

Zigbee Sensor Based Automatic Room Light Controller with Visitor Counter

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Abstract: The purpose of this paper is to propose an automatic control system of Room light with Energy Saver. In this paper a model of Energy Saving Room light control system is developed with respect to number of person inside that entity. An energy saving light switch included a human actuable switch, visitor counter and IR sensors to control the circuit and make responsive. Its architecture is designed in such a manner that it can reduce power consumption and make the room controllable easily by IR remote control arrangement. The room structure designed is consist of automatic standby power cut-off outlets, a ZigBee Sensor a and dimming light system. The ZigBee sensors used as a of switches for the power outlet and the controlling the dimming light system. In the designed room ZigBee sensors turns on the power outlet and dims the light.[1] Designed architecture allows a person to control the power outlet and the dimming light with one IR remote control system in the energy-saving room.

Keywords: light control system, an IR remote control, ZigBee Sensor, automatic room architecture, Visitor Counter

I.INTRODUCTION

Energy conservation can be achieved by various efficient energy utilizing schemes, in those cases energy use is decreased by achieving an optimized outcome, or by reduced consumption of energy services. Electrical energy conservation is an important element of policy, which may result in increase of financial capital, environmental value, reduction in the energy demand per capita and thus affects some of the growth in energy supply needed to keep up with population growth. Due to this reduction in the rise in energy costs is possible, and can be reduce the need of new power plants,. The reduced energy demand can provide more flexibility in choosing the most preferred methods of energy production. A model is a reliably designed that takes over the task of controlling the room lights as well us counting number of persons/ visitors in the room very accurately. When somebody enters into the room then the counter is incremented by one and the light in the room will be switched ON and when any one leaves the room then the counter is decremented by one. The light will be only switched OFF until all the persons in the room go out. The total number of persons inside the room is also displayed on the seven segment displays. The limitation is here that availability of no of person present in the room is limited or when this no become equal to the availability

entry of a person is closed until or unless exit door counter not display a exit of a person. The microcontroller does the above job in much synchronized manner. Signals are received from the sensors, operated by the software whose whole programing is stored in ROM. in this circuit Microcontroller AT89S51 is used which continuously observe the Infrared Receivers, Any object when pass under the IR Receiver's then it obstructed the IR Rays falling on the receivers .this obstruction is monitored by the Microcontroller

II. BLOCK DIAGRAM

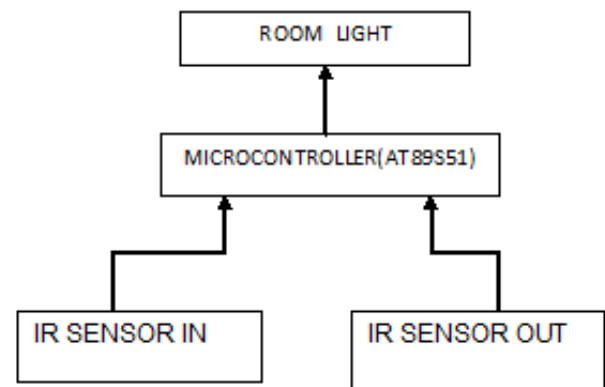


Fig 1: Basic block diagram[3]

The basic block diagram of the zigbee sensor based automatic room light controller with visitor counter is shown in the figure. This block diagram consists of the following sub blocks.

A. Power Supply

There are many types of power supply. Generally most of them are designed to convert high voltage AC supply to a suitable low voltage supply for proposed circuits and other devices. regulated power supply is needed for all digital circuit , A power supply can by studied as a

combination of several blocks, each of whom designated to performs a specific function.

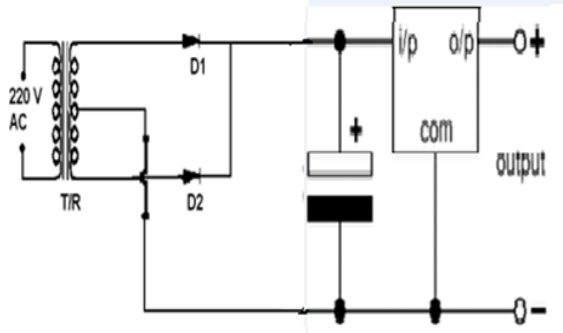


Fig 3: Circuit diagram of power supply[4]

