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REAL TIME STREET LIGHTS BASED ON MOTION DETECTION

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Abstract - A Street light is raised source of light on the edge of a road or walkway, which is turned ON at ascertain time every night. The System consists of LED, PIR sensor, IR Sensor and LDR sensors which are connected and controlled using Raspberry pi. Three modes of Operation is going to be done in this project by giving commands. PIR Sensor will be placed before certain number of street lights which detect the moving vehicles by automatically turning ON Whole Street lights for a period of time declared. LDR sensor is fixed, which activates during night by turning on the Lights and remain off during day time. An IR sensor is fixed for every street light pole to detect the motion by automatically turning ON the respective Street Light. This is intended with Solar Module which is controlled by Arduino Uno. Here solar power is used as power supply for street lights.

Keywords: Raspberry Pi, street light, sensors, energy saving.

1. INTRODUCTION

Street Automation plays a very important role in the world economy and in daily life. Automatic systems are being preferred over any kind of manual system. Intelligent light sensing refers to public street lighting that adapts to movement by pedestrians, cyclists and cars [1]. This street lighting System referred as adaptive street lighting, dims when no movement is detected, but brightens when motion is detected [2]. This type of lighting is different From traditional and illumination, or dimmable street lighting that dims at pre-determined times.

Embedded means something that is connected to another thing and a system is an arrangement in which all its unit fabricate work together according to a set of rules [3]. It can also be described as a way of working, organizing or doing one or many tasks according to a fixed plan. An embedded system can be thought as a computer hardware system having software embedded in it[4]. An embedded system is a microcontroller or micro processor based system which is designed to perform a specific task.

The Internet of Things has developed due to the convergence of multiple technologies, real-time analytics, commodity sensors, machine learning, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation and others all contribute to enabling the Internet of Things. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating possibilities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency and accuracy.

2. OBJECTIVE

The main objective of this Street lightning System is to control energy efficient LED street lights to turn ON only when needed otherwise to remain OFF. It helps to decrease the wastage of Electricity by controlling the working of street light system.

3. LITERATURE SURVEY

Street Lightning System is necessary to provide ease to the people for safety measurements on the road during nights. Many authors have worked on this street lightning system [11]. It suggested an intelligent management of the lamp posts by sending data to a central station by ZigBee wireless communication. With the suggested system, maintenance can be easily and efficiently planned from the central station, allowing additional savings [12].

4. DESCRIPTION OF THE PROJECT
4.1 PROPOSED SYSTEM

PIR Sensor, LDR Sensor and IR sensor are connected to the Raspberry Pi. There are three modes of

Operation in this project by giving manual commands for every mode in putty software. The modes of operation is as follows

Mode 1- If IR Sensor detects an object then the respective street light will turn on, if not it remains off. The process will continue till we exit from the command and then stop [5].

Mode 2- If PIR sensor detects the motion then the whole street lights will be turned ON for period of time declared. If PIR sensor does not detect any motion the street lights remains OFF. The process will continue till we exit from the command and then stop [6].

Mode 3- If LDR sensor module detects darkness i.e., in the night time the whole street lights will turn ON and in the daytime street lights will be turned OFF. The process will continue till we exit from the command [7].
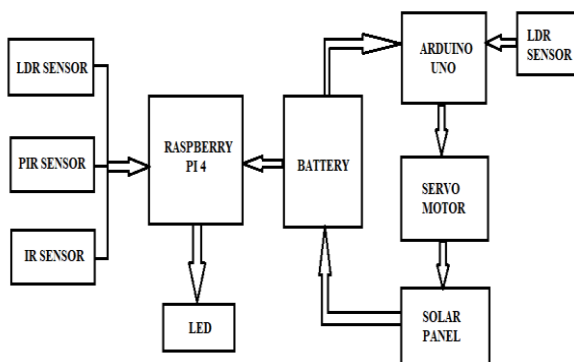

Fig: System Architecture

This is intended with Solar Module which is controlled by Arduino Uno. Solar panels are used for charging batteries by changing daylight into electricity. The energy which is stored in battery is used as power supply for the street lights[8]. Thus, this technique reduces power wastage and also a manual switch is provided. Servo Motors are used in applications to control rotational speed and position as well as output torque. Servo Motor is connected to Arduino Uno to control the direction of solar panel [9].

