<u>Acknowledgments</u>

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Introduction To Our Project

Project name: Automated Street Light System

Guided by: Mrs. Ami J Patel

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- ➢ In the present days automated system have less manual operations, high flexibility, and accurate.

- ➢ Especially in the field of electronics automated systems are giving good performance.

- ➢ Our project is to control the switching of street light automatically.

- ➢ IR's Which detect the vehicle with the Micro controller are used.

Objectives:-

- ➢ We have set multiple objectives for ourselves to make our project as better as possible.

- ➢ This project aim to design streetlight that works in both conventional (electrical) as well as non-conventional (solar) energy resource.

- ➢ Using LDR we control the streetlight, when the LDR value falls above the threshold value the light are switch on and when the value falls below the threshold value the light are switched off.

- ➢ By using this system energy consumption is reduced.

- ➢ IR sensor and microcontroller are main component of the project.

- ➢ IR sensor is like our EYE which detect the presence of an object.

Aim of project:-

> The aim of this project is to design a street light control system using microcontroller, which automatically turns on or off the street lights by detecting the movement of vehicles. The working of the project is explained   here.

> The IR transmitter is placed directly in line of sight with IR receiver, so that the IR receiver continuously receives infrared rays. Once the IR receiver receives infrared rays, the microcontroller will detect Logic 1. If the infrared rays are blocked by some means, the microcontroller will detect logic 0.

> So, the program for the microcontroller must be written in such a way that it will turn ON the LEDs, which means here the street lamp, when it detects Logic 0 and it will turn OFF the LEDs, when it detects Logic 1.

> Consider the two IR sensors i.e. IR Transmitter and IR Receiver are placed on the either side of the road. As per the circuit diagram, the IR receivers are connected to the PORT0 and the LEDs are connected to the PORT2 of the microcontroller.

> At the beginning, when there is no obstacle, the IR receiver continuously detects IR light transmitted by the IR Transmitter. When a car or any other vehicle blocks any of the IR sensor, the microcontroller will turn ON the immediate three LEDs.

> If the car blocks the first IR sensor, the first three LEDs are turned ON by the microcontroller. As the car moves forward and blocks the second IR sensor, the corresponding next three LEDs will be turned ON and the first LED of the previous set is turned OFF. The process continues this way for all the IR Sensors and LEDs.

➤ This project is used to detect the movement of a vehicle on highways or roads to turn ON the lights when the vehicle is ahead of the lights, and to turn OFF the glowing light when the vehicle passes away from the lights. By using this project we can conserve the energy.

➤ During the night time all the lights on the highway road remain on throughout the night, so the energy loss will be high when there is no movement of vehicles. This project gives a solution for saving the energy. This is attained by detecting an approaching vehicle by turning ON the street lights. As the vehicle passes away from the street light, then the lights get turn OFF. If there are no vehicles on the road, then all the lights will turn OFF.

➤ The infrared sensors are placed on each side of the road that are used to detect the vehicle movement and send the logic signals to a microcontroller (AT89S52 series) to turn on/ off the LEDs for a specific distance. Therefore, this way of dynamically switching ON and OFF the street lights helps in reducing the power consumption.

➤ By using this project a lot of energy can be saved. The proposed system uses LEDs instead of other lamps. The project is especially designed for street lighting in remote rural and urban areas where the traffic is low at times. The system is multipurpose, extendable and totally variable to user needs.

➤ The applications of this street light that glows on detecting vehicle movement mainly involve in highways, real time street lights, hotels, parking areas and restaurants, etc. The advantages are; low cost, more life span and energy can be saved.

PROBLEM DEFINATION AND BENEFITS:-

DRAWBACK AND PROBLEM WITH EXISTING SYSTEM

- ➢ The initial investment is very high.

- ➢ Rechargeable batteries have to be replaced from time to time.

- ➢ Non availability of sunlight during rainy and winter season is problem.

- ➢ Dust accumulation on the surface of panel create a problem.

- ➢ Iot is depended on Internet.

- ➢ Can be more complicated to align detector pairs.

- ➢ It has a limitation of power.

- ➢ LED is a voltage device.

ADVANTAGE:-

- ➢ Energy saving.

- ➢ Low cost.

- ➢ Automated operation.

- ➢ Power consumption is much lower.

- ➢ Maintainance cost is low compare to convencial street light.

- ➢ The longer life compare to street light.

- ➢ Reducing physical effort.

- ➢ Efficient method.

- ➢ Cheap and economical.

- ➢ If the lighting system implements all LED lights, the cost of the maintenance can be reduced as the life span and durability of LEDs is higher than Neon based lights which are normally used as street lights.

- ➢ As the lights are automatically turned ON or OFF, huge amount of energy can be saved

SYSTEM REQUIREMENTS:-

- **HARDWARE REQUIREMENTS**

Basic Hardware requirements are:-

- ✓ PROCESSOR:- 1GHz or Faster Processor INTEL PENTIUM 4 or HIGHER
- ✓ RAM:-1 GB RAM
- ✓ HARD DISK:- 20 GB or MORE
- ✓ A working computer system with legal and certified operating System.
- ✓ Battery for Uninterrupted power supply.

