Human body motion using pir sensor

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Abstract- **Intelligent Energy Saving System can be used in places like where lighting is very important. The 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. All these can be done through by Dimming circuit and PIR sensor. If a person entering to the monitored area, the PIR sensors activates and sense the person, gives to the micro controller. 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. By using this system we can adjust the speed of Fan according to the room temperature measured by Thermostat, which is connected to the micro controller. To display the room temperature of PIR mode operation we are using the LCD display.**

Introduction

The aim of the project is to save the energy or power, used in places like libraries where lighting is very important for the people who come to read books. So, the libraries will be well illuminated with many lamp. At the same time when people are not present at a particular reading place the lighting can be made off by using Dimmer and when people come to that area, according to the LDR lighting can be made sufficiently brighter. By using this system, we can also adjust the speed of the Fan according to the room temperature using Thermostat and Dimmer.

Principle of operation

Consider a particular table in the library, which is connected with our experimental kit .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.

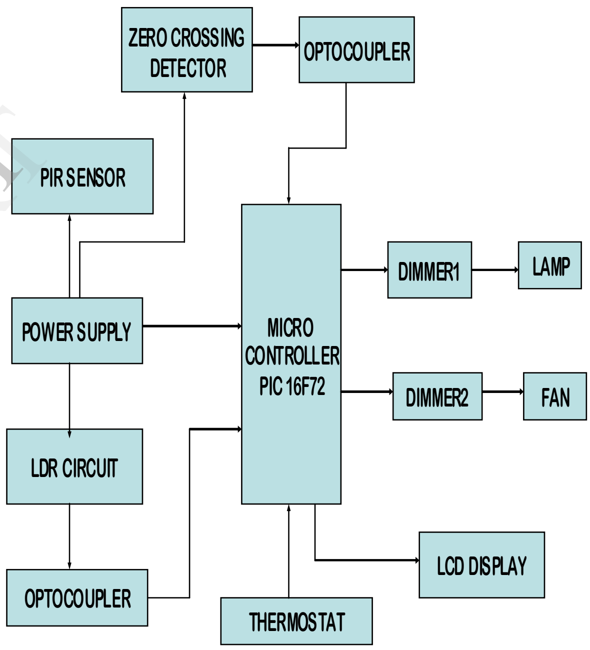

Fig1: Block Diagram

Hardware description

The introduction to PICI6F72 is a complete micro controller. There are 40 pins needed by the five-bidirectional ports. Pins provide power, allow you to connect a crystal clock and provide a few timing and control signals. The architecture includes the ALU, W register, the stack; a block of registers. All these devices are connected to via internal 8-bit data bus. Each I/O port is also connected to the 8-bit internal data bus through a series of registers. These registers hold data during I/O transfers and control the I/O ports. The architectural block diagram also shows the PICI6F72 ROM and RAM

Functions:

- External interrupt
- Change on PORTB interrupts
- Timer0 clock input
- Timer1 clock/oscillator
- Capture/Compare/PWM
- A/D converter
- SPI/I^2C
- Low Voltage Programming
- In circuit Debugger

The i2c bus protocol

The I2C bus physically consists of 2 active wires and a ground connection. The active wires, called SDA and SCL, are both bi-directional. SDA is the Serial data line, and SCL is the Serial clock line. Every device hooked up to the bus has its own unique address, no matter whether it is an MCU, LCD driver, memory, or ASIC. Each of these chips can act as a receiver and/or transmitter, depending on the functionality. Obviously, an LCD driver is only a receiver, while a memory or I/O chip can be both transmitter and receiver. The I2C bus is a multi-master bus. This means that more than one IC capable of initiating a data transfer can be connected to it. The I2C protocol specification states that the IC that initiates a data transfer on the bus is considered the Bus Master. Consequently, at that time, all the other ICs are regarded to be Bus Slaves. As bus masters are generally microcontrollers, let's take a look at a general 'inter-IC chat' on the bus. Let's consider the following setup and assume the MCU wants to send data to one of its slaves.

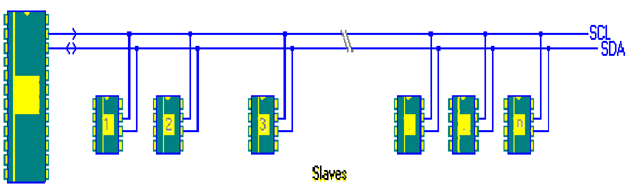

Fig 2: 12C Protocol

Passive infrared sensor (pir)

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.