4.2 HARDWARE RECQUIREMENTS

RASPBERRY Pi 4

Raspberry Pi is a small-sized computer used Linux operating system. It is a small size computer used to run larger and smart programs to achieve output quickly. RPi 4 B+(RP4) is the latest model developed by the company, which has all the essential latest wired

and wireless communication system used in most of the smart projects [10]. A single Raspberry Pi 4 comes to a Quad-core Processor but it has three various versions which give three various sizes of RAM.
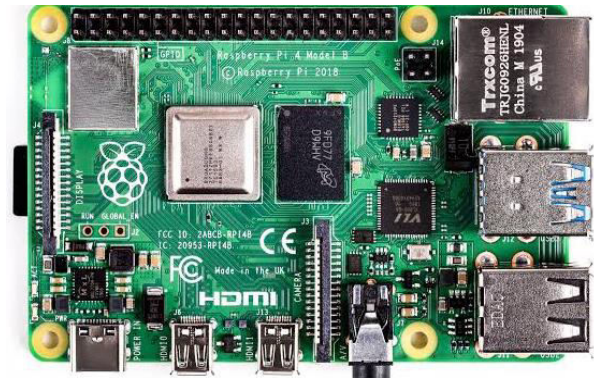

Fig: Raspberry Pi 4

INFRARED SENSORS

An IR sensor is an electronic device that is used to sense some aspects of the surrounding environment. An IR sensor can measure the heat of an object as well as detects the movement as well as the presence of an object due to interruption. These type of sensors measure only infrared radiation, rather than emitting it that is called as a passive infrared sensor, an IR sensor is simply a device which detects infrared radiation falling on it.
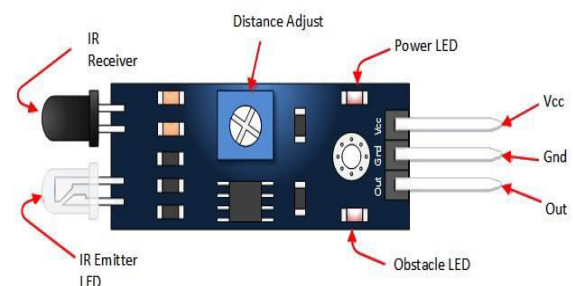

Fig: IR Sensor

LIGHT DEPENDENT RESISTANCE

Light Dependent Resistors are very useful especially in light or dark sensor circuits. Light dependent resistor as the name suggests depends on light for the variation of resistance. Normally the resistance of an LDR is very high, sometimes as high as 1000000 ohms, but when they are illuminated with light resistance drops dramatically. Electronic onto sensors are the devices that alter their electrical characteristics, in the presence of visible or invisible light.
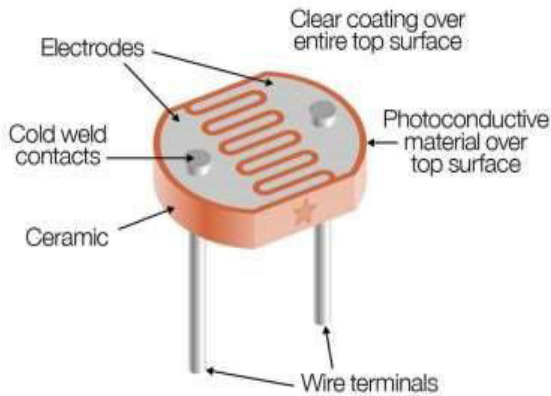
Fig: LDR Sensor

Fig: Arduino Uno

PIR SENSOR

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR based motion detectors. PIR sensors use a pair of piezoelectric sensors to detect heat energy in the surrounding environment. PIR sensors are commonly used in security alarms, motion detection alarms and automatic lighting applications.
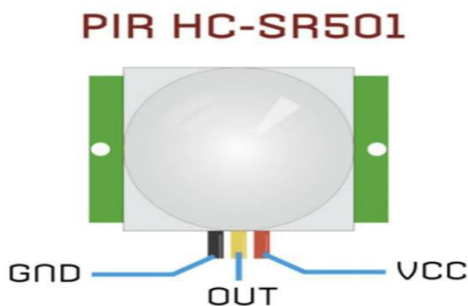

Fig: PIR Sensor

ARDUINO UNO

Arduino UNO is the microcontroller used in this paper, it is based on ATmega328.It is open source electronic platform based on easy to use software and hardware. It reads input-light on sensor, finger on a button, etc. It has14 input/output and 6 Analog pins. The software used in this microcontroller is ARDUINO IDE.
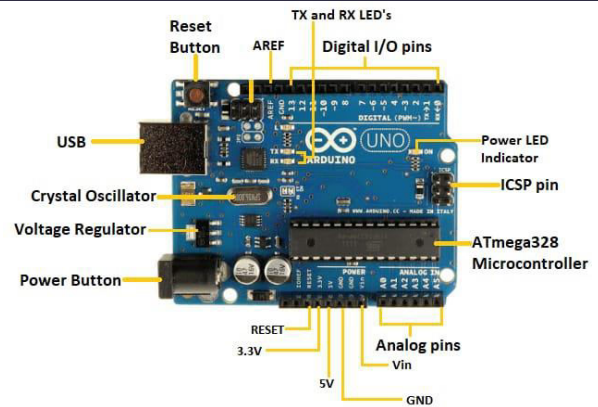
LIGHT EMITTING DIODE