- **SOFTWARE REQUIREMENTS**

Basic Software requirements are:-

- ✓ Arduino Software (IDE)
- ✓ Proteus

Hardware Section:-

1. NodeMcu:-

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects
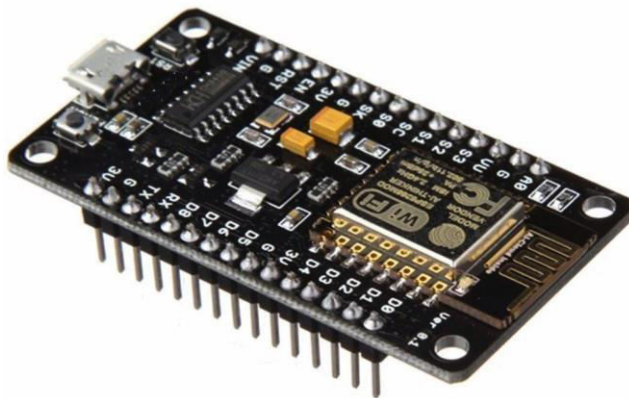
Advantages:-

- **Inexpensive**: Arduino boards are relatively inexpensive compared to othermicrocontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50.

- **Cross-platform**: The Arduino Software (IDE) runs on Windows, MacintoshOSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

- **Simple, clear programming environment**: The Arduino Software (IDE) iseasy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

- **Open source and extensible software:** The Arduino software is published asopen source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

2. RELAY MODULE

➢ A relay is an electrically operated switch of mains voltage. It means that it can be turned on or off, letting the current go through or not.

➢ Controlling a relay with the Arduino is as simple as controlling an output such as an LED.

➢ **COM**: common pin

➢ **NO (Normally Open):**there is no contact between the common pin and thenormally open pin. So, when you trigger the relay, it connects to the COM pin and supply is provided to a load

➢ **NC (Normally Closed):**there is contact between the common pin and thenormally closed pin. There is always connection between the COM and NC pins, even when the relay is turned off. When you trigger the relay, the circuit is opened and there is no supply provided to a load.

➢ The Relay Board can be used to turn lights, fans and other devices on/off while keeping them isolated from your microcontroller.

➢ The Relay Board allows you to control high-power devices (up to 10 A) via the on-board relay.

➢ Control of the relay is provided via a 1 x 3 header – friendly to servo cables and convenient to connect to many development boards.

3. IR SENSOR (INFRARED SENSOR)

- ➢ An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings.

- ➢ An IR sensor can measure the heat of an object as well as detects the motion.

- ➢ These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

- ➢ Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.

- ➢ These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.

- ➢ The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

- ➢ When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

➢ IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum.

➢ By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light.

➢ When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor.

➢ This results in a large jump in the intensity, which we already know can be detected using a threshold.

➢ It is capable of measuring heat and detection of moving object
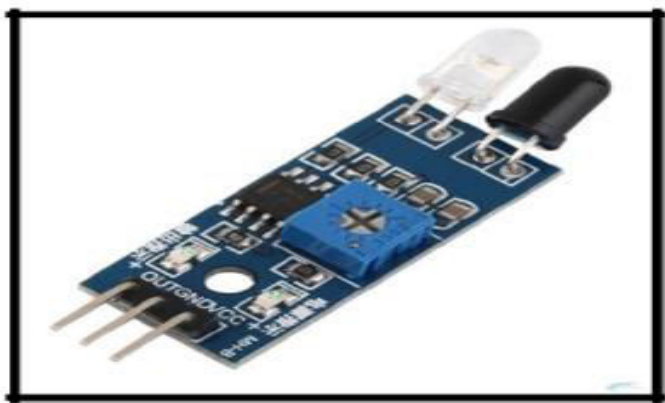
4.LDR SENOSR:-

➢ It stand for *LIGHT DEPENDENT RESISTOR*

➢ **Light Dependent Resistor** (LDR) is made from a piece of exposed semiconductor material such as cadmium sulphide that changes its electrical resistance from several thousand Ohms in the dark to only a few hundred Ohms when light falls upon it by creating hole-electron pairs in the material.

➢ An ldr offers the resistance in the response to the ambient light.

➢ The registance of the ldr increase as the intensity of light increase

➢ It can act as a sensor,since a varying voltage drop can be obtained in accordance with the varying light.

➢ The net effect is an improvement in its conductivity with a decrease in resistance for an increase in illumination. Also, photoresistive cells have a long response time requiring many seconds to respond to a change in the light intensity.

➢ Materials used as the semiconductor substrate include, lead sulphide (PbS), lead selenide (PbSe), indium antimonide (InSb) which detect light in the infra-red range with the most commonly used of all photoresistive light sensors being **Cadmium Sulphide** (Cds).

➢ Cadmium sulphide is used in the manufacture of photoconductive cells because its spectral response curve closely matches that of the human eye and can even be controlled using a simple torch as a light source.

Typically then, it has a peak sensitivity wavelength (λp) of about 560nm to 600nm in the visible spectral range.

www.dnatechindia.com

5.ESP8266 WIFI MODULE:

➢ The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontrollercapability produced by Shanghai-based Chinese manufacturer Espressif Systems Manufacturer

Espressif Systems	
Type	32-bit microcontroller
CPU	@ 80 MHz (default) or 160 MHz
Memory	32 KiB instruction, 80 KiB user data
Input	16 GPIO pins

Successor	ESP32

The chip first came to the attention of western makers in August 2014 with the **ESP-01**module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.

[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.
[3]The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi

> ➢ It is mostly used for development of IOT(internet of Things) embedded application.

