Design of Smart Power Controlling and Saving System in Auditorium by using MCS 51 Microcontrollers

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Abstract
The main aim of this paper is to design and employ of power saving in general public places like auditoriums, shopping malls and theatres etc. Generally an Auditorium consists of so many number of electrical and electronic devices or equipments. To control and monitor all these equipments or appliances we need a person or controlling system. In this paper we are presenting the working of smart power controlling and saving in auditoriums, shopping malls, theatres etc., by using an electronic circuit in an easy way without having human being. This paper describes the complete working of electrical and electronic devices with automatic control and also power saving in theatres, shopping malls and auditoriums. To implement this we have used MCS 51 family microcontroller, IR sensors/LDR (Light Dependent Resister), 16X2 LCD (Liquid Crystal Display). MCS 51 family Microcontroller is used to control the total operation. The MCS 51 family microcontrollers are famous for these types of projects.

Keywords-components LCS 51 Family Microcontroller (AT89S52), Ultrasonic sensors/IR sensors, LDR, LCD display, ULN driver, relay and AC/DC loads.

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 and Theatres etc. Now in all cities/areas we have shopping malls, theatres and auditoriums. In this monitoring and controlling the appliances becomes very typical to human being. If less number of persons enters in the auditorium then no need to switch on all the devices in that. If they on it is waste of power. If maximum persons are in that we need to ON all the devices without fail. This is too hard to maintain properly and manually. If suddenly any problem arise, it is very difficult to find out. To overcome these types of problems we are developed a system that can maintain all these ricks. This paper covers the features of capacity of monitor, hardware description, the use of different types of sensors.

Technology
The technology behind this project is microcontroller. It is the bedrock of the system. The microcontroller a different type of integrated circuit is a complete computer on a chip, containing all the elements of the basic microprocessor along with other specialized functions like serial communication, interrupts, timing circuit ROM (data memory), RAM (program memory). Basically a microcontroller is a computing device, and is a single integrated circuit (“silicon chip” or IC) used to form part of
a product that incorporates some software program control. As a microcontroller is basically part of a computing system it can be used in applications requiring control, operator and user display generation, simple sequencing and many other mundane tasks.

**Main blocks of the functional diagram**

**Power supply unit**

![Fig.2](image)

In this circuit we have used a step down transformer which can convert from 240V to 12V ac-ac, the output of this is connected to full wave/bridge rectifier (four 1N4007 diodes) which converts ac voltage to dc voltage with ripples (ac component). Further it is connected to capacitor acts as filter to filter the ripples. And here we connected a voltage regulator 12-5v LM7805, then it is applied to capacitor and then LED to indicate the power.

**IRsensor LED/LDR**

An infrared sensor LED is an electronic device that emits or detects infrared radiation to sense aspects of its surroundings. TSAL6200 is a high efficiency infrared emitting diode in GaAlAs on GaAs technology, molded in clear, bluegrey tinted plastic packages. In comparison with the standard GaAs on GaAs technology these emitters achieve more than 100 % radiant power improvement at a similar wavelength. The forward voltages at low current and at high pulse current roughly correspond to the low values of the standard technology. Therefore these emitters are ideally suitable as high performance replacements of standard emitters. The features and operation circuit of IR- TX and IR – RX is shown if fig.4

- Extra high radiant power and radiant intensity
- High reliability
- Low forward voltage
- Suitable for high pulse current operation
- Standard T-13A (Ø 5 mm) package
- Angle of half intensity $\phi = \pm 17^\circ$
- Peak wavelength $\lambda p = 940$ nm

Instead of IR sensor we can use LDR as a sensor. LDR’s or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

**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 microcontroller.

**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)

**Pin description of AT89S52**

- VCC: Supply voltage
- GND: ground
- Port 0: Port 0 is an 8-bit open drain bidirectional I/O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as
high-impedance inputs. Port 0 can also be configured to be the multiplexed low-order address/data bus during accesses to external program and data memory. In this mode, P0 has internal pull-ups.

