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Monitoring of Power and Optimization using Embedded System Design

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1.INTRODUCTION:

In this sophisticated world every activity is getting automized with the help of embedded concepts. All the way so far we have seen that any controlling of parameters, utilizing natural resources for circuit operation, preventing the devices from electric disorders, optimizing etc…, is carried out with analogue instruments. So we decided to develop an electronic aid which is helpful for the above purpose which is called as EMBEDDED DESIGN FOR POWER MONITORING AND OPTIMIZATION.

In automation and instrument building we often are confronted by the necessity to precisely control illumination of light, rotational speed of a fan, controlling the devices depending on the detection of human being presence in the room or not, device switching using remote. Their illumination can be controlled by switching ON the number of LED'S as per requirement; depending on the room temperature speed of the FAN or conditioning unit of can be controlled as a function of applied voltage. Here is a project for EMBEDDED DESIGN FOR POWER MONITORING AND OPTIMIZATION.

It monitors the surrounding environment and electrical condition depending on those parameters the embedded system will control the operation of the devices like, if the room temperature is increased more than the desired temperature the system will automatically controls the speed of the fan, in other condition it will check for the natural light intensity depending on that microcontroller will control how many set of LED's should be switched ON, similarly one of the main feature of this project is PIR sensor, this sensor is used to detect presence of anybody in the room or not with respect to that the system will control the action of devices such that switching ON/OFF and this project works on the dc power supply, in presence of sunlight the circuit will work with power generated by the solar cells else with the main power supply.

This particular machine is a Embedded one, so that it is highly efficient and it is also packed with a highly interactive and user friendly components with a wide application. This Cost effective unit is surely a good example of technology being used for a very productive purpose. The unit being flexible to use also renders the best of features found in some of the commercially available units.

2.BLOCK DIAGRAM:

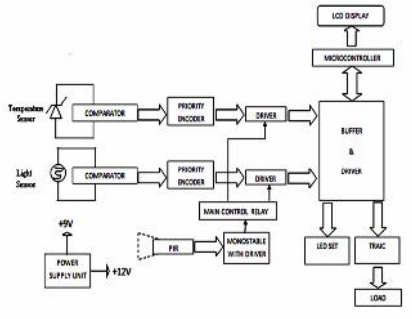

Fig.1 Theoritical view

Fig.2 Practical view

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3.COMPONENTS REQUIRED:

The above block diagram shows the complete overview of project.

This project consists of following blocks.

1) Human detection using PIR sensor
2) Illumination control.
3) Room temperature conditioner.
4) Solar tracking system.

As listed above, these are the main features of our project EMBEDDED DESIGN FOR POWER MONITORING AND OPTIMIZATION. In the above block diagram we can observe that it consists of different stages for all the above stages explanation goes like this

4.HUMAN DETECTION USING PIR SENSORS:

A PIR (passive infrared) detector coupled with an electric light is now widely used for intruder protection. PIR are also available as stand-alone units which usually have a switched output for controlling external loads. To enable the PIR detector to work in daylight also, you have to cover the internal light/darkness sensor (usually an LDR).

The PIR detector used in this circuit reacts to fast temperature variations caused by the movement of people or animals in an enclosed space. All mammals radiate a certain amount of heat, and it is this that causes local variations in temperature. The radiant heat energy occupies the electromagnetic spectrum between light and radio waves, i.e. 0.74….300µm, which is usually called the infra-red region. The radiant energy is picked up by a Fresnel lens, at the focus of which is a double differential pyroelectric sensor. The detector is largely unaffected by other electrical radiation. Also, it does not react to movement outside the guarded space.

5.ILLUMINATION CONTROL:

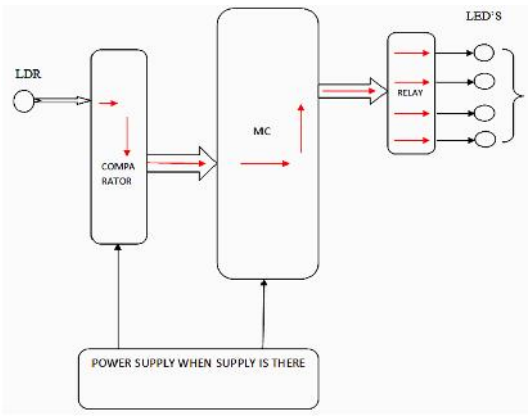

Fig.3 Theoritical view **Fig.4 Practical view**

As we observe in our daily life knowingly or unknowingly we leave lights, fan and other appliances running which leads to a lot of power wastage.