> ➢ Esp8266 module is low cost standalone wireless transceiver that can be used for end-point IOT developers.
> ➢ This will be used to integrate the system onto cloud and facillities storage&analysis of data collected.

6.LED:-

- ➢ It stand for LIGHT EMITTING DIODES.

- ➢ A light-emitting diode is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated.

- ➢ A LED is semiconductor light source.

- ➢ LED are used as indicator lamps in many devices,and are increasignly used for lighting.

- ➢ Led are intorduced as a practical electronic component in 1962

- ➢ A diode is a component that only allows electricity to flow one way. It can be thought as a sort of one way street for electrons. Because of this characteristic, diode are used to transform or rectify AC voltage into a DC voltage. Diodes have two connections, an anode and a cathode. The cathode is the end on the schematic with the point of the triangle pointing towards a line. In other words, the triangle points toward that cathode. The anode is, of course, the opposite end. Current flows from the anode to the cathode.

> Light emitting diodes, or LEDs, differ from regular diodes in that when a voltage is applied, they emit light. This light can be red (most common), green, yellow, orange, blue (not very common), or infa red. LEDs are used as indicators, transmitters, etc. Most likely, a LED will never burn out like a regular lamp will and requires many times less current. Because LEDs act like regular diodes and will form a short if connected between + and -, a current limiting resistor is used to prevent that very thing. LEDs may or may not be drawn with the circle surrounding them.
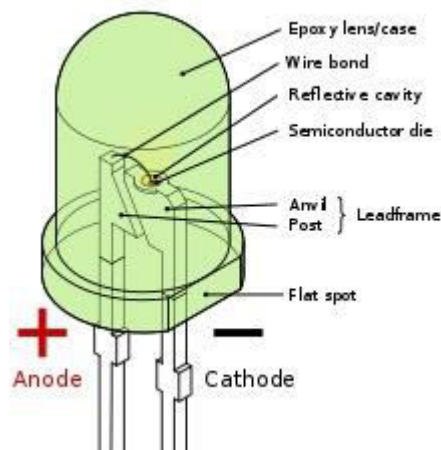
Software Section:-

1. Arduino Software (IDE)

➢ Arduino is an open-source electronics platform based on easy-to-use hardware and software.

➢ Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language(based on Wiring), and the Arduino Software (IDE), based on Processing.--

➢ The open-source **Arduino Software** (**IDE**) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source **software**.

➢ The Arduino Integrated Development Environment - or Arduino Software (IDE) - 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 programs and communicate with them.

- ## **Writing Sketches**

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information.
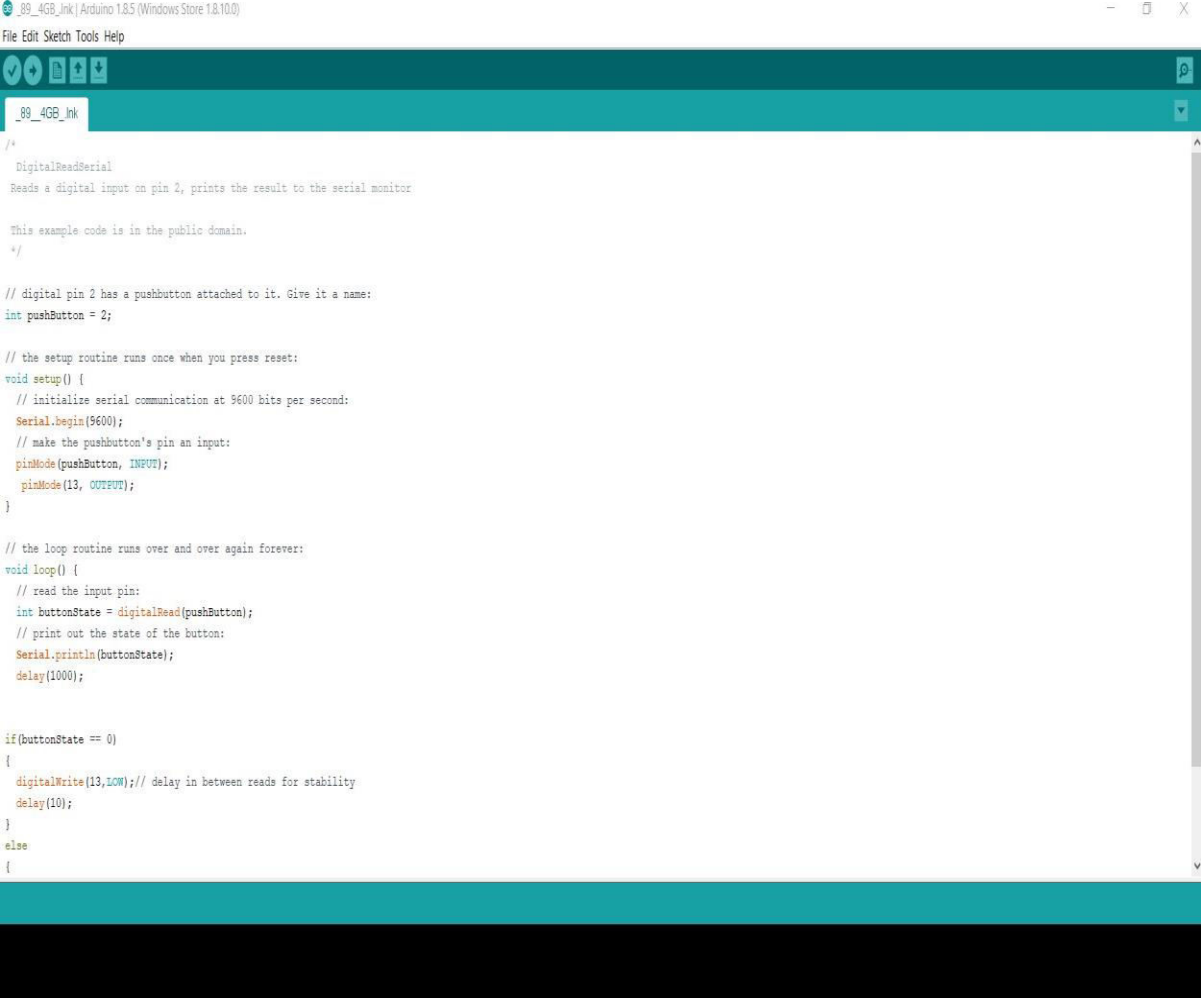
- ## **Tabs, Multiple Files, and Compilation**

