



## IOT BASED SMART STREET LIGHTNING SYSTEM

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**Abstract:** IOT based smart Street Lightning system aims at designing & executing the advanced development in embedded systems. This paper gives the most effective solution for electric power wastage for manual operation of the switching action of the road lights. Street Lightning system has multifunctional features as two are used which are Light Dependent Resistor (LDR) sensor to point a day/night time and also the passive infrared sensor (PIR) to detect the movement of auto on the road. The ARDUINO UNO (ATMEGA328T) is employed as brain to regulate the road light system, where ARDUINO programming is used. The smoke sensor used also will detect the extend of pollution caused by the gases For over-speeding motion sensor is used as if vehicle on the road crosses the speed limits to avoid the accident on the road side areas and specially the highways. Upon sensing the movements the sensor transmits the info to the microcontroller which instructs the sunshine to change ON. Similarly as soon as vehicle or an obstacle goes away the light intensity decreases. This was to scale back the side effects of this street lightning system, and find an answer to save lots of power. This project is cost effective, practical, eco-friendly and also the safest thanks to save energy it clearly tackles the two problems that world is facing today, saving of energy and also disposal of incandescent lamps very efficiently. Thus, the paper contains a wider impact on the event of this method for the smart city project.

**Keywords:** Street Lights, LDR sensor, PIR sensor, ARDUINO UNO, ARDIUINO NANO, SMOKE SENSOR, COMPARATOR, WI-FI ESP MODULE(8266),

### 1. INTRODUCTION

The idea of designing a replacement system for the road light that do not consume huge amount of electricity and illuminate large areas with the best intensity of sunshine is concerning each engineer working during this field [1]. Providing street lightning is one in every of the foremost important and expensive responsibilities of a city. Lightning can account for 10-38 % of the overall energy bill in typical cities world-wide [2]. Street Lightning could be a particularly critical concern for public authorities in developing countries due to its strategic importance for economic and social stability. Insufficient Lightning waste significant

financial resources once a year and poor lightning creates unsafe conditions[3]. Energy efficient technologies and style mechanism can reduce cost of the road lightning drastically. This paper gives the simplest solution for electric power wastage. Also the manual operation of the lightning system is totally eliminated during this paper[4]. The two sensors are used which are Light Dependent Resistor (LDR) sensor to point a day/night time and also the passive infrared sensor (PIR) to detect the movement on the road[5]. The ARDUINO UNO (ATMEGA328T) is employed as brain to regulate the road light system, where the programming used

for developing software to microcontroller is ARDUINO program [6]. Finally, the system has

been successfully designed and implemented as the prototype of the system[7].



Figure 1: IOT Based street lightning system

## 2. METHODS AND PROCEDURES

The project is usually a multi-functional prototype that has the aptitude to get rid of the manual operation of the old street lightning system by the strategy of the self-automation [8]. It aims at designing & executing the advanced development in embedded systems for energy saving of street lights and their maintenance at reduced cost with modern development. Street Lightning system has the features as two sensors are used which are Light Dependent Resistor (LDR) to point a day/night time and therefore the passive infrared sensor (PIR) to detect the movement on the road[9]. The ARDUINO UNO (ATMEGA328T) is employed as brain to manage the road light system, where the programming language used for developing the software to the microcontroller is ARDUINO program [10]. The smoke sensor used also will detect the amount of pollution caused by the gases and specially the system for the over-speeding of the vehicle, if the vehicle on the road

crosses the speed limits to avoid the accident on the road side areas and specially the highways [11]. The proposed systems provide an answer for energy saving, this is often achieved by sensing & approaching a vehicle using an IR transmitter and IR Receiver [12]. Upon sensing the movements the sensor transmits the info to the microcontroller which instruct the sunshine to switch ON [13]. Similarly as soon as vehicle or an obstacle goes away the sunshine gets shifted. As sensor sense any object at the identical time the status (ON/OFF) of the road light is accessed from anywhere and anytime through internet [14]. The Wi-Fi ESP (8266) MODULE is employed to upload the important time information on the cloud through IOT panel [15]. The crystal display LCD screen with help of IOT panel displays the pole number, if anybody of pole gets shifted, it'll display the information the pole is finally shifted [16].



