# SMART ENERGY SAVING SYSTEM

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## ABSTRACT

*The main objective of this is to develop this system can be used in places like where lighting is very important. The places like libraries will be 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. This is done through by Dimming circuit and PIR sensor. The monitored area, the PIR sensors activates and senses the person, gives to the microcontroller. The Infrared energy emitted from the living body is focused by a Fresnel lens segment. Then only the PIR sensor activates. After sensing the person LDR checks the light intensity of the monitored area, whether it is bright or dark. Depending on the LDR output, the lamp may be ON / OFF by using Dimmer circuit.*

**Keyword: -** *Dimming circuit, PIR sensor, LDR, microcontroller, Fresnel lens segment etc….*

## 1. INTRODUCTION

Smart Energy Saving System, the aim of the project is to save the energy. In this project we are using various sensors, controlling and display. However, in this project work the basic signal processing of various parameters which are temperature, LDR, Smoke sensor. For measuring various parameters values, various sensors are used and the outputs of these sensors are converted to control the parameters. The control circuit is designed using micro-controller. The outputs of all the three parameters are fed to micro-controller. The output of the microcontroller is used to drive the LCD display, so that the value of each parameter can be displayed. In addition to the LCD display microcontroller outputs are also used to driver a relay independently. This relay energizes and de-energizes automatically according to the condition of the parameter.

### 1.1 Existing System

Previously a wireless sensor developed at Oak Ridge National Laboratory which boosted home energy efficiency through automated control systems for lighting and other systems that access data such as outside air and room temperature and occupancy all at a fraction of a cost of typical wireless sensors you see on the market today. Pacific Northwest National Laboratory, National Renewable Energy Laboratory and Lawrence Berkeley National Laboratory are also developing new protocols and standards that will improve how smart appliances communicate with each other and interact with the electric grid.

### 1.2 Proposed System

In addition with the sensing of the energy consumption, we are even able to control our system which will monitor the presence of entity (human) and with that it will be controlling the illumination of light for this entity in the case of library, or some other room generally used on daily basis.

### 1.3 System Specifications

The system specification shows the description of the function and the performance of the system. The scope of this project is to control lighting system present in the room without any contact but by simply due to the presence of entity(person), the intensity and also the switching cases.

**1.4 System Description**

The system has two parts namely hardware and the software. The hardware here used is microcontroller PIC 16F72 which is a 28 pin IC, PIR sensor, LDR, LCD, Thermostat, ZCD. The software part used is Arduino IDE and Processing IDE.

**1.4.1 Hardware used**

The following hardware part is used in this project is explained as follows

**1.4.1 PIR sensor**

A PIR detector is a motion detector that senses the heat emitted by a living body. These are often fitted to security lights so that they will switch on automatically if approached. They are very effective in enhancing home security systems. The sensor is passive because, instead of emitting a beam of light or microwave energy that must be interrupted by a passing person in order to sense that person, the PIR is simply sensitive to the infrared energy emitted by every living thing. When an intruder walks into the detector's field of vision, the detector sees a sharp increase in infrared energy.

**1.4.2 LDR**

LDR's or Light Dependent Resistors are very useful especially in light/dark sensor circuits. These help in automatically switching ON /OFF the street lights and etc., normally the resistance of an LDR is very high, sometimes as very high as 1000000 ohms, but when they are illuminated with light, resistance drop dramatically. Electronic opto sensors are the devices that alter their electrical characteristics, in the presence of visible or invisible light. The best-known devices of these types are the light dependent resistor (LDR), the photo diode and the phototransistors.

**1.4.3 DIMMER**

Dimmers are devices used to vary the brightness of a light. By decreasing or increasing the RMS voltage and hence the mean power to the lamp it is possible to vary the intensity of the light output. Although variable-voltage devices are used for various purposes, the term dimmer is generally reserved for those intended to control lighting.

**2. Software Used**

The following software part is used in this project is explained as follows.