In order to overcome the above disadvantage we have developed this project where by in this illumination control is one part of it. Here in this stage depending on the natural light entering into the room or office with the help of LDR the intensity is measured and given to the COMPARATOR which will convert its equivalent digital signals at its output pin and those signals are fed to microcontroller 89C51, here the decision is made how many number of LED's to be switched ON to maintain the room/office lights in required manner.

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Depending on the natural light intensity number of LED should be switched ON and OFF. This operation should be performed using COMPARATOR and MC. Whenever the light intensity in a room varies depending on that a digital signal has to be generated using COMPARATOR which should be given to the microcontroller. In microcontroller a decision has to be made that how many LED should turn ON or OFF. In above fig 2 a LED array is shown in 3 numbers, because a single LED array consists of 9 LED's therefore totally 27.

6.ROOM TEMPERATURE CONDITIONER:

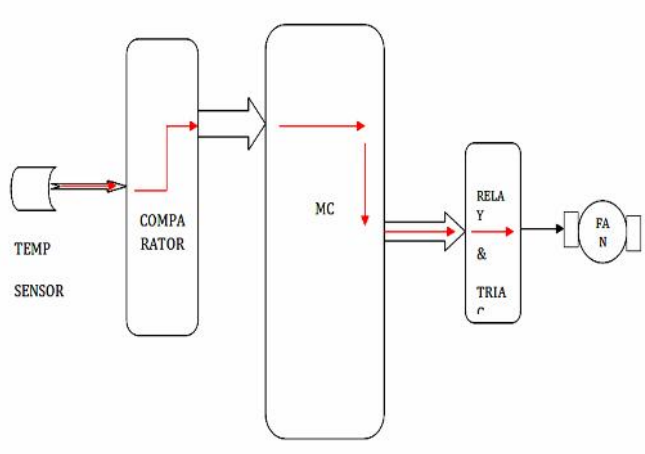

Fig.5 Theoritical view

Fig.6 Practical view

6.1FAN DRIVER STAGE:

The Counter & Switching section sends the signals to this Fan Motor Driver section to run the AC Motor with required speed. This section has a Triac and Diac combination, which supplies regulated Alternating Current to the Regulator circuitry of a fan.

7.CIRCUIT DIAGRAM OF FAN DRIVER SECTION:

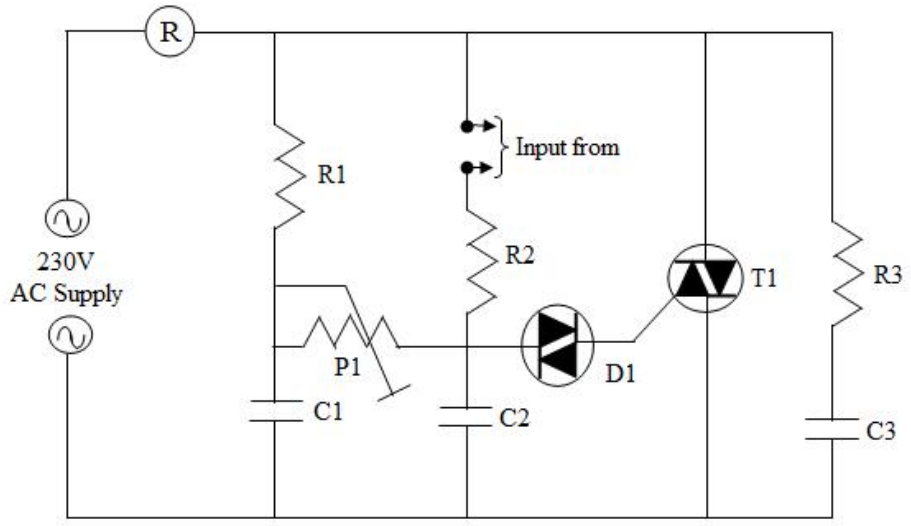

FIG.7 CIRCUIT DIAGRAM OR FAN DRIVER SECTION

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Parts List:

Representation	Range	Quantity
Semiconductors		
D1	**ER900 DIAC**	**1**
T1	**BT 136 TRIAC**	**1**
R1	**68 K Ohm ¼ Watt**	**1**
R2	**270 Ohm ½ Watt**	**1**
R3	**10 K Ohm ½ Watt**	**1**
P1	**100 K Ohm Preset**	**1**
Capacitors		
C1& C2	**300 nF / 400V**	**2**
C3	**33nF/ 400 V**	**1**

Table 2.6.3 PARTS LIST

When Input from Counter & Switching section is very low negligible potential divider action or phase shifting takes place, and the C1 voltage closely follows that of the a.c. power line until the trigger voltage of the Diac is reached, at which point the Triac fires and turns ON the motor with predefined speed and removes all drive from the Input from Counter &Relay section-C1 network. The Triac thus fires shortly after the start of each half-cycle under this condition, and almost full power is applied to the load.

When Input from Counter & Switching section is very high, on the other hand, the potential divider action is such that the peak voltage on C1 only just reaches the 35 V needed to trigger the Diac, and the phase shift of C1 is close to 90°. Since the peak of a half-wave occurs 90° after the start of the half-cycle, the net effect of the low voltage and near-90° phase shift on C1 is to delay the firing of the Triac by about 170°. Under this condition, therefore, the Triac does not fire until 10° before the end of each half-cycle, and negligible power is applied to the load. Thus, the Input from Counter & Relay section-C1 and Diac network enables the firing of the Triac to be delayed between roughly 10° and 170° in each half-cycle, and efficient variable power control is available.

8.POWER SUPPLY UNIT

CIRCUIT DIAGRAM OF FULL WAVE REGULATED DC POWER SUPPLY USING BRIDGE RECTIFIER:

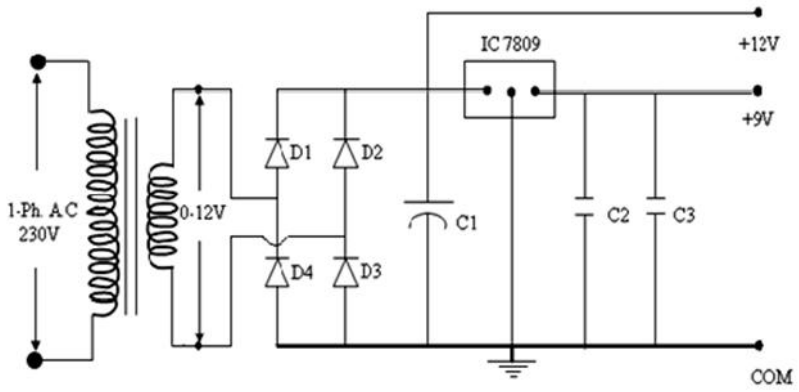

Fig.8 CIRCUIT DIAGRAM OF POWER SUPPLY UNIT

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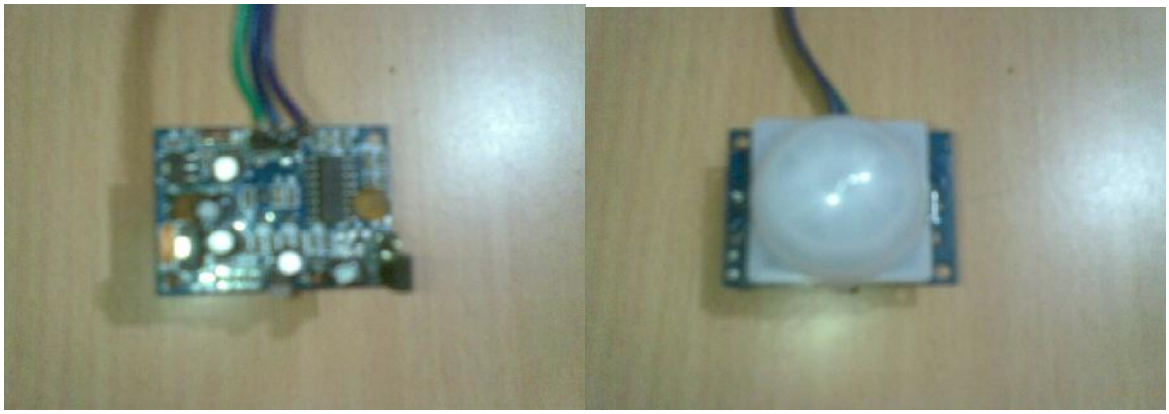
The circuit needs two different voltages, +9V & +12V, to work. These dual voltages are supplied by this specially designed power supply.