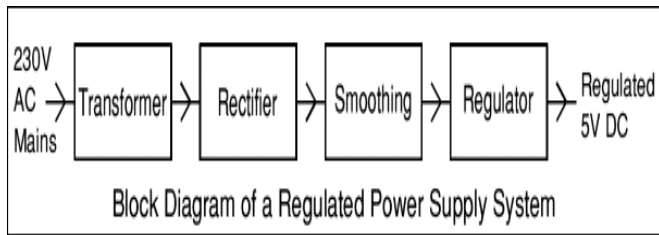


Fig 4: Block Diagram of Power Supply[4]

B. Microcontroller AT89S52

In the proposed system Microcontroller AT89S52 is used which is a high-performance using low-power, CMOS 8-bit microcontroller with programmable Flash memory in association of 8K bytes of in-system. The device is manufactured using Atmel’s high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. A 8-bit CPU is combined with in-system programmable Flash on a monolithic chip, the microcontroller Atmel AT89S52 is very powerful which gives a highly-flexible and economic solution to many embedded controlling applications. [5]The AT89S52 have some standard features like 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

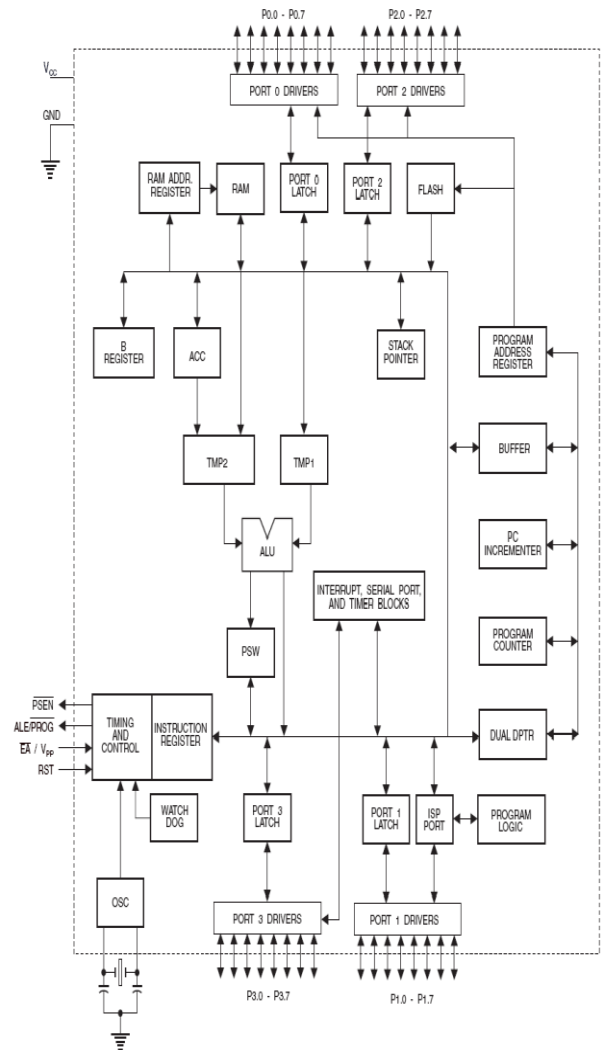


Fig 5:Block Diagram of Microcontroller89s52[5]

C. Infrared (IR)Sensors

is an electronic device measures infrared light radiating from various objects in its specific range of view is known as Infrared(IR) sensor that. IR-based motion detectors are oftenly constructed by using IR sensors . Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.

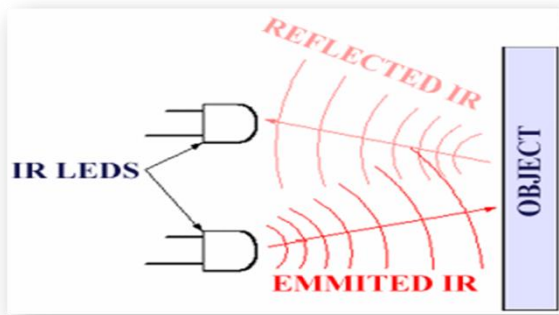


Fig 6: General Diagram of IR Sensor[7]

Generally all objects emits radiations which is known as black body radiation.or usually infrared radiation which is invisible to the human eye but can be observed by electronic devices(Sensors) designed for such a required purpose. IR device does not emit an infrared beam but merely passively accepts incoming infrared radiation. The IR sensor is often made as part of an integrated circuit (IC) and may be consist of one , two or four 'pixels' of equal areas of the pyro electric material.