Port 0: Port 0 is a 16-bit bidirectional I/O port with internal pull-ups. The Port 0 output buffers can sink/source four TTL inputs. When 1s are written to Port 0 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 0 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. In addition, P1.0 and P1.1 can be configured to be the timer/counter 2 external count input (P1.0/T2) and the timer/counter 2 trigger input (P1.1/T2EX), respectively, as shown in the following table.

Port 1: Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs.

Port 2: Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs.

Port 3: Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs.

<table>
<thead>
<tr>
<th>Port Pin</th>
<th>Alternate Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3.0</td>
<td>RXD (serial input port)</td>
</tr>
<tr>
<td>P3.1</td>
<td>TXD (serial output port)</td>
</tr>
<tr>
<td>P3.2</td>
<td>INT0 (external interrupt 0)</td>
</tr>
<tr>
<td>P3.3</td>
<td>INT1 (external interrupt 1)</td>
</tr>
<tr>
<td>P3.4</td>
<td>T0 (timer 0 external input)</td>
</tr>
<tr>
<td>P3.5</td>
<td>T1 (timer 1 external input)</td>
</tr>
<tr>
<td>P3.6</td>
<td>WR (external data memory write strobe)</td>
</tr>
<tr>
<td>P3.7</td>
<td>RD (external data memory read strobe)</td>
</tr>
</tbody>
</table>

Interrupts
The AT89S52 has a total of six interrupt vectors: two external interrupts (INT0 and INT1), three timer interrupts (Timers 0, 1, and 2), and the serial port interrupt. The main circuit diagram or schematic of this paper is shown in figure 6.

Circuit Operation
The two IR sensors/LDRs are directly connected to the microcontroller pin P0.0 and P0.1. The output of the two sensors are 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 assembly language. The “ENTRENCE” IR sensor reads/counts the no. of persons enters into the auditorium/shopping mall/theatre. Then lights, fans, other electronic and electrical appliances are switched ON automatically, as per the count given in the program/code. In this project we illustrated the concept with one ‘ac’ bulb and two ‘dc’ fans. If less no. of persons are enters in auditorium, only one device should goes ON. If the no. of persons are entering into auditorium is increased then automatically the remaining all devices goes ON. In the same way the “EXIT” IR sensor sense/counts the no. of persons leaving from the auditorium. If one by one leaves from auditorium then automatically the devices in that goes OFF one by one.

If no person in auditorium then all the devices should becomes 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 auditorium. While doing this operation the circuit is able to display the no. of persons in auditorium on the 16x2 LCD display. If the auditorium does not have any person then it displays
“AUDITORIUM empty”. If any person enter in to auditorium it is sensed by “ENTRENCE IR Sensor” and displays the no. of persons are in auditorium. If the auditorium is full then LCD display shows the message “AUDITORIUM full”. So by implementing this concept we can control the wastage of the power in such type of areas.

Software
Keil was founded in 1982 by Günter and Reinhard Keil, initially as a German GbR. In April 1985 the company was converted to Keil Elektronik GmbH to market add-on products for the development tools provided by many of the silicon vendors. Keil implemented the first C compiler designed from the ground-up specifically for the 8051 microcontroller. Software used for this concept is “Keil µversion”. Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports ASM language code, C language code, Object code file. The graphical window of “Keil” software is shown in figure.

Results and discussions
The concept of power saving through this paper will help us to implement real time applications and industrial. We implemented and observed the results of this project for 120 people capable room, and consume maximum 35 Watt power. The experimental chart is shown in figure.

Conclusion
In this paper we have developed a real time model that can control and monitor the complete status of all appliances of any place like auditorium, shopping mall, theatre, school, college, bus stand etc automatically without having human interference. So that there is a chance to reduce the power wastage and human efforts. An automated auditorium can be a very simple grouping of controls, or it can be heavily automated where any appliance that is plugged in to electrical power supply is remotely controlled. It monitors the entrance and exit s of the auditorium so that we need not to check manually. This system has a lot of advantages such as simple structure, small size, low power consumption, low cost and stable.

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