Allows you to manage sketches with more than one file (each of which appears in its own tab). These can be normal Arduino code files (no visible extension), C files (.c extension), C++ files (.cpp), or header files (.h).

- ## **Uploading**

Before uploading your sketch, you need to select the correct items from the Tools > Board and Tools > Port menus. Theboards are described below. On the Mac, the serial port is probably something like /dev/tty.usbmodem241 (for a Uno or Mega2560 or Leonardo) or /dev/tty.usbserial-1B1 (for a Duemilanove or earlier USB board),

LAYOUT OF Arduino Software (IDE)

3. <u>Proteus</u>

- The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation.

- The software is used mainly by electronic design engineers and electronic technicians to create electronic schematics and electronic prints for manufacturing printed circuit boards.

- It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages.

- Proteus is a software package for computer-assisted design, simulation and design of electronic circuits.

- It consists of two main parts, the ISIS, the circuit design environment, which also includes the simulator VSM, and the ARES, the circuit board designer.

LAYOUT OF Proteus Software (IDE)
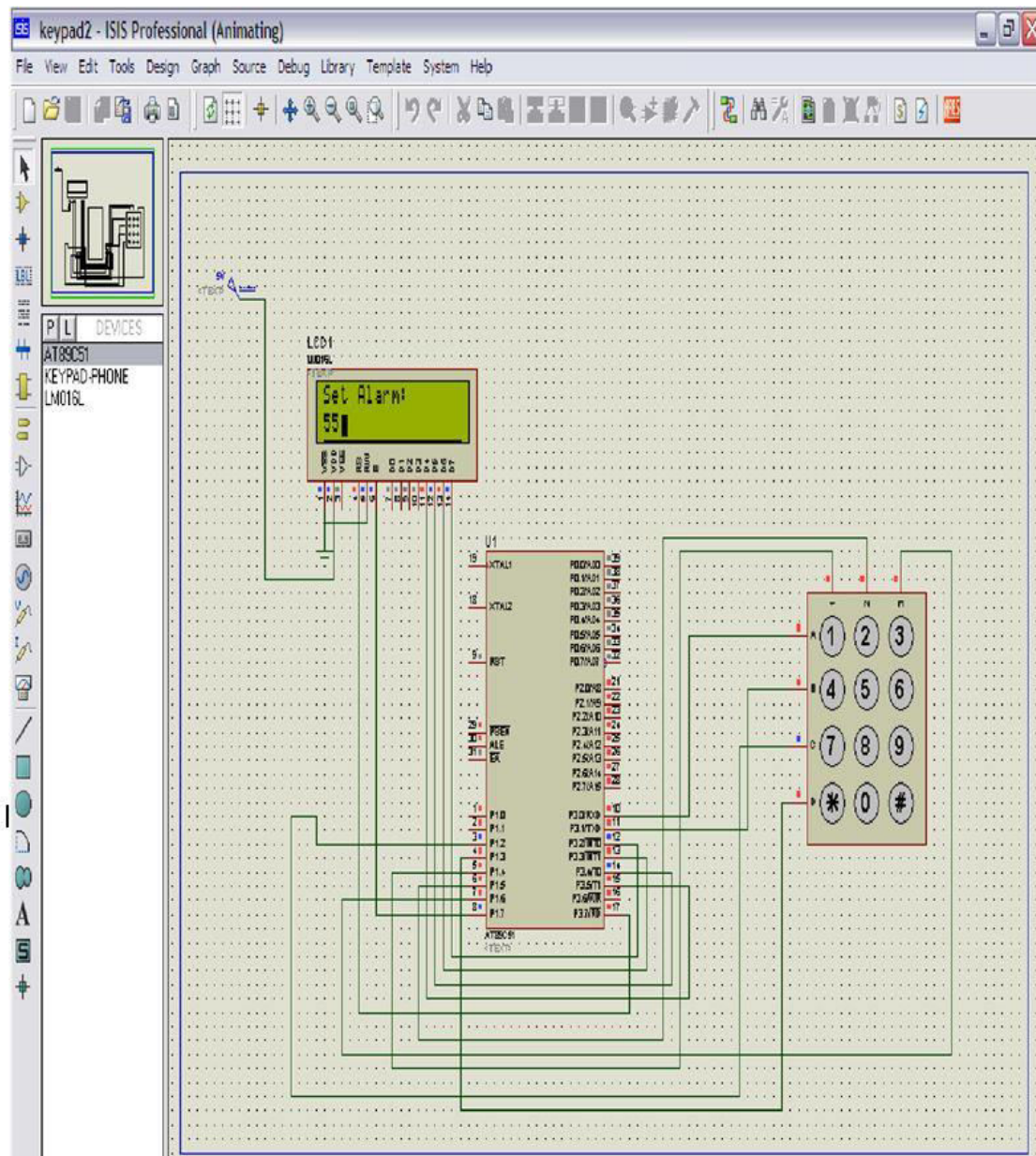
Defining IOT:-

- The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects.