D.I R Transmitter & Receiver:

This kit consists of two separate units. The transmitter and receiver for this purpose kit contains two IR LEDs, at both end . An infrared emitter is a type of LED which is made by gallium arsenide, and emits infrared radiation at about 880nm.

IR sensitive photodiode detector are used at the receiver unit. The infrared phototransistor work as a transistor whose base voltage is determined by the light falling on the transistor. It acts as a variable current source. greater currents flow through the collector-emitter leads due to the greater amount of IR light .As shown in the figure 7, the phototransistor is connected in a similar configuration to the voltage divider. The variable current passing by the resistor creates a voltage drop in the resistor.[6]

The device works best when the distance between the sensor and the reflective surface is small and well shielded from ambient light and . IR reflector sensors are generally used to detect black and white surfaces. Black surfaces generally reflect poor while White surfaces reflect well.

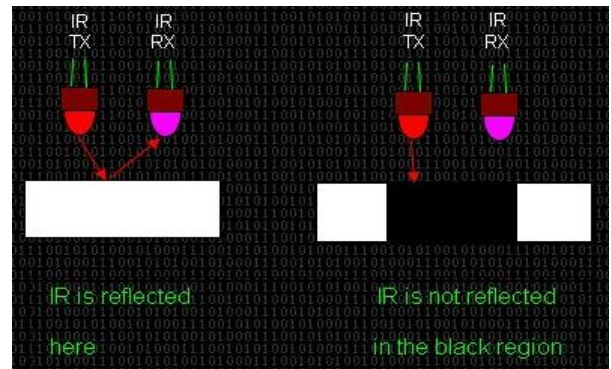


Fig 7: Working Diagram of IR Tx-Rx[7]

E. Crystal Oscillator

It is an electronic circuit based device which uses mechanical resonance of vibrating material (piezoelectric crystal) to generate an electrical signal with a precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters/receivers.

A crystal is a solid in which the constituent atoms, molecules, or ions are packed in a regularly ordered, repeating pattern extending in all three spatial dimensions. Generally any object made by an elastic material can be used like a crystal with appropriate transducers ,due to the fact all objects have natural resonant vibration frequencies.

The responsible factors for resonant frequency are size, shape, elasticity, and the speed of sound in the material. A crystal of quartz when properly cut and mounted, can be prepared to distort in an electric field by applying a voltage to an electrode near or on the crystal, this property is known as piezoelectricity. After the removal of field, the quartz will generate an electric field and it returns to its previous shape.

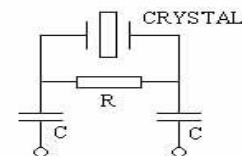


Fig 8: Symbol of Crystal Oscillator

III.CIRCUIT DESIGN

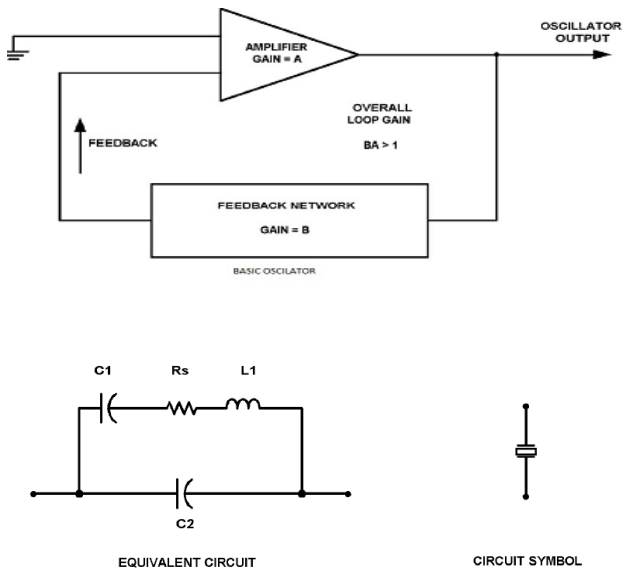
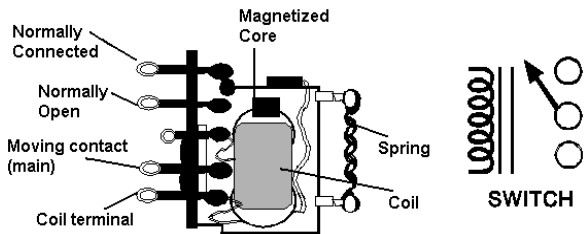


