Smart Technology for Classroom

Amita A. Narnaware[1], Kailas R. Londhe[2], Karishma J. Atram[3] , Priyanka S. Dabhade[4], Sonu T. Thenge[5] Vivek V. Pawar[6] Atul s. Lilhare

*Department Of Electrical Engineering, Yeshwantrao Chavan College Of Engineering*

Abstract : *The aim of proposed work is to develop a smart technology for classrooms in schools, colleges etc. In this project work Arduino UNO is used for programming in designing of smart control technology where PIR sensor , LDR ,Finger print sensor, LCD display , Temperature sensor are used for human identification, light intensity , attendance in person and display purpose. The overall scenario is design in order to enhance the power utilization by reducing energy consumption. Also at the same time it has been seen that while taking attendance, there is a break in continuity of teaching during traditional condition. So this can be avoided by providing smart attendance monitoring, that care is taken through this project.*
Keyword: *Arduino, LCD display, Relay driver circuit, LDR,PIR sensor, LM35 sensor, finger print sensor, Opto coupler.*

I.   Introduction

In today's world, there is a continuous need for automatic appliances. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Also if at all one wants to know the number of people present in room so as not to have congestion, this circuit proves to be helpful. Smart technology for classroom with biometric Counter is a reliable circuit that takes over the task of controlling the room lights and fans as well as counting number of persons/ visitors in the room very accurately. Electricity is one of the most important resources in this century. We should conserve the electricity. But many times teachers/student come outside the classroom/hall and forget to turn off the lights/fan, thus the electricity is wasted. To overcome this we are going to implement a project called "smart technology for classroom" This project has 2 modules. First module is "Visitor counter and biometric counter " and the other module is "Automatic room light controller". Main concept behind this project is to take the attendance of student using biometric and to measure and display the number of persons entering in any room/classroom when number of persons inside the room is zero, power supply inside the room will be turned off. This will help to save electricity. LCD display placed outside the room displays number of person inside the room. When somebody enters intothe room then the counter is incremented by one and the light and fan in the room will be switched ON and when any one leaves the room then the counter is decremented by one. The light and fan 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 program which is stored in ROM. This obstruction is sensed by the Microcontroller. However, it implies the possibility that inconvenience of users can be bigger because of frequent light on/off, and dark indoor environment, etc. whereas the energy saving effect becomes larger.
This project is very helpful in Schools and Colleges and in offices.

II.   Overview of design
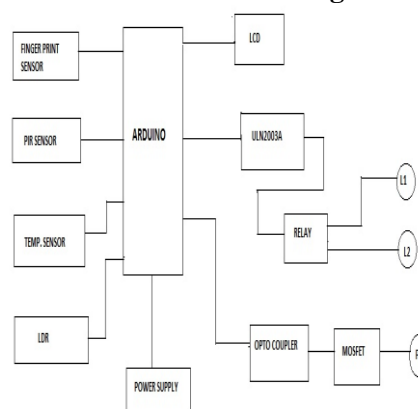
Arduino

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board. Arduino board are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions. You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).

LCD Display

Liquid-crystal display (LCD) is used to display number of individuals in room. LCD is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. A 2x16LCD has 2 rows and 16 columns and it can display a maximum of 32 characters. Liquid Crystal Display screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

Relay driver circuit

In relay driver circuit there are transistor, diodes and the relays. Relay driver circuit is used to control. The light. This block can drive the various controlled devices. We are using +12V dc relay. As Microcontroller cannot drive relay directly so output signal from microcontroller is passed to base of the transistor, which activates the particular relay so that it can select the particular device to operate. Relays can control the charge flowing to the load. Load maybe AC device such as light, fan, bulb etc.

PIR Sensor

A Passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared light radiating from object in its field of view. They are most often used in PIR-based motion detectors. All objects with the temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices design for such a purpose. The term passive in this instance refers to the fact that PIR device do not generate or radiate any energy for detection purposes.

Temperature Sensor

LM35 it is a precision integrated circuit temperature sensor. The output voltage is linearly proportional to the Celsius temperature and the range of this sensor is -550C to +120.The power supply of the LM35 temperature sensor requires 5.5V and it consists of three terminals of a material which perform the operation according to the temperature to vary resistance. When the voltage increases, then the temperature also rises. We can see this operation by using a diode.
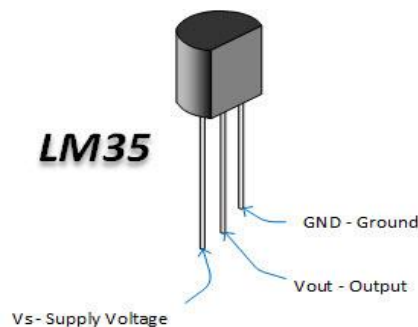
LM35 Temperature Sensor

Temperature sensors directly connected to microprocessor input, therefore it has capable of direct and reliable communication with microprocessors. The sensor unit can communicate effectively with low-cost processors without the need of A/D converters. The features of LM35 temperature sensor are explained below.

Finger Print Scanner

Finger print in its narrow sense is an impression left by the friction ridges of a human finger. The recovery finger prints from a crime sense is an important method of forensic science. Finger prints are easily deposited on suitable surfaces (such as glass or metal or metal or polished stone) by the natural secretions of sweat from the endocrine glands that are present in epidermal ridges.

