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MICROCONTROLLER BASED ADVANCED AUTOMATIC CITY STREET CONTROL SYSTEM

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Abstract:

Automatic control of street lights is deigned to turn on and turn of street lights automatically. This project check the amount of light. If light is 80 percent available, it automatically turn off street lights. But if amount of light is less than 80 percent, this project will automatically turn on street lights. one can also adjust it according to its requirement. Light sensor is used to detect intensity of light. Microcontroller is used interfaced with light sensor to sense amount of light available. Control signal is generated with the help of microcontroller after analyzing amount of light. Control signal generated by microcontroller is used to turn on the street light. We have used led as street light in this project. Because this is just for demonstration purpose. To use it practically, you can use as many street lights as many you want to control through this automatic control of street lights.

I. INTRODUCTION

The project related to design of energy efficient street lighting system mainly focuses on using sensor based technology. The project can be classified broadly into two categories, to sense the demand by detecting the traffic in the vicinity or to detect ambient natural light. The sensor based systems hence developed decide the state of the street light based on the data received from the sensors. The major issue regarding the use of sensor based systems is their poor reliability. Thus, such systems are not robust. To improve the system reliability one may go for wireless sensor networks but cost of infrastructure and maintenance in that case would he high. To develop a cost effective and robust energy efficient system which requires minimum maintenance, a time based approach can he utilized by studying astronomical clocks depending upon geographical area.

A microcontroller the ambient light intensity to control the switching of the street light. Conventionally ON-OFF control action is implemented Some energing Controllers are providing Gradient control of Intensity of Street light depending upon the ambient natural light intensity.

The Sensor used is LDR (Light dependent resistor).The LDR forms a part of the voltage divider circuitry. Thus a voltage proportional to the intensity of Light sensed is generated across the LDR.

The voltage is fed to the microcontroller at a Analog interface, which can properly scaled with the help of mathematical calculations inside the microcontroller. The Scaled value is then compared with sone suitable reference value to generate the output for Street light. In Gradient control actions, the intensity of the Street Light is made inverselyproportional to the sensed ambient natural light intensity by the help of suitable logic inside the Microcontroller.

II. POWER SUPPLY

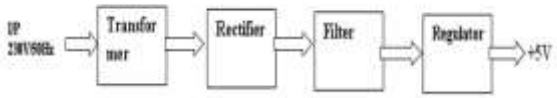


Figure .1 Power Supply

III. HARDWARE

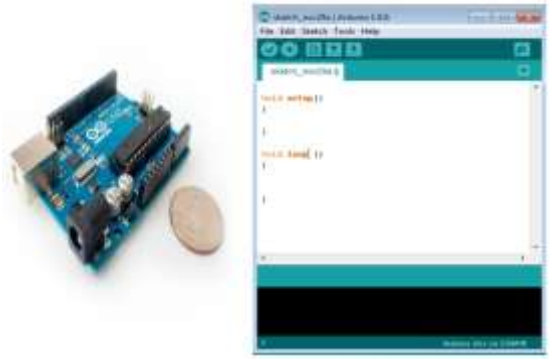
Arduino

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 programed (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.

The key features are −

- Arduino boards 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).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.



Liquid Cristal Display

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the contollers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4-bit data bus it only requires the supply lines plus 6 extra lines(RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

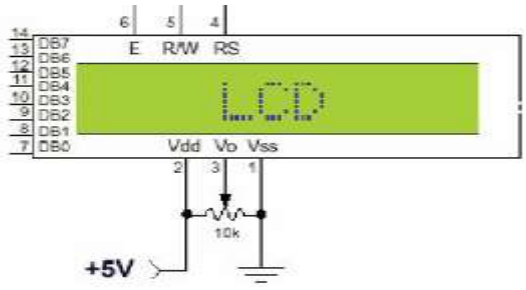


Figure .2. Pin diagram of 1x16 lines LCD

Relays

A relay is an electrically operated switch. These are remote control electrical switches that are controlled by another switch, such as a horn switch or a computer as in a power train control module, devices in industries, home based applications. Relays allow a small current pin, 4-pin, 5-pin, and 6-pin, single switch or dual switches. Relays are used throughout the automobile. Relays which come in assorted sizes, ratings, and applications, are used as remote control switches. A typical vehicle can have 20 relays or more.

