads/counts the no. of persons enters into the room. Then lights, fans, other electronic and electrical appliances are switched ON automatically, as per the average temperature. In this project we illustrated the concept with ac, fan, and light heater. If no. of persons are enters in room, by that only devices should goes ON. If the no. of persons are entering into room is increased then automatically temperature changes then all devices will function accordingly. In the same way the IR sensor sense/counts the no. of persons leaving from the room. If no person in room then all the devices should OFF. This is done by microcontroller switching without having any human interference. So using this electronic circuit we can reduce 99% human efforts in controlling the all appliances in room. While doing this operation the circuit is able to display the no. of persons in room on the 16x2 LCD display.

Microcontroller The Intel MCS-51 generally called as 8051 is Harvard architecture, single chip microcontroller which was developed by Intel in 1980. Intel's original MCS-51 family was developed by using NMOS technology, but later versions were CMOS technology. CMOS chips consume less power than NMOS chips. The important features of MCS-51 family microcontrollers:

1. Central Processing Unit
2. Random Access Memory
3. Read Only Memory
4. I/O Ports
5. Interrupt pins
6. Timers
7. Counters
8. Serial controls pins (UART)

ATMEL Microcontroller:

AT89S52 The AT89S52 is a 40 pin, 24MHz, low-power, high-performance CMOS 8-bit micro-controller.

Features

- Compatible with MCS®-51 Products
- 8K Bytes of In-System Programmable (ISP)
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock • 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines • Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag
- Fast Programming Time
- Flexible ISP Programming (Byte and Page Mode)

SYSTEM HARDWARE

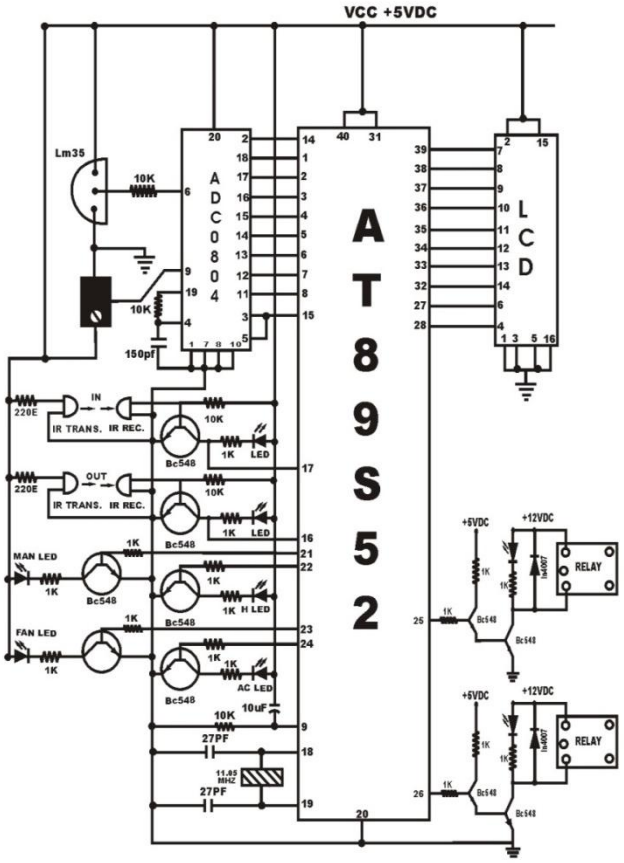


Fig 2: Circuit Diagram of proposed system

By the analysis circuit diagram of the power saving system, start with the microcontroller which is basically 40 pin integrated circuit through these pins many components are connected such as LCD connected to pin 27 to 39 pins. Power supply of the micro controller is connected to 31 & 40 pin. Here we are using ADC0804 it is 20 pin integrated circuit which helps in conversion of signal which further helps in programming the microcontroller LM35 temperature sensors are connected to the ADC with 1 terminal

connected through the ground, with further connection with the voltage regulator which main function is to control the voltage. Here the led of different component's connected to the transistors (BC548) to the different pins of microcontroller. Weuse many passive elements such as addition led, resistors, capacitors for perfect process of the system.IR sensors having the function to sense the signals in the surrounding areas these are used for transmitting and receiving the data to the microcontroller. Relays connected to the 25 &26 pins which helps in control the power at the system. All the above connections are done with using very precise frequency with the known parameter crystal oscillator. These are done under the general PCB. The programming is in the c-language which can be done with the help of software known as Keil which uses the code in the hex file for proper compilation in the microcontroller.