- Usually the network will be wireless and self-configuring, such as household appliances.

- It is a system of interrelated comuputing device ,digital machines,objects,animals or people that are provide with unique identifiers and abiltity to transafer data over a network

- Internet of Things refers to the concept that the Internet is no longer just a global network for people to communicate with one another using computers, but it is also a platform for devices to communicate electronically with the world around them.

- The Internet of Things (IOT) is the network of physical objects—devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

- The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.

- IOT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial

intelligence technology to deliver complete systems for a product or service.

- These systems allow greater transparency, control, and performance when applied to any industry or system.

- IOT systems have applications across industries through their unique flexibility and ability to be suitable in any environment. They enhance data collection, automation, operations, and much more through smart devices and powerful enabling technology.

IOT − Key Features

- The most important features of IOT include artificial intelligence, connectivity, sensors, active engagement, and small device use. A brief review of these features is given below –

- **AI**: IOT essentially makes virtually anything "smart",meaning itenhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks. This can mean something as simple as enhancing your refrigerator and cabinets to detect when milk and your favorite cereal run low, and to then place an order with your preferred grocer.

- **Connectivity** – New enabling technologies for networking, andspecifically IOT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IOT creates these small networks between its system devices.

- **Sensors** – IOT loses its distinction without sensors. They act asdefining instruments which transform IOT from a standard passive network of devices into an active system capable of real-world integration.

- **Active Engagement** – Much of today's interaction with connectedtechnology happens through passive engagement. IOT introduces a new paradigm for active content, product, or service engagement.

Future of IOT:

- ➢ According to NASSCOM, the global market size of IOT is expected to touch USD 3 trillion by 2020. In this landscape, startups are playing the biggest role in enabling IOT services in the consumer as well as the industrial segment. In India, there are more than 60 percent start-ups working on the lines of IOT with their highly technical and technological skills.

- ➢ ~7 devices per person

➢ Huge demand for IOT developers

➢ IOT proves to have a huge scope as it provides a unique opportunity for businesses to turn data into insights. There are a number of contributing factors as well that drive the adoption of IOT such as improved sensors, device connections, the evolution of lifestyle and mobility. These factors alone will drive the adoption of IOT in India. By 2020, India's IOT market is expected to reach by USD 15 billion as per NASSCOM's report. To provide an improved internet experience, many companies and start-ups have emerged as big players in the IOT market. In India, nearly 120 companies and 70 % start-ups are offering IOT enabled solutions. From 2015 till now, around 60 USD million has been invested in IOT which has given birth to a new way of working and living.

➢ If we talk about IOT applications in an organized manner, these are broadly divided into Industrial and Consumer segments. The industrial segment covers industrial and retail automation which largely contributes to the development of smart cities. On the other hand, the consumer segment is mainly driven by personal interest and covers smart lifestyle, home, health & fitness automation. Likewise, enterprises and consumers using IOT solutions will be complementing the IOT growth in our country.

<u>IOT – Advantages:-</u>

The advantages of IOT span across every area of lifestyle and business. Here is a list of some of the advantages that IOT has to offer-

- ➢ **Improved Customer Engagement**– Current analytics suffer fromblind-spots and significant flaws in accuracy; and as noted, engagement remains passive. IOT completely transforms this to achieve richer and more effective engagement with audiences.

- ➢ **Technology Optimization** – the same technologies and data whichimprove the customer experience also improve device use, and aid in more potent improvements to technology. IOT unlocks a world of critical functional and field data.

- ➢ **Reduced Waste** –IOT makes areas of improvement clear. Currentanalytics give us superficial insight, but IOT provides real-world information leading to more effective management of resources.

- ➢ **Enhanced Data Collection** – Modern data collection suffers from itslimitations and its design for passive use. IOT breaks it out of those spaces, and places it exactly where humans really want to go to analyse our world. It allows an accurate picture of everything.

IOT – Disadvantages:-

- ➢ Though IOT delivers an impressive set of benefits, it also presents a significant set of challenges. Here is a list of some its major issues −

- ➢ **Security** − IOT createsan ecosystem of constantly connected devicescommunicating over networks. The system offers little control despite any security measures. This leaves users exposed to various kinds of attackers.

- ➢ **Privacy** − the sophistication of IOT provides substantial personal datain extreme detail without the user's active participation.

- ➢ **Complexity** − Some find IOT systems complicated in terms of design,deployment, and maintenance given their use of multiple technologies and a large set of new enabling technologies.

- ➢ **Flexibility** − Many are concerned about the flexibility of an IOTsystem to integrate easily with another. They worry about finding themselves with several conflicting or locked systems.

- ➢ **Compliance** − IOT, like any other technology in the realm of business,must comply with regulations. Its complexity makes the issue of compliance seem incredibly challenging when many consider standard software compliance a battle.