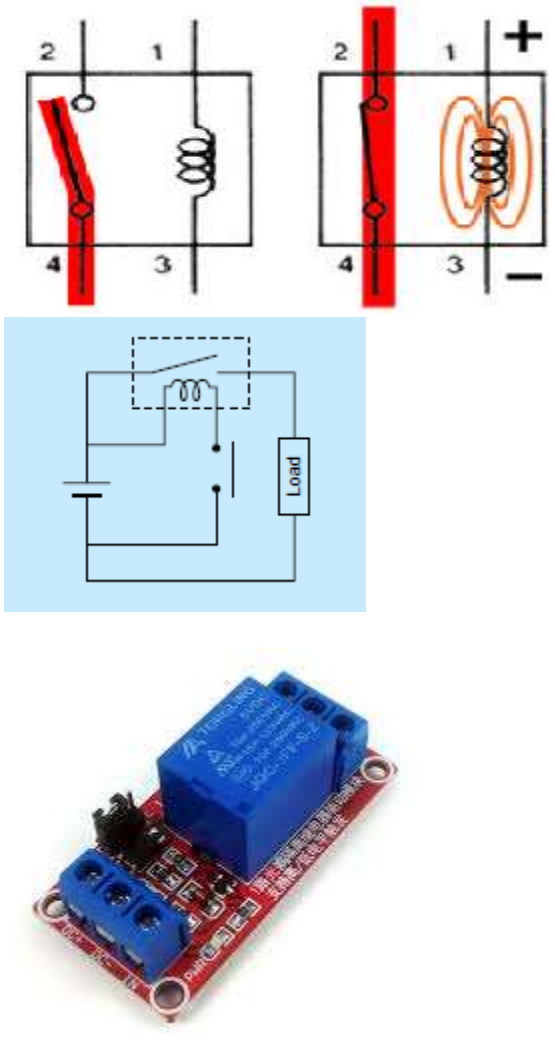
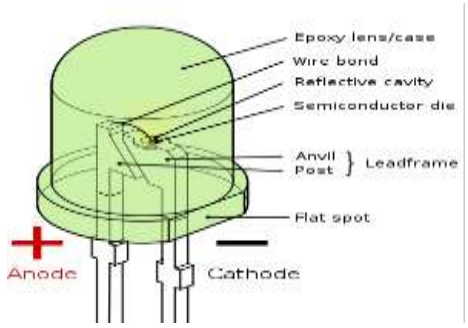


Figure 3 Relay

LED:

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.

The LED is based on the semiconductor diode. When a diode is forward biased, electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is usually small in area (less than 1 mm^2), and integrated optical components are used to shape its radiation pattern and assist in reflection. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability.



IR Sensor

Infrared technology addresses a wide variety of wireless applications. The main areas are sensing and remote controls. In the electromagnetic spectrum, the infrared portion is divided into

three regions: near infrared region, mid infrared region and far infrared region.

The wavelengths of these regions and their applications are shown below.

- Near infrared region — 700 nm to 1400 nm — IR sensors, fiber optic
- Mid infrared region — 1400 nm to 3000 nm — Heat sensing
- Far infrared region — 3000 nm to 1 mm — Thermal imaging

The frequency range of infrared is higher than microwave and lesser than visible light.

For optical sensing and optical communication, photo optics technologies are used in the near infrared region as the light is less complex than RF when implemented as a source of signal. Optical wireless communication is done with IR data transmission for short range applications.

An infrared sensor emits and/or detects infrared radiation to sense its surroundings.

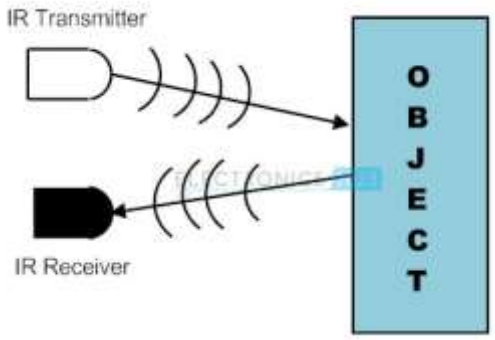
The working of any Infrared sensor is governed by three laws: Planck's Radiation law, Stephen – Boltzmann law and Wien's Displacement law.

Planck's law states that "every object emits radiation at a temperature not equal to 0^0K". Stephen – Boltzmann law states that "at all wavelengths, the total energy emitted by a black body is proportional to the fourth power of the absolute temperature". According to Wien's Displacement law, "the radiation curve of a black body for different temperatures will reach its peak at a wavelength inversely proportional to the temperature".