Figure 2: Project in the working conditioon

1. **For over-speeding:** if the vehicle crosses its regulation say 2 km/hour, using Motion sensor the buzzer will start to supply the sound indicating that the vehicle is crossing the regulation of the road which makes it easy to prevent the traffic.
2. **For Intensity Adjustment:** it increases or decreases the intensity of the lights to the accidental prone areas using the LDR sensor, if vehicle is present on the streets then intensity increases but if not then intensity decreases.
3. **For Smoke detection:** For Smoke Detection, it will detect the amount of

pollution caused by the gases like CO<sub>2</sub>, sulphur dioxide, nitrous dioxide and carbon monoxide polluting the atmosphere within the parts per million (PPM), it'll display a true time graph on the IOT panel to manage the amount of the pollution.

4. **For GSM switching:** a true time SMS are going to be generated to ON/OFF the pole, if it's found that street lights are OFF and that they are continuously on for a extended period of your time, if the road lights are damaged then using message it can be quickly maintained.

### 3. MATERIALS

#### 3.1 LIGHT DEPENDENT RESISTOR:

The switching action of the street lights is controlled by the LDR sensor. The resistance of the photo resistor decreases with the increasing intensity of the lights and vice-versa thus saving the



Figure 3: Light Dependent Resistor (LDR) sensor.

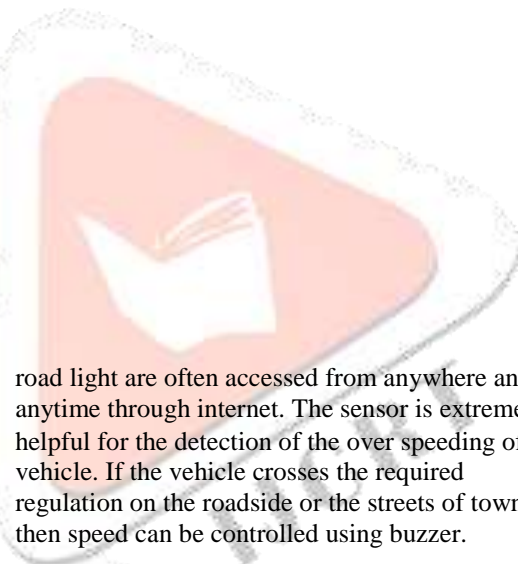
**3.2 MOTION OR PIR SENSOR:** It helps in detection of obstacle on the roadside areas. As soon as the vehicle or an obstacle goes away the sunshine gets changed because the sensor sense any object at the same time the status (ON/OFF) of the



Figure 4: Motion or PIR sensor operation

**3.3 SMOKE SENSOR:** The smoke sensor senses the smoke level caused by the polluting gases mainly carbon monoxide (CO) and greenhouse gases. It will indicate the extend of the pollution caused by the gases and displays it on the IOT panel to point the pollution level. It will dedicate the pollution level of the gases generally in the particles per million (PPM). This is often proved to be a very awfully advantageous for the case where

energy. Thus it is Very helpful in arranging the light intensity as per the requirement of the people and according to the atmospheric conditions.



road light are often accessed from anywhere and anytime through internet. The sensor is extremely helpful for the detection of the over speeding of the vehicle. If the vehicle crosses the required regulation on the roadside or the streets of town then speed can be controlled using buzzer.

the extend of gases emitted by vehicles polluting the environment is quite high. Thus it helps to reduce the pollution of environment.



Figure 5: Smoke sensor

**3.4 WI-FI Module:** The ESP-8266 may be a low cost Wi-Fi microchip with full TCP/IP Transfer control protocol/ Internet protocol). It makes the web connectivity possible for the IOT panel. ESP8266 offers a whole and self-contained W-Fi. It



helps in transmitting the \$64000 time information on the cloud data and specially the IOT panel, wish to close up the road lights during the day time, to test if the vehicle crosses the safest value of the ordinance, and upload the amount of pollution caused by the gases specially within the particles per million.. Thusit's a important part of the project to display \$64000 time information on the web and specially the cloud and IOT panel to stay the record of the main points.

