An Innovative Approach for Autonomous Centralized Real Time Area Monitoring

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Abstract— The main objective of this system is to develop the efficient monitoring and updatation of class room automatically. It can also be called as an Energy Saving System because it is designed and programmed in such a way that it will automatically switches OFF all running electric appliances when the class gets empty. Thus it can also be used in places where lighting is very important. For instance, the libraries are well illuminated with many lamps. When people are not present at a reading place the lighting can be made OFF and when they are present, the lighting made ON. All these can be done using this project. The sensing part in the project is IR sensors. Two IR sensors are employed in this project. If a person enters into the monitored area, the IR sensor gets activated and senses the person, and then gives signal to the microcontroller. The Infrared energy emitted from the living body is focused by a Fresnel lens segment. Then only the IR sensor activates and its count increments or decrements as the case may be. It depends on whether the person is entering or exiting. By using this system we can easily check the current status of the class. A 16x2 LCD display is used to display the counting operation of IR sensors. Then finally the desired information can be sent to the HOD room. The control centre and class room module communicates through the GSM module which connects the system module to HOD Smartphone and gives the information; thereby the information monitored is stored in the centre PC. The purpose of monitoring is to find the number of students present in the class in each hour. This system minimizes energy consumption and human intervention.

Key words: IR Receiver, transmitter, energy efficiency.

I. INTRODUCTION

This concept uses the real time monitoring system. As of now trend uses the manual operation of taking records of students which consumes more time which concise the time and students don't get enough time for study analysis and these manual records are further carry for higher authority for processing. So as now digital India is trending now as technology is at its verge stage and implement in the our school and colleges for reducing man power and accurate results. The In-charge also monitor the classroom and also locate the staff members and their location.

II. PRINCIPLE OF OPERATION

The smart part of the project is based on Proximity IR sensors and microcontroller. Consider a particular room in building, which is connected with project. When a person entering into it, the PIR sensor absorbs the black body radiation emitted by that person and activates it. The LCD display will hence increment the count value by 1. When the person comes out of the room the same count will gets decremented by 1.

All the other projects made up till now uses sensors at two different gates, one for entry and other corresponding to exit. However, the novelty in this project is that it uses both sensors on a single gate. The principle behind the operation of this project lies in the fact that, if 1st sensors activates first followed by 2nd sensor then, the person must have entered the room. On contrary, if the 2nd sensor activates first followed by 1st sensor then the person must have exited. As soon as the count value gets zero, a relay driver circuitry trips all the active lights of the room to OFF, so as to save power as well.

Though the hardware is usual one, all this smart control would be done in programming part in 8051 microcontroller. In addition to that, this project will not be limited for any particular application, it can be used anywhere in a process industries with little modifications in software coding according to the requirements. This concept not only ensures that our work will be usable in the future but also provides the flexibility to adapt and extend, as needs change.

III. OVERVIEW OF SYSTEM DESIGN

In this paper energy efficient wireless classroom monitoring system which allows department head to monitor the class room from remote location. We uses the concept of transmitter and IR receiver for sending and receiving the information through the main circuit.

A. Master Unit:

The system has a master unit which is located at classroom and sensors that are a IR receiver which are located in a classroom. Master module is placed in classroom and through GSM module information is send to the higher authority.

It consist of 16x2 LCD display along with IC AT89C52 and holding a relay of 12V which make & break circuit breaker to control electrical appliances operating in a classroom.

B. Class Room Module:

Classroom module is placed in a classroom which counts the number of students entered in a classroom through IR Pair sensor. The sensor reads collects the student information from the RFID tag, which is carried by the, then the transmitter module will send both information supply system and the number of students present in the class to the control centre

The information sent in the form of ASCII code. These codes are received by the master unit and updated in the system. When the IR pair start counting the people, the load automatically turns on by the microcontroller.

C. System view:

This system is also used in mesh network. More number of class rooms can be connected in single mesh network which also needs the ZigBee. The model we have done is based on single class room. Many number of classes can be connected with the single master unit. This can be done by creating nodes and connecting via nodes. The nodes are active when they are working and go to sleeping mode when there are not used, thereby saving power. In this way more number of buses can be connected to the master unit. The bus numbers are linked with the ZigBee mac id. The ZigBee will have unique mac id. Each bus will throw this unique id. The numbers and routes are stored in the database corresponds to this unique mac id. TheZigBee is a kind of Hotspot wireless module which connects all the information of all the class room and sent to the admin Location.