The basic concept of an Infrared Sensor which is used as Obstacle detector is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver.

There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength can be used as infrared sources. The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response.

Optical lenses made of Quartz, Germanium and Silicon are used to focus the infrared radiation.



LIGHT DEPENDENT RESISTOR (LDR)

A photo resistor is an electronic component whose resistance decreases with increasing incident light intensity. It can also be called a light-dependent resistor (LDR), or photo conductor.

Other light dependent resistors, or photo resistors have been made using materials including Cadmium Sulphide, Lead Sulphide and the more commonly used semiconductor materials including Ge ,Si and GaAs.

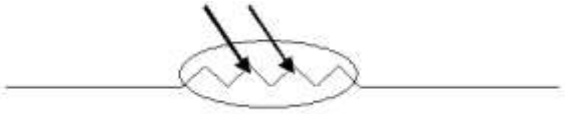


Fig.4: - Schematic Symbol of LDR

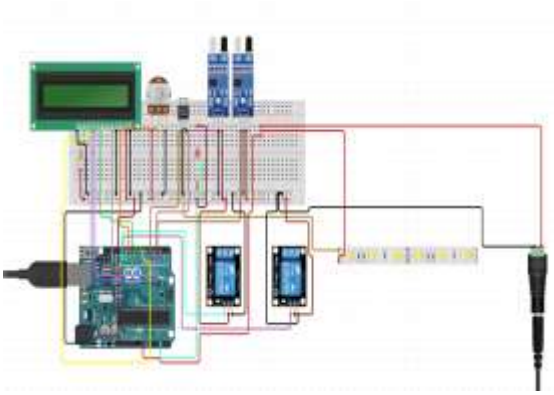
The photo resistor, or Light Dependent Resistor, finds many uses as a low cost photo sensitive element and was used for many years in photographic light meters as well as other applications. such as flame, smoke, and burgler detectors, card readers and lighting controls for street lamps.

Units for the light intensity are Lux or Lumence.

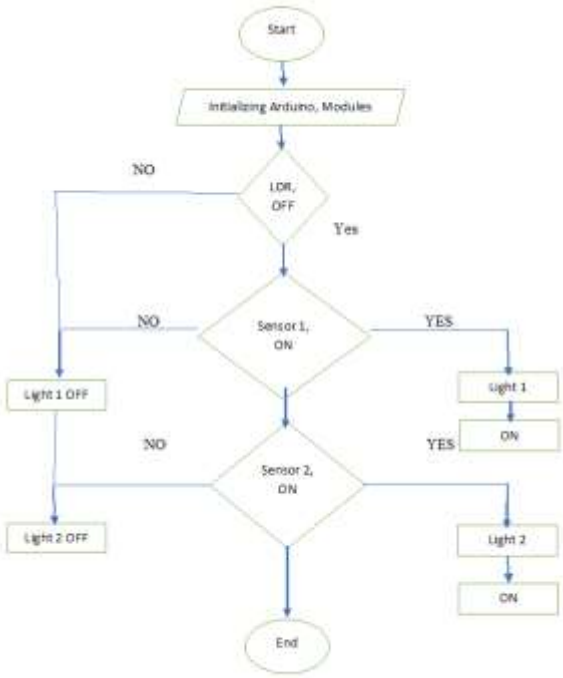
IV. RESULT

Block Diagram:

Schematic Diagram:



Flow Chart:



Working:

In this project we are implementing automatic street light system using controller and with sensor. When ever a vehicle passes for the sensor the data will pass to controller, then the controller will give a signal to relay, then that particular street light will on. The relay will act as a switching like a switch the street light is connected to output side of the relay, input is given to controller. We also implemented day and night system with help of LDR sensor. At day time the street lights will be off state.

V. CONCLUSION

In the proposed thesis an attempt has been made to design a microcontroller based Street light Control system. The proposed system uses an Arduino controller. The control logic is written in 'C' language using 'KEIL' compiler. The evaluation of the circuit and code has been done

in Proteus software. A time based intensity control system of LED Street lighting has been successfully designed. The system is simple and cost effective as compared to wireless sensor network based systems. Moreover, its performance does not depend upon dust, moisture, temperature unlike sensor based systems. If this system is used with existing grids in India with thousands of lights per grid, there would he a huge energy saving.

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