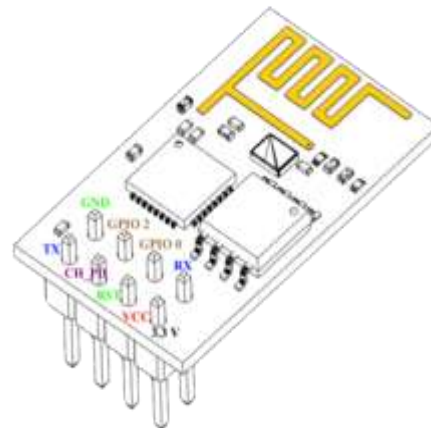


Figure 6: Wi-Fi ESP MODULE (8266)



Figure 7: ARDUINO UNO DIAGRAM

**3.6 ARDUINO NANO:** The ARDUINO NANO may be a small, complete and breadboard-friendly board supporting the ATMEGA328P. It works with



Figure 8: ARDUINO NANO DIAGRAM

**3.7 VOLTAGE REGULATOR:**It is 1 Amp, 3 terminal devices which is used to avoid thermal overload protection, short circuit protection and output transistor safe area operation.

Figure 9 LM317 VOLTAGE REGULATOR

**3.8 TRANSFORMER:**A transformer could be a power converter that transfers power from one circuit to a different circuit through inductively coupled conductors i.e. the transformer coils.

**3.5 ARDUINO UNO:**This Software (IDE) is an open source software and it makes easy to the code and upload it to the board.. It runs on the different platform Windows, MACOS, Java etc.

a Mini-USB cable 6-20 V unregulated external power supply (pin 30). The ability source is automatically selected to the very best voltage source. It's mainly used for doing the programming to control the smoke sensor.

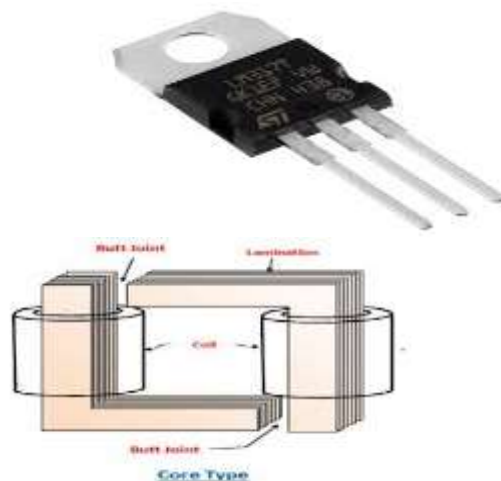


Figure 10: Core type transformer

**5. WORKING PRINCIPLE OF PROJECT**

The Internet Of things are ready to implement transparently a really great amount of the heterogeneous end systems, while digital service provides open access to subset of the knowledge. The main focus is an smart street lightning system,. During this system the road light systems are automatically ON and OFF in keeping with true.

The ARDUINO UNO and ARDUINO NANO is employed to regulate the method. It's focussed on controlling intensity of the sunshine considering the thing movement near the sunshine. Two different sensors named Light Dependent Resistor and Pyro-electric sensors are used. Once if the sun light goes under the visible region then this technique automatically switches light ON. As soon because the sun light is visible then automatically switches OFF lights.



Figure 11: Working principle of project

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#### 4. ADVANTAGES

- ❖ Major advantages of street lightning include prevention of the accidents and increase in the safety.
- ❖ Several decades ago when automobile crashes were way more common, street lightning was found to cut back pedestrian crashes by approximately 50%.
- ❖ Lightning system also reduces crime say murder, theft and plenty of more to a great- extend.

Highways and within the cities. The long run scope of this project expands into speed detection and customizable area of illumination. This project could be a cost effective, practical, eco-friendly and the safest thanks to save energy and this system the light status information can be accessed from anytime and anywhere. It clearly tackles the two

- ❖ Towns, cities, and villages use the unique location provided by the lamp-post to hold decorative or commemorative banners.

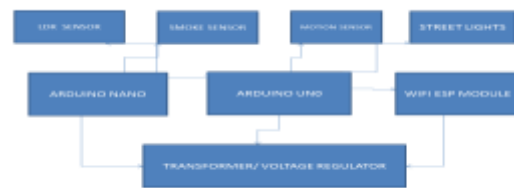


Figure 12: Block diagram of project

#### 6. RESULTS

The project aims were to scale back the side effects of this street lightning system, and find an answer to avoid wasting power. During this project the primary thing to try and do, is to organize the inputs and outputs of the system to regulate the lights of the road. This project could be a cost effective, practical, eco-friendly and also the safest thanks