Introduction to Front-End

- Front End of system is very much necessary because by this the customer or the user can interact with it. It is also known As GUI (Graphical User Interface).

- Project becomes more attractive when GUI is used. It can be known as only factor by which user gets attracted.

- In our project GUI is on cloud, which user store data on cloud

Introduction to Back-End

- There is Back-End of every system. Back-End part is necessary because by these the developer applies his/her logic to develop the product.

- Back-End is also called Database in computer language, but we are using Arduino IDE to develop.

- Without Back-End, a system is just a prototype which cannot be worked.

- Without it a page or an application is static which cannot be worked further with better functionalities.

- In IOT there is also database but Arduino is board level programming by which the actual project works.

- With the help of Arduino the particular sensor will work.

Cloud storage:-

- ➤ **Cloud storage** is a model of computer data storage in which the digital data is stored in logical pools. The physical storage spans muliple servers (sometimes in multiple locations), and the physical environment is typically owned and managed by a hostingcompany. These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment protected and running. People and organizations buy or lease storage capacity from the providers to store user, organization, or application data.

- ➤ Cloud storage services may be accessed through a colocated cloud computing service, a web service application programming interface(API) or by applications that utilize the API, such as cloud desktop storage
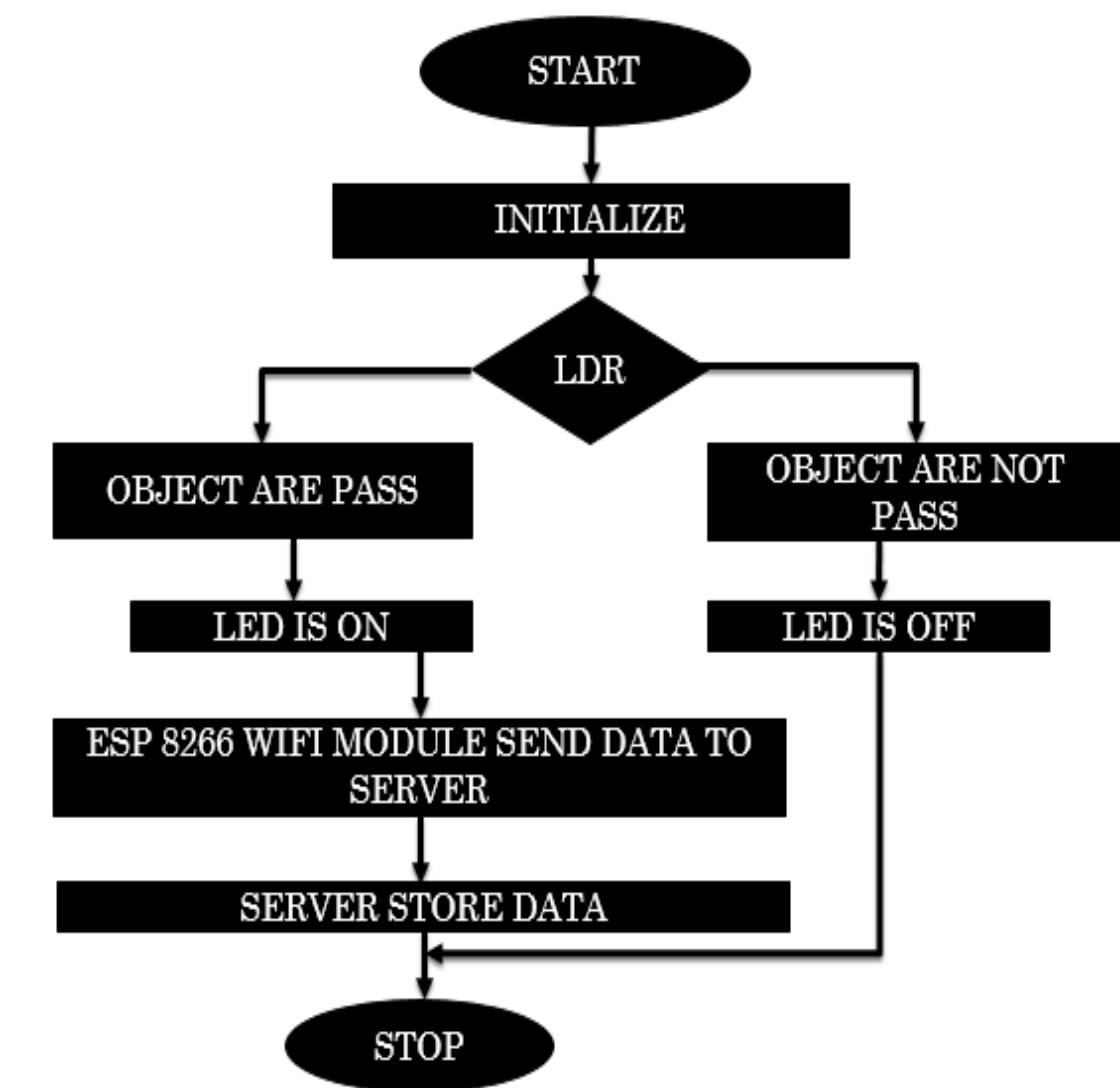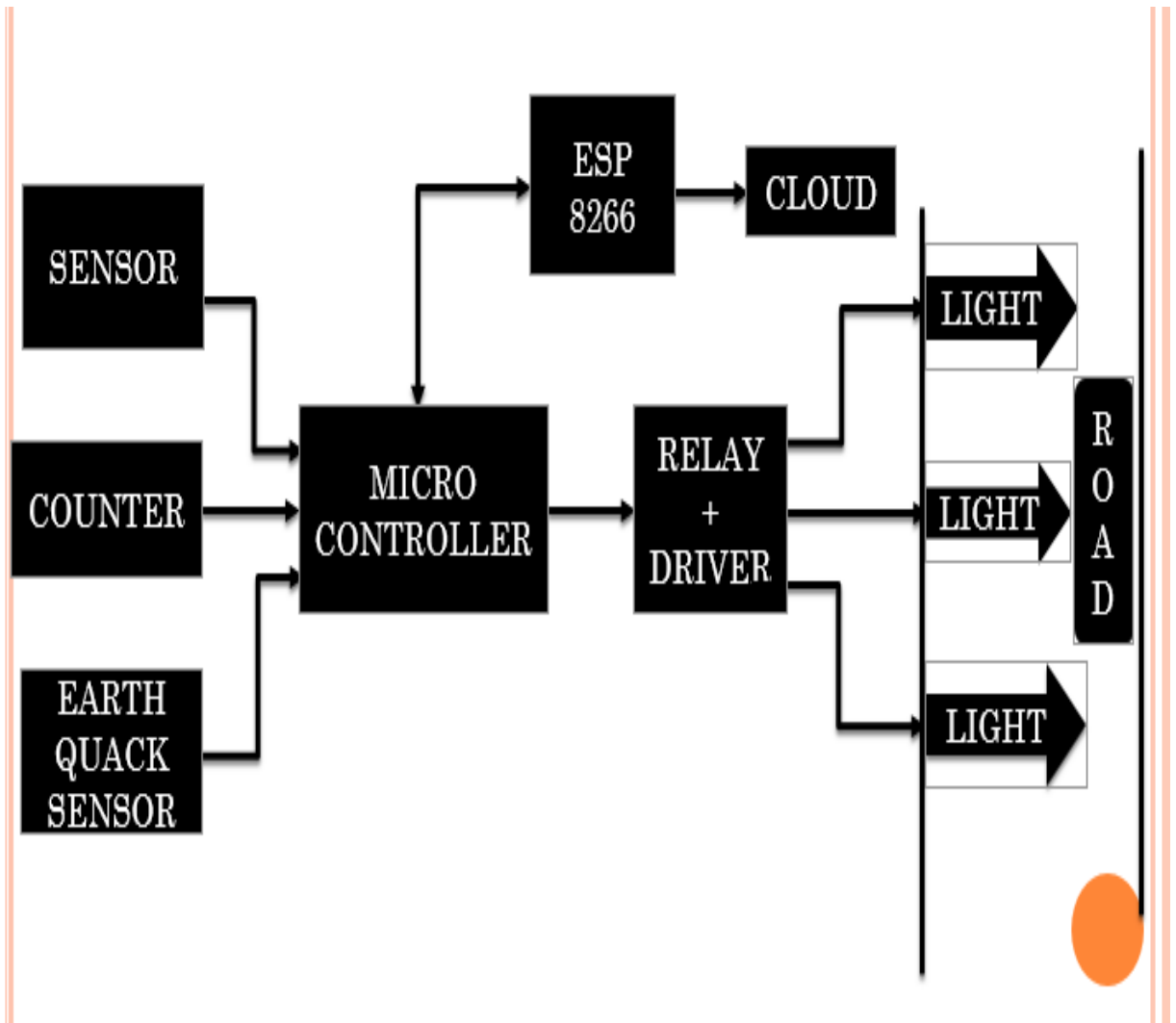
Cloud Computing