IV. TECHNICAL DETAILS

A. Power Supply:

Power supply is the major concern for every electronic device. Since the controller and other devices used are low power devices there is a need to step down the voltage and as well as rectify the output to convert the output to a constant dc. The block diagram of regulated power supply is as shown in figure below.

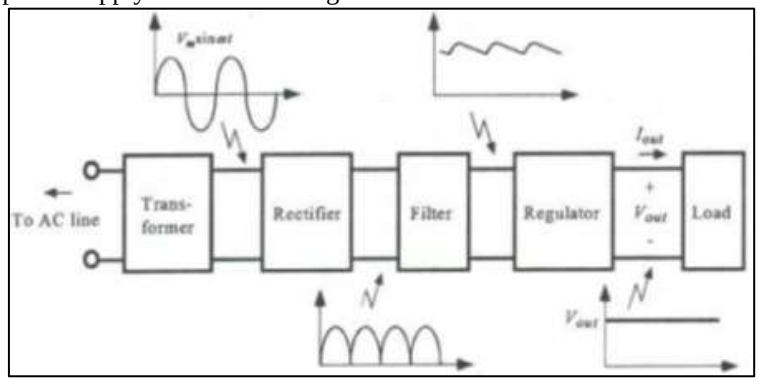

Fig. 1: Components of a typical linear power supply

Circuit Diagram of Power Supply

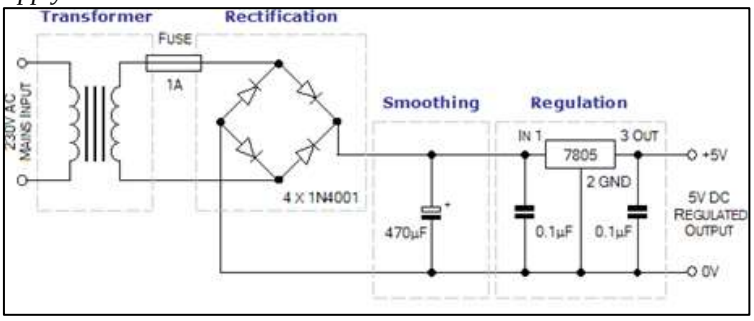

Fig. 2: A Simple SV DC regulated power supply system

B. Infrared Sensors:

Passive infrared sensor is an electronic device, which measures infrared light radiating from objects in its field of view. All objects emit what is known as black body radiation. This energy is invisible to the human eye but can be detected by electronic devices designed for such a purpose.

In an IR-based motion detector, the IR sensor is typically mounted on a printed circuit board, which also contains the necessary electronics required to interpret the signals from the chip. The complete circuit is contained in a housing, which is then mounted in a location where the sensor can view the area to be monitored. Infrared energy is able to reach the sensor through the window because the plastic used is transparent to infrared radiation (but only translucent to visible light). This plastic sheet prevents the introduction of dust and insects, which could obscure the sensor's field of view.

Long range IR Transmitter:

The IR LED emitting infrared light is used here which is driven through transistor BD139. IC 555 is used to construct an astablemultivibrator which has two quasi-stable states. It generates a square wave of frequency 38 KHz and amplitude 5Volts. It is required to switch ‘ON’ the IR LED.

In astable mode, the 555 timer puts out a continuous stream of rectangular pulses having a specified frequency. Resistor R1= 8.2K is connected between VCC and the discharge pin (pin 7) and another resistor (R2=1M) is connected between the discharge pin (pin 7), and the trigger (pin 2) and threshold (pin 6) pins that share a common node. Hence the capacitor is charged through R1 and R2, and discharged only through R2, since pin 7 has low impedance to ground during output low intervals of the cycle, therefore discharging the capacitor. In the astable mode, the frequency of the pulse stream depends on the values of R1, R2 and C:

$$f = \frac{1}{\ln(2) \cdot C \cdot (R_1 + 2R_2)}.$$

Long range IR Receiver:

TSOP1738 is used as sensor which detects IR pulses transmitted by IR-LED. Whenever, the obstacle arrives, output of IR sensor momentarily transits through a low state. As a result the monostable is triggered and a short pulse is applied to the port pin of the 8051 microcontroller.