**2.1 Arduino IDE**



**Fig -1**: Arduino IDE

The Arduino Software (IDE) or Arduino Integrated Development Environment - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload the program and communicate with them. The Arduino IDE is a cross platform Java application that serves as a code editor and compiler and is also capable of transferring firmware serially to the board.
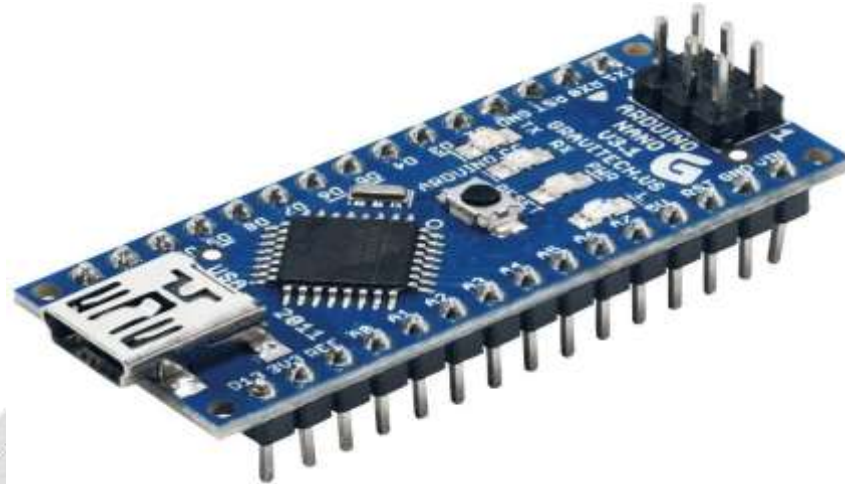


**Fig -2**: Arduino Nano

**2.2 Processing IDE**

It is an integrated environment and open source language of computer programming developed for electronics arts, new media arts, and visual design communities for the purpose of teaching the fundamental programming language in a visual context and to serve as a foundation for electronics sketchbooks. Processing has spawned another project, Wiring, which uses the Processing IDE with a collection of libraries written in the C++ language as a way to teach artists how to program microcontrollers. There are now two separate hardware projects, Wiring and Arduino, using the Wiring environment and language.
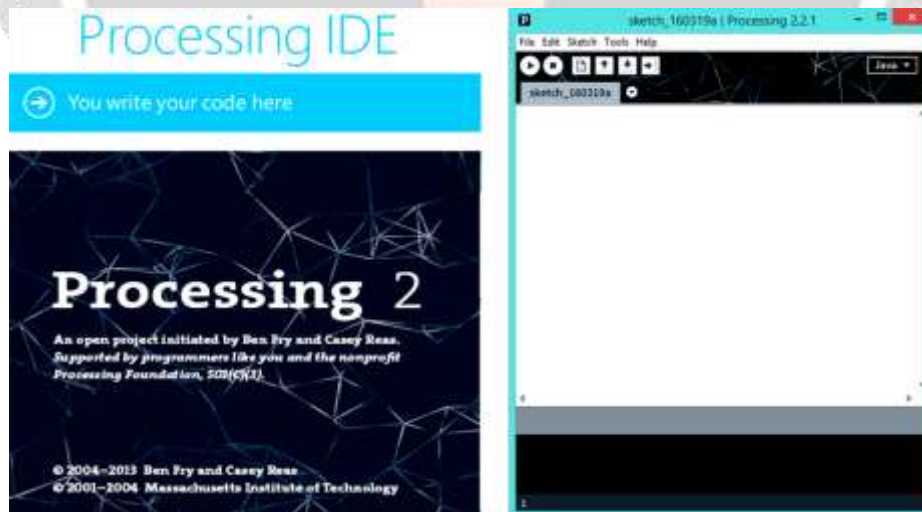


**Fig -3:** Processing IDE

## 3. Working Principle

Consider a particular table in the library, which is connected with our experimental circuit. When a person entering into that place the PIR sensor absorbs the black body radiation emitted by that person and activates it. The LCD display will displays the ―PIR ON. After some time delay the light will glows for some time by using the Dimmer circuit and with the help of LDR sensor it checks the room lightening , and it takes the condition when the light is sufficient the lamp will be in OFF state and when light is insufficient the lamp will be in ON state.