Fig: 9-diagram of crystal oscillator[9]

F. RELAY

Relay is a common, electromagnetic device which consist of an electromagnet made from an iron rod which wound with number of fine copper wires. When electricity is applied to the wire, the rod becomes magnetic. Above the rod a movable contact arm is pulled toward the rod until it makes switch contact closed. When the electricity is off, the contract arm pulled away from the rod by a small spring until it closes a second contact switch. With the help of relay, a current circuit can be closed in one circuit. Relays can have several poles and contacts. The contacts of relay could be normally open and normally closed. When normally closed occurs the relay can turn on similarly normally open can turn off the closed contacts. there is requirement of a current in a relay through their coils, for which voltage is applied. This voltage for a relay can be D.C. low voltages up to 24V or could be 240V a.c.

Fig 10: Relay



Circuit diagram of project is shown in figure 11. The diagram a show how is the project objective has been achieved. As per schematic diagram 2.54mm pitch header is provided for all port pins for flexibility. So input & output device connection can br changed as per requirement. Here microcontroller AT89S52 is preferred. Pin P3.2(pin 12) is connected to output of enter sensor receiver circuit & P3.3(pin 13) is connected to exit sensor circuit. seven segment display is connected and interface with circuit port 0 & from P1.7(pin 8)& P1.6(pin 7) control signal is recived. Relay interface circuit is connected with P1.5 (pin 6).