CONSTRUCTION DETAILS OFPROJECT

This power saving system having following operation techniques which can understand by mainly 3 steps: - In door lock system we use the concept of 555 timers. It mainly consists of 5 Timers, IN which one timer completely depends upon the previous timer and the 5^{th} timer is used for the security purpose through the cellular device. After the completion of the lock system door will open with the help of dc motor.
Temperature sensors help in sensing the average temperature of the room which is displayed on LCD. By this operation of appliances can be controlled. We also used relays for the control of voltage in the system.so many components are connected to the microcontroller on the PCB. Other part of project consists of a room which is divided into various cabins. There is a sensor applied under each seat of a cabin which senses whether the person is sitting or not. If the person doesn't comes after a time interval as set by the timer then the lights automatically are switched off.

RESULTS AND DISCUSSIONS

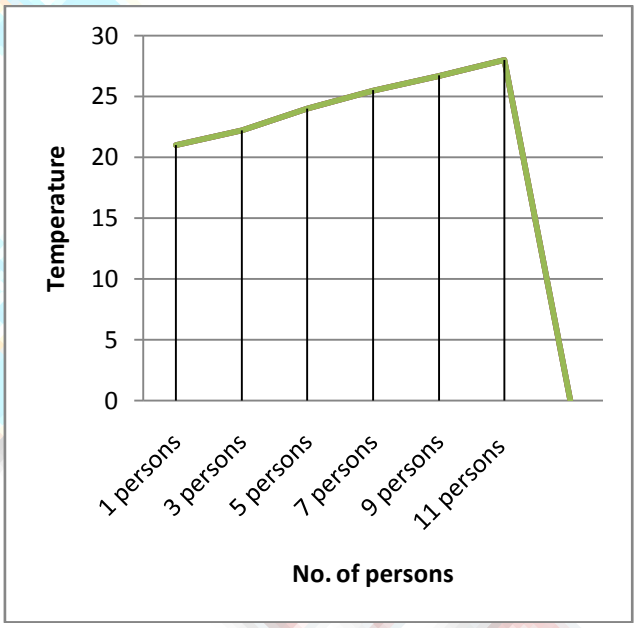
We compare the usage of the electric appliances with our control and the baseline usage where the electric appliances are used for a day.
Table 5 is the status of the fan speed using the tested fan controller. The first column 'temp' shows the current temperature. The second column '#per' is the number of persons in the room. The next column 'Fan Speed no' is the fan speed setting after using the fuzzy controller .The last column 'Fan Speed No.(Aft. Rounding)' shows the value after rounding to the closest integer to send the fan speed controller.

Table 1 Results for Temperature Control Testing

temp)°C(	# per	Fan Speed no.	Fan Speed No. (Aft. Rounding)
28.45	1	1.14	1
29.44	3	1.24	1
30.00	5	1.3	1
25.00	7	1.4	1
36.00	1	1	1
33.33	3	1.63	2
33.33	5	1.63	2
35.60	4	1.86	2
29.55	10	2.25	2
34.66	6	1.96	2
34.33	10	2.73	3
32.77	12	2.57	3
35.00	9	2.71	3
30.00	13	2.6	3
27.00	14	2.8	3
32.44	15	3	3

In Table 1, Column '#per' presents the number of total people in the scenario. Column 'person per room' is the number of person per each room. Column 'room A light switch' is the status of each light switch for each test case. Column 'Fan and air condition' presents the status of the fan and the air condition in each room. The total watts used are shown in column 'total watts used' and the total cost each case is shown in Column 'total cost'.

As a whole, we can see that using the prototype can save the electricity cost for every case. This demonstration shows that the smart home can be built easily with simple software and controllers from scratch and how we can earn the energy saving by introducing such automation.



CONCLUSION:

Energy saving is an important issue nowadays. This paper presents the building of the simple smart room prototype using a microcontroller. The model is created for the room floor plans. The temperature sensors are put in the rooms and infrared sensors are put at the door and chairs. The LED setup shows the output of the fan speed controls and light switch. The databases of the electric appliances are created. The software shows the status of the people in the rooms and temperatures. The microcontroller program determines the lights to switch on/off and the fan speed setting. Finally, the total watts used can be estimated and the user knows the electricity cost in real-time. The prototype with the simple automation can save the energy cost in all most cases.

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