These are sometimes referred to as "Chanced Impressions".

In a wider use of the term, finger prints are the traces of an impression from the friction ridges of any part of a human or other primate hand. A print from the sole of the foot can also leave an impression of friction ridges.

Deliberate impressions of finger prints may be formed by ink or other substances transferred from the peaks of friction ridges on the skin to a relatively smooth surface such as a fingerprint card.

Fingerprint records normally contain impressions from the pad on the last joint of fingers and thumbs, although fingerprint cards also typically record portions of lower joint areas of the fingers.

Human fingerprints are detailed, nearly unique, difficult to alter, and durable over the life of an individual, making them suitable as long-term markers of human identity .They may be employed by police or other authorities to identify individuals who wish to conceal their identity people who are incapacitated or deceased and thus unable to identify themselves, as in the aftermath of a natural disaster. Fingerprint analysis, in use since the early 20th century, has led to many crimes being solved.

This means that many criminals consider gloves essential. In 2015, the identification of sex by testing the fingerprint biochemical content (rather than visual pattern) has been reported.


Opto coupler

An-isolator contains a source (emitter) of light, almost always a near infrared light-emitting diode (LED),that converts electrical input signal into light, a closed optical channel (also called di-electrical channel, and a photo sensor, which detects incoming light and either generates electric energy directly, or modulates electric current flowing from an external power supply.

The sensor can be a photo resistor, a photodiode, a phototransistor, a silicon-controlled rectifier (SCR) or a triac. Because LED_S can sense light in addition to emitting it, construction of symmetrical, bidirectional opto-isolators is possible. An opto coupled solid state relay contains a photodiode opto-isolator which drives a power switch, usually a complementary pair of $MOSFET_S$. A slotted optical switch contains a source of light and a sensor, but its optical channel is open, allowing modulation of light by external objects obstructing the path of light reflecting light into the sensor.

Circuit Diagram
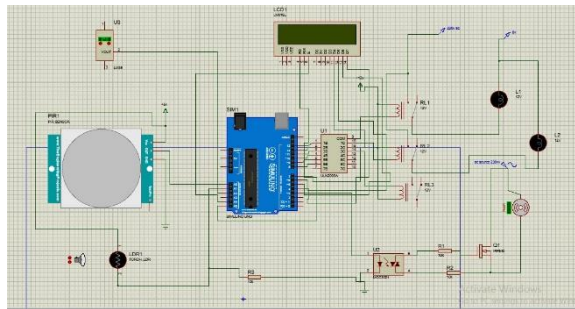
LDR:

Photo resistors, also known as light dependent resistors (LDR), are light sensitive devices most often used to indicate the presence or absence of light, or to measure the light intensity. In the dark, their resistance is very high, sometimes up to 1MΩ, but when the LDR sensor is exposed to light, the resistance drops dramatically, even down to a few <u>ohms</u>, depending on the light intensity. LDRs have a sensitivity that varies with the wavelength of the light applied and are nonlinear devices. They are used in many applications but are sometimes made obsolete by other devices such as photodiodes and phototransistors. Some countries have banned LDRs made of lead or cadmium over environmental safety concerns.

Description:

In this project model install in between combination of light and fan.PIR sensor is installed which sense the object when it comes under 120 degree then it will provide output in the form of , by switching light and fan. LDR (light dependent resistor) which control the intensity of light according to that light will glow. Fan will operate with the help of an opto-coupler. Opto coupler is used to control the speed of fan according to the room temperature.

In the above circuit diagram it is shown that, 5 volt supply is given to PIR sensor. LDR is connected to its input side and output pins are given to the input side of Arduino. Arduino has 28 pins (input and output). It works on 5v supply. An Arduino is an open source prototyping platform used for building electronics projects. It contains both a physical programmable circuit board and a software. Output from the Arduino is given to the relay driver (ULN2003) then relay driver is used to drive the relay which is used to provide the supply(5v to 12v) this supply is given to light and fan on which they run. We cannot control the speed of fan directly by an opto coupler so, MOSFET is connected to opto coupler through which speed can be controlled.

LCD(liquid crystal display) display plays outside the room and at that time lights are turned on. And in reverse way, the person count will decremented if somebody leaves the room. When the number of person inside the room is zero, lights inside the room are turned off using a relay interface in this way relay does the operation of automatic room light controller. Since project uses to infrared sensors, it can be used as bidirectional person counter as well.

Nowadays without electricity we can't imagine our daily life because electricity has become a necessity for all, without which day to day life daily activities became stand-still. Due to the depletion of non renewable resources, conservation of energy has became important and by doing so we can reduce electricity will as well. On other hand, the energy resources like petroleum, natural gas, uranium and propane are called non renewable resources, because their supplies are limited. Many environmental effects and day by day depleting energy resources warn as to save energy by using automatic room controller and energy efficient lighting system.

This project useful in developing countries and this project has a bright future. This project help us to control the light of a room automatically and count the number of persons/visitors entering and leaving the room. By using the circuit and proper power supply we can implement various applications such as fan, tube light etc.

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