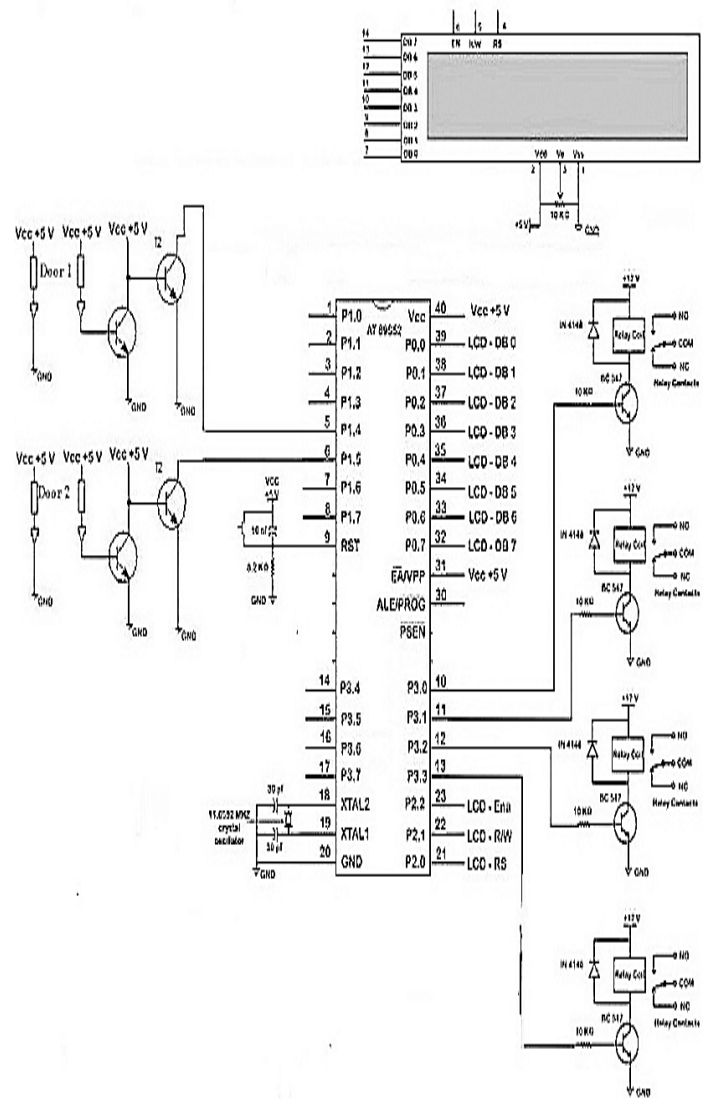


Fig 11: Circuit diagram

IV. WORKING

The control circuit works in a first timed mode in which for a predetermined period of time the light is turned on, responsive to an initial switch actuation and operates the light in a second untimed mode in which for an indefinite period of time light is turned on that also responsive to the actuation of the switch during a predetermined time window forming a portion of the predetermined time. When somebody just about to enters the room at door, IR Sensor located at entrance senses the person and transmit the signal to the Microcontroller due to this the counter is incremented by one and the room light become e switched ON. Number of person entered in the room and no. of devices switched ON (according to the presence of persons) continuously displayed on the LCD. When any one leaves the room SENSOR placed at exit door senses the person and transmit the signal to the Microcontroller then the counter is decremented by one. The light will be only switched OFF until all the persons in the room go out. The total number of persons inside the room is also displayed on the LCD. The microcontroller does the above job. It receives the signals from the sensors, and this signal is operated under the control of software which is stored in ROM. In summarized way it can be said that Microcontroller AT89S52 continuously monitor the IR Receivers, when any object pass through the range of IR Receiver, IR radiation falling on the receivers is obstructed, this obstruction is sensed and signal is transmitted to the Microcontroller which further conveyed it to forward. The automatic standby power cut-off outlet also monitors the power consumption of the outlet and completely cut off the power supply when the monitored power value is below the threshold period Based on the Zig Bee sensor properties.

V. LCD INTERFACING

A liquid crystal display (LCD) is a thin, electronic flat visual display which uses the modulating properties of liquid crystals (LCs) irrespective of light. LCs do not emit light directly. LCDs are classified as "passive" displays due to the need of a light source and. Some different types of LCD uses ambient light such as room lighting or sunlight. LCDs are designed for both special and general uses. They can be use for static text, detailed still images. At present LCD is finding widespread use replacing LEDs because of the declining prices of LCD. The ability to display numbers, characters, and graphics. Ease of programming for characters and graphics

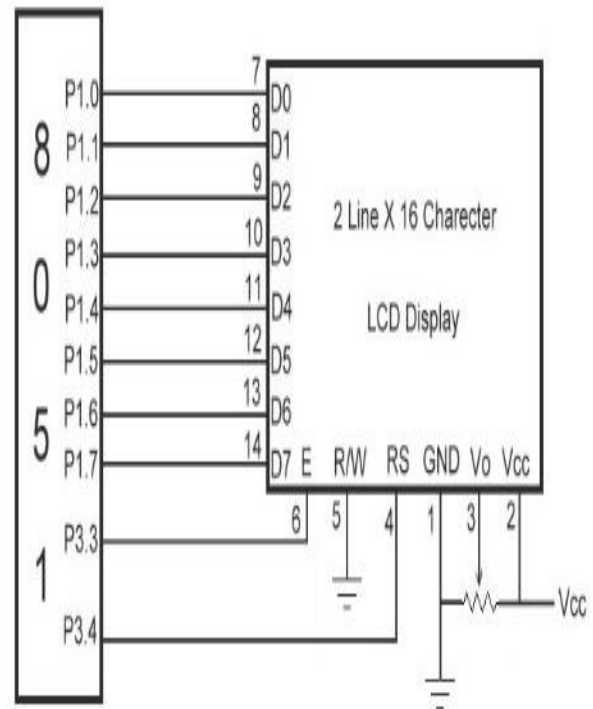


Fig 12: LCD interfacing[12]

VI. CONCLUSION

In this paper design of a fully automatic controlled room light system is proposed which save the energy without unnecessary uses according to the presence of the human being in the room. This property makes this project completely energy conserving system which has got very reliable operation and simple construction. The additional feature of this project is that we can operate the gathering of 255 persons in a room or hall in sequential manner, by using only one microcontroller. These features make this project suitable for industrial, domestic, academic purposes. IR sensor plays a very important role and take care of the person entering in the room or person existing from the room. With the variation of presence of person present in a room the microcontroller will adjust the load operating devices such as relays, and making the ON-OFF control fan and light. The propose circuit has been completely designed and is checked in proper working condition. With adding some extra fractures like temperature sensor, human being sensor, light depending resistor. It can be used more effectively in other model of room light control.

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