A light-emitting diode (LED) is a two-lead semiconductor light source. The long terminal is positive and the short terminal is negative. It is p-n junction diode that emits light when activated. When a suitable current is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the colour of the light is determined by the energy band gap of the semiconductor. LEDs are typically small and integrated optical components may be used to shape the radiation pattern.
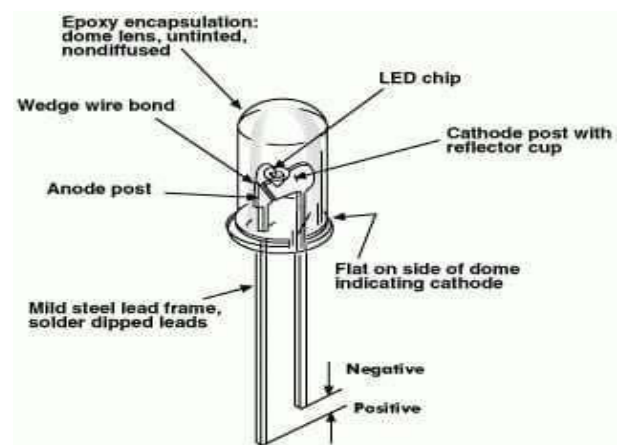

Fig: LED

SOLAR PANEL

Solar energy begins with the sun. Solar panels are also known as "PV panels" which are used to convert light from the sun, which is composed of particles of energy called "photons", into electricity that can be used to power electrical loads. Solar panels can be used for a

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wide variety of applications including remote power systems for cabins, telecommunications equipment, and for the production of electricity by residential and commercial solar electric systems.

Fig: Solar Panel

SERVO MOTOR

Micro Servo Motor SG90 is a tiny and lightweight server motor with high output power. It is an electromechanical device. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. It produces torque and velocity based on the supplied current and voltage.
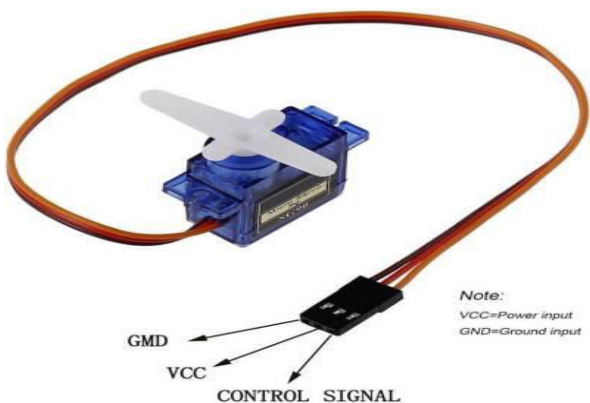

Fig: Servo Motor

SOFTWARE RECQUIREMENTS

RASPBIAN

➤ Installation of Raspbian OS in Raspberry Pi.
➤ Raspberry Pi Supports C/C++ and Python version 2/3 by default.
➤ However, These Language Compiler or Interpreter can be installed on Raspbian OS.

ARDUINO IDE

➤ Downloading Arduino IDE software and then power up Arduino Board.
➤ Launching Arduino IDE.
➤ The Arduino integrated development environment is a cross platform Application, that is written in Java programming language and C/C++.
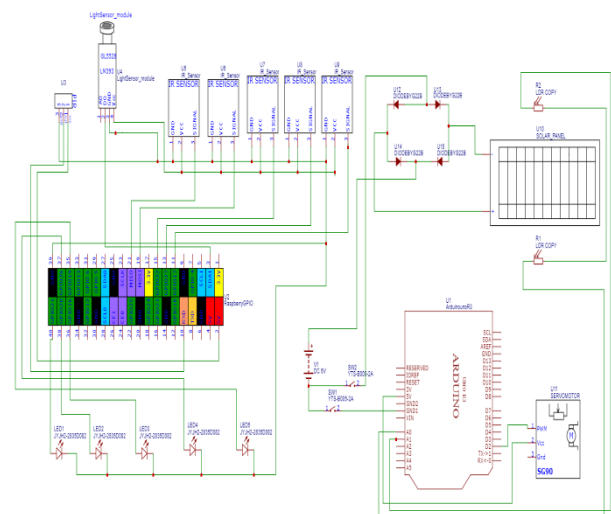
4.3 IMPLEMENTATION OF PROJECT

Fig: Schematic Diagram

Raspberry Pi is connected remotely in a hub for automatic turning ON/OFF the street lights. A person is going to control different streets in that hub. In between 6 and 11'O clock at Night, there are huge vehicles on the Roads. So PIR mode of Operation is used for automatic turning ON the whole street lights when Motion is detected for a period of time declared i.e., for 10 secs. During mid night, there are less vehicles on the roads. So IR mode of Operation is used for automatic turning ON the respective street light when the motion is detected. At the time of Festivals, LDR mode of Operation is used i.e., the street lights automatically turned ON at night and turned OFF at day time. Here Manual commands has to be given in the putty software for shifting the mode of Operation the Solar Module is appended for maintaining less power consumption. There are two manual switches provided to maintain Raspberry pi and Arduino Board. Solar panels are used for charging batteries by changing daylight into electricity. Servo Motor is used to direct the solar panel. The energy which is stored in battery

is used as power supply for the street lights. Whenever there is no charge in the battery then the second switch is used to process the Arduino board.