A PIR sensor light is designed to turn on when a person approaches, but will not react to a person standing still. The lights are designed this way. A moving person exhibits a sudden change in infrared energy, but a slower change is emitted by a motionless body. Slower changes are also caused by gradual fluctuations in the temperature of the environment. If the light were sensitive to these slower changes, it would react to the sidewalk cooling off at night, instead of the motion of a burglar. If you have a PIR light, you may notice that it is more sensitive on cold days than on warm days. This is because the difference in temperature between the ambient air and the human body is greater on cold days, making the rise in temperature easier for the sensor to detect. This has drawbacks, though; if the sensor is too sensitive, it will pick up things you don't want it to such as the movement of small animals. Infrared radiation enters through the front of the sensor, known as the sensor face. At the core of a PIR is a solid state sensor or set of sensors, made from approximately 1/4 inches square of natural or artificial pyroelectric materials, usually in the form of a thin film,

out of gallium nitride (GaN), cesium nitrate ($CsNO_3$), polyvinyl fluorides, derivatives of phenylpyrazine, and cobalt phthalocyanine. (See pyroelectric crystals.) Lithium tantalate ($LiTaO_3$) is a crystal exhibiting both piezoelectric and pyroelectric properties.

The sensor is often manufactured as part of an integrated circuit and may consist of one (1), two (2) or four (4) 'pixels' of equal areas of the pyroelectric material. Pairs of the sensor pixels may be wired as opposite inputs to a differential amplifier. In such a configuration, the PIR measurements cancel each other so that the average temperature of the field of view is removed from the electrical signal; an increase of IR energy across the entire sensor is self-cancelling and will not trigger the device. This allows the device to resist false indications of change in the event of being exposed to flashes of light or field-wide illumination. (Continuous bright light could still saturate the sensor materials and render the sensor unable to register further information).

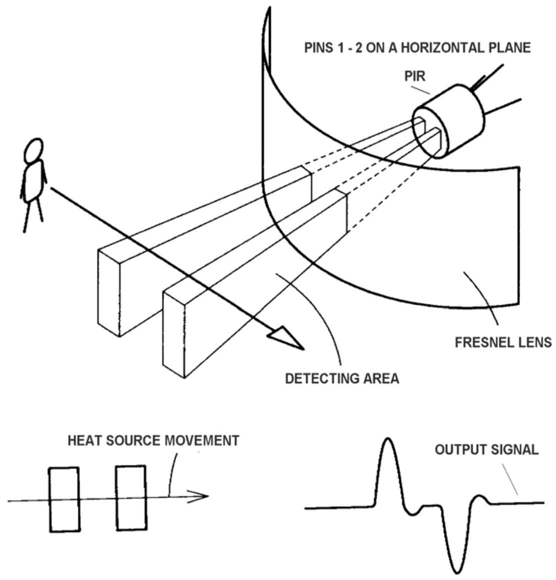

Fig 3: PIR sensor

Zero crossing detectors (zcd)

Zero crossing detectors as a group are not a well-understood application, although they are essential elements in a wide range of products. It has probably escaped the notice of readers who have looked at the lighting controller and the Linkwitz Cosine Burst Generator, but both of these rely on a zero crossing detector for their operation. A zero crossing detector literally detects the transition of a signal waveform from positive and negative, ideally providing a narrow pulse that coincides exactly with the zero voltage condition. At first glance, this would appear to be an easy enough task, but in fact it is quite complex, especially where high frequencies are involved. In this instance, even 1 kHz starts to present a real challenge if extreme accuracy is needed. The not so humble comparator plays a vital role - without it, most precision zero crossing detectors would not work, and we'd be without digital audio, PWM and a multitude of other applications taken for granted.

Basic low frequency

The zero crossing detector as used for the dimmer ramp generator. Although it has almost zero phase inaccuracy, that is largely because the pulse is so broad that any inaccuracy is completely swamped. The comparator function is handled by transistor Q1 - very basic, but adequate for the job.The circuit is also sensitive to level, and for acceptable performance the AC waveform needs to be of reasonably high amplitude. 12-15V AC is typical. If the voltage is too low, the pulse width will increase. R1 is there to ensure that the voltage falls to zero - stray capacitance is sufficient to stop the circuit from working without it.

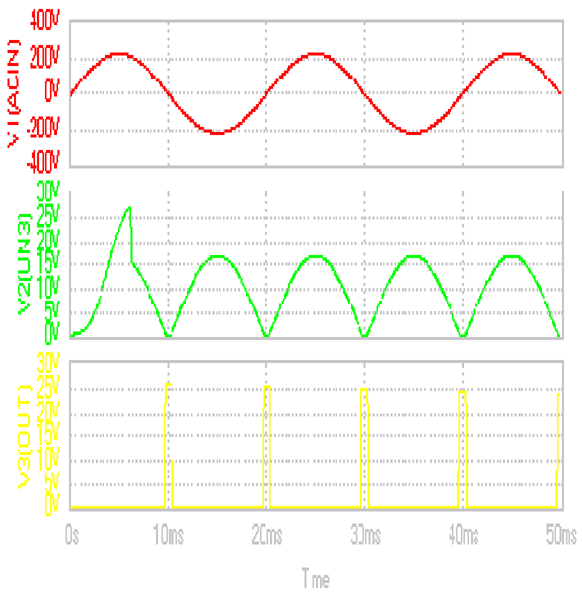

Fig 4: ZCD Output waveform

Conclusion

Intelligent Energy Saving System is not limited for any particular application, it can be used any where 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 interfering of PIC microcontroller has been mastered during the implementation. This work includes the study of energy saving system in many applications.

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