In monostable mode, the 555 timer acts as a "one-shot" pulse generator. The pulse begins when the 555 timer receives a signal at the trigger input that falls below a third of the voltage supply. The width of the output pulse is determined by the time constant of an RC network, which consists of a capacitor (C) and a resistor (R). The output pulse ends when the voltage on the capacitor equals 2/3 of the supply voltage. The output pulse width can be lengthened or shortened to the need of the specific application by adjusting the values of R and C.

The output pulse width of time t, which is the time it takes to charge C to 2/3 of the supply voltage, is given by

$$t = RC\ln(3) \approx 1.1RC$$

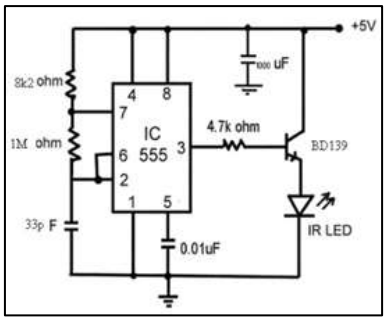

Fig. 3: Long range IR TX

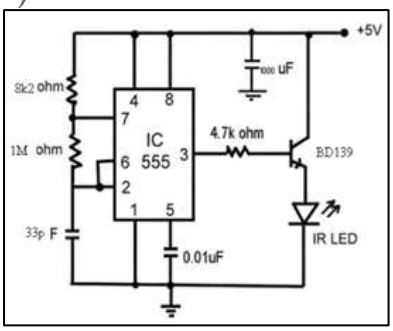

Fig. 4: Long range IR RX

C. Main Microcontroller Circuit:

Microcontroller is a mini computer used for a single integration circuit. Basically, it is a system on chip. A microcontroller is used for 1 or multiple CPU's along with the programmable logics.

Microcontrollers are used in automatically control system or devices such as remote controls, automobile and various uses in embedded system. It reduces the size and cost.

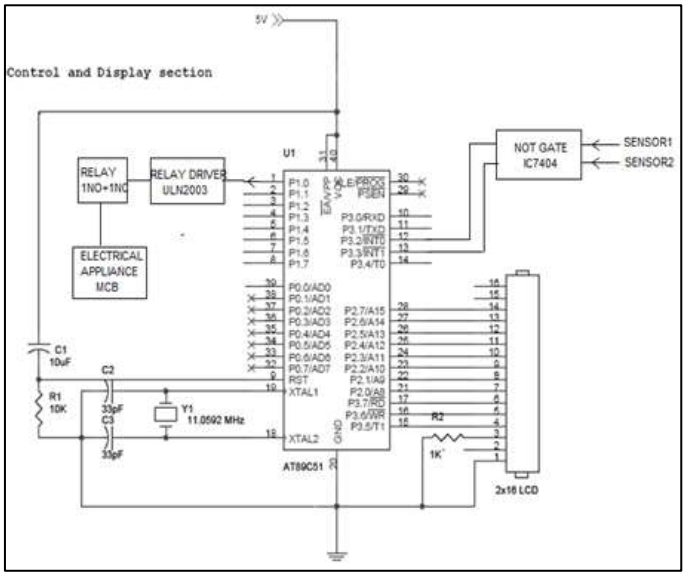

Fig. 5: Main Microcontroller Circuit

D. SIM 900 GSM/GPRS Modem:

GSM /GPRS RS232 modem from RHYDOLABZ is built with SIM CON make SIM 900/quad band GSM/GPRS works on high frequency 850MHz 900Mhz 1900Mhz.It is very compact in size and easy to use as plug in GSM module.The modem is designed with RS 230Level convertercircuitry which allows you to directly interface PC serial port.The BAUD rate can be configuration

9600-115200 through AT command This GSM/GPRS modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable of SMS as well as data transfer application in M2M interface.

The modem needs only 3 wires(Tx Rx GND) except power supply to inetface with microcontroller and host PC.

V. CONCLUSION

Electrical energy is essential to survive in modern era.All the equipments and gadgets are used in day to day life directly or indirectly based on the consumption of electricity and electricity is produced by burning fuels and nuclear reaction etc which harms the environment.So its our soul duty to save and conserve energy for long term use.By the use of Intelligent Energy Efficient Classroom Management System we can achieve these targets and also reduces the manual operation of shutting down of electrical equipments which increases the reliable controlling.

VI. APPLICATIONS

- Airports
- Libraries
- Entertainment venues
- Laboratories
- Homes
- Offices
- Retail environments, malls and shops
- Seminar rooms
- University campuses

VII. ADVANTAGES

- Easy operation
- Convenient
- Affordable

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