RESULT

PIR mode of Operation, when the motion detected, the whole street lights ON for a period of 10 sec.
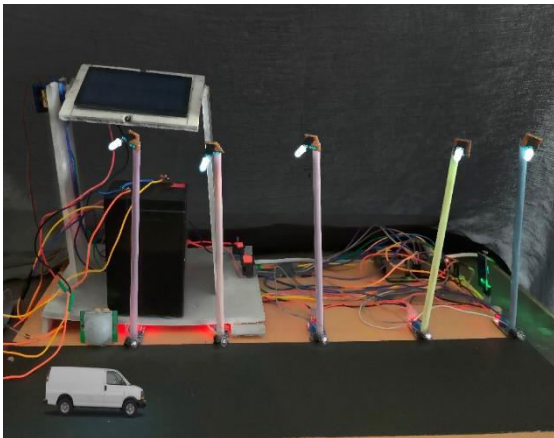

Fig: PIR Mode

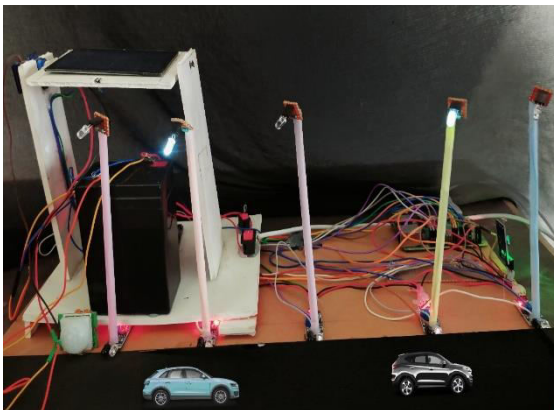IR mode of Operation, whenever there is a movement, the respective street lights turns On.

Fig: IR Mode

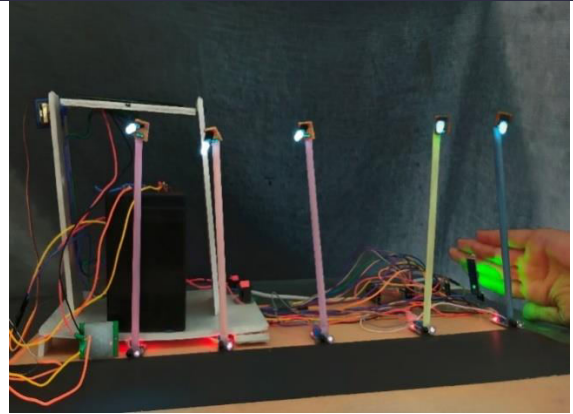LDR mode of Operation, in the dark condition the street lights will turns On.

Fig: LDR Mode

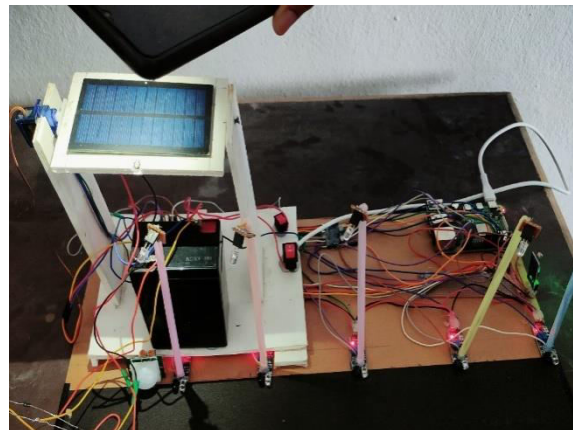Solar Panel rotation when it hits by lightning which converts light energy into electricity.

Fig: Solar Model

5. CONCLUSION

This project of REAL TIME STREET LIGHTS SYSTEM has been implemented in order to provide ease to the people for safety measurements on the road during nights. The prototype of this project is build, Raspberry pi is used to control the Street lights by considering the commands in the software by wirelessly. Different Sensors are used in this project to maintain the modes of lightning system. We can control the street lights from the hub where the processor is maintained and can Identity which street light is turned ON/OFF. Hence, The solar module provides the safety way to save energy.

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