With the help of Thermostat sensor the room temperature is measured and the speed of the Fan varies according to the temperature of Thermostat. The LCD display will displays the room ―temperature in degree centigrade‖.

When a person is leaving that place, the PIR sensor will activate again and firstly the Fan will be OFF and after some time delay the lamp also will be OFF. Now the LCD display is in stand by mode state. And the main supply power will be switched OFF.
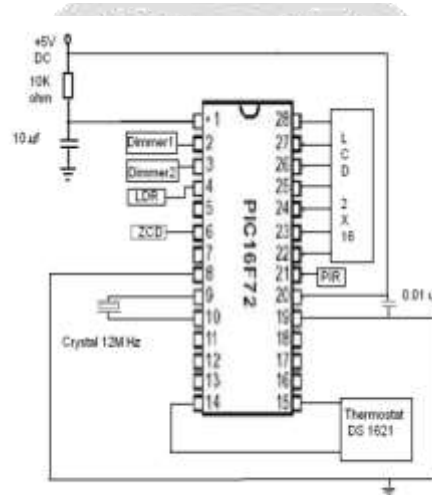


**Fig -4**: Experimental Block Diagram

### 3.1 . PROGRAM FOR ARDUINO

The purpose of this Arduino code is it to read the status of the PIR sensor on which light is being broadcast by the lens and the Dimmer and the other light system is used. It should also receive data from LDR by the light so that the light is to controlled.

```
if(Counter > 0)
 {
     digitalWrite(Bulb, LOW);
     digitalWrite(Fan, LOW);
     digitalWrite(Buzzer, HIGH);
     lcd.setCursor(0, 2);
     lcd.print("Fan : ON ");
     lcd.setCursor(0, 3);
     lcd.print("Bulb : ON ");
```

As in the above lines based on the status of the sensors, and the action to be followed for the people presence and absence like if the counter for the number of people present in the room is greater than one, like if someone is present in the room, then the arduino will be having the trigger for the fan and bulb to be switched on. and in the lines below its the opposite case if the presence of entity goes to zero, then the fan and the bulb of the specific room will switched off.

```
if(Counter < 1)
{
    digitalWrite(Bulb, HIGH);
    digitalWrite(Fan, HIGH);
    digitalWrite(Buzzer, HIGH);
    lcd.setCursor(0, 2);
    lcd.print("Fan : OFF");
    lcd.setCursor(0, 3);
    lcd.print("Bulb : OFF");
```

Second set of code is to check the entry and leaving of the person in the room as shown in the below lines based on the status of the sensor and from all collective set of circuits output to the respective pins. Part A of code is to check the entry of person into the room and this is done by the counter is increased each time the status is changed for the layered circuit.

```
if(((digitalRead(Sensor1) == LOW) || (Sen1Check == 1)) && (Sen2Check == 0))
    {
        while(digitalRead(Sensor1) == LOW);
        Sen1Check = 1;

        if(digitalRead(Sensor2) == LOW)
        {
            Counter++;
            Sen1Check = 0;
            while(digitalRead(Sensor2) == LOW);
        }
    }


if(((digitalRead(Sensor2) == LOW) || (Sen2Check == 1)) && (Sen1Check == 0))
    {
        while(digitalRead(Sensor2) == LOW);
        Sen2Check = 1;

        if(digitalRead(Sensor1) == LOW)
        {
            Counter = Counter - 1;
            Sen2Check = 0;
            while(digitalRead(Sensor1) == LOW);
        }
    }
```

These lines are used to check if there is anyone present in the room and thereby the counter is the set for checking this number and the presence or the absence of the entity from which the light is being controlled, here in this Part B of the code the leaving of person is recorded and with which the counter is decreased respectively.

## 4. CONCLUSIONS

Intelligent Energy Saving System is not 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.

In this project work we have studied and implemented a complete working model using a PIC microcontroller. The programming and interfacing of PIC microcontroller has been mastered during the implementation. This work includes the study of energy saving system in many applications

## 5. REFERENCES

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