A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as regulated d.c power supply**.** It is also referred as full-wave regulated power supply as it uses four diodes in bridge fashion with the transformer. This laboratory power supply offers excellent line and load regulation and output voltages of +9V & +12 V at output currents up to one amp.

9.SENSOR'S

9.1 LX16C PASSIVE INFRARED SENSOR (PIR):



- The product is an energy saving device automatic switch, it adopt integrated circuit and precise detecting components.
- It can be ON when one comes in the detection field and will off automatically after one leaves the detection field.
- It can identify day and night automatically.
- Its performance is very stable.
- Can identify day and night automatically.
- Ambient-light can be adjusted. so it will work at night and stops in the day time. The consumer can adjust it freely.

Detection distance can be adjusted according to the local place:

Detection distance (<24 ˚c)	:	2-11 m (adjustable)
Detection range	:	180˚
Power source	:	180-240v/AC, 50-60 Hz
Rated load	:	1200w (220v/AC Max)
Working temperature	:	-20˚ - +40˚c
Working humidity	:	< 93% RH
Time delay	:	5 sec – 7 min, ±2 min
Ambient- light	:	< 10-2000
Lux adjust Installation height	:	1.8m-2.5m

9.2 Operation:

Sensitivity: turn the knob clock wise to raise its sensitivity and turn it anti clock wise to reduce it sensitivity. Turn the knob to clock wise to last operating time and turn it anti clock wise to shorten it.

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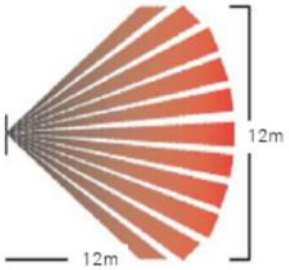
Specifications

Dimensions:	87mm x 62mm x 40mm (h x w x d)
Weight:	65.5g
Power Requirements:	20mA @ 12Vdc
Operating Voltage:	10~14 Vdc
Current:	9 mA quiescent
Alarm Relay:	Form A (NC) \ 100 mA@24 Vdc
Tamper Switch:	24V, 100 mA
Operating Temperature:	-10°C ~ +49°C
RF Immunity:	20 V/m from 10-1000 MHz Suitable for use with EN50131-1
White Light Immunity:	2,500 Lux
PIR Sensitivity:	Jumper selectable – high and low
LED Enable:	Can be enabled/disabled by a jumper
Wire Channel:	8 mm x 6.5 mm (w x d)
Accessories:	**SMB-10**: Universal white swivel mount bracket **SMB-10T**: Tampered universal white swivel mount bracket **SMB-10C**: Universal white ceiling mount bracket
Approvals:	CE approved

Ordering Information

Part Number	Description
616.007.047.U	IS215T 12m wide angle residential PIR



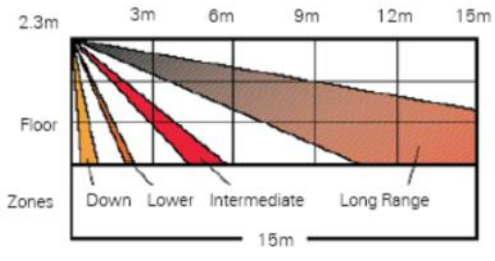
Detection Range:

12m x 12m

PIR Fields of View

(2 fields of view per PIR finger):

Long Range:	44
Intermediate:	14
Lower:	8
Look-down:	4



9.3 LM35

PRECISION CENTIGRADE TEMPERATURE SENSORS

GENERAL DESCRIPTION:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Ê Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of±¹¤4 ÊC at room temperature and ±³¤4 ÊC over a full -55 to +150ÊC temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1 ÊC in still air. The LM35 is rated to operate over a -55Ê to +150ÊC temperature range, while the LM35C is rated for a -40Ê to +110ÊC range (-10Ê with improved accuracy). The LM35 series is available pack-aged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also avail-able in an 8-lead surface mount small outline package and a plastic TO-220 package.

10.RESULT AND CONCLUSION

Instead of using relays if we replace it by IC 4066 (QU*AD BILATERAL SWITCH)* then there will be drastically power consumption can be reduced to an greater extent.

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BIOGRAPHY

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