- Cloud computing is an information technology (IT) paradigm, a model for enabling ubiquitous access to shared pools of configurable resources.

- Resources such as computer networks, servers, storage, applications and services, which can be rapidly provisioned with minimal management effort, often over the Internet.

- Cloud computing allows users and enterprises with various computing capabilities to store and process data either in a privately-owned cloud, or on a third-party server located in a data centre – thus making data-accissing mechanism more efficient and reliable.

- Cloud computing relies on sharing of resource to achieve coherence and economy of scale, similar to a utility.
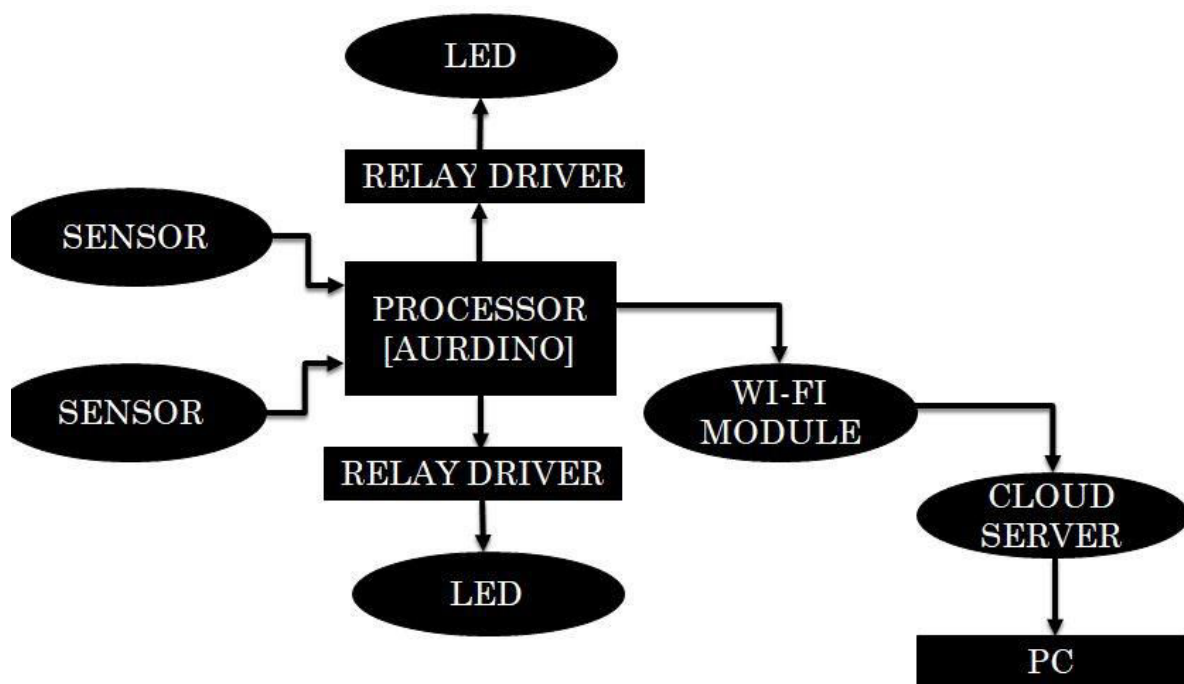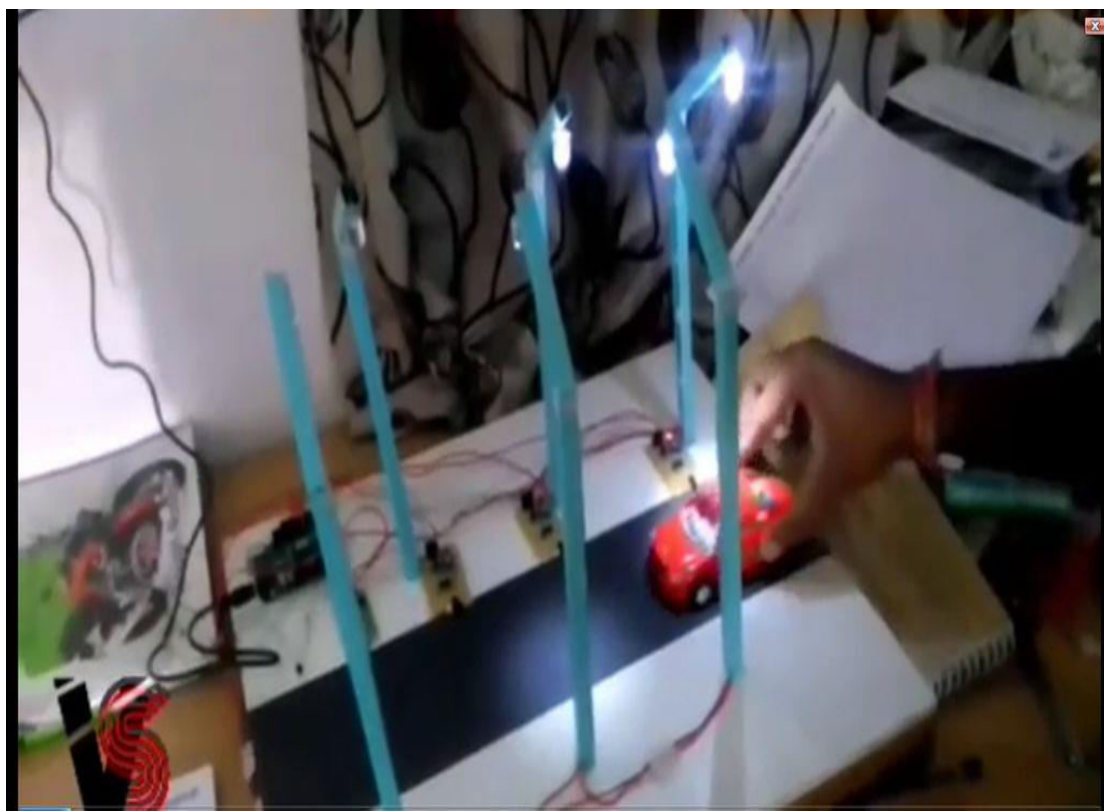
Flowchart:-

```
                    START
                      |
                      v
                  INITIALIZE
                      |
                      v
                     LDR
          +-----------+-----------+
          |                       |
          v                       v
   OBJECT ARE PASS        OBJECT ARE NOT
                              PASS
          |                       |
          v                       v
      LED IS ON              LED IS OFF
          |                       |
          v                       |
 ESP 8266 WIFI MODULE SEND DATA   |
           TO SERVER              |
          |                       |
          v                       |
   SERVER STORE DATA              |
          |                       |
          v<----------------------+
        STOP
```

Architecture Design:-

Data Flow Diagram:-

Layout of project:-

Further Enhancement

- We can make this system work in Highways and road

- With the concept of 'Digital India' and 'Make in India' we could make this project on big scale for smart city purpose

- Pole damage detection with the addition of a suitable sensor

- If the system has traffic speed sensor then this information could be used to manage traffic speed via the dimming of the street light

- With the added intelligent in the lamp you can add further features to increase hid lamp life such as softer star-up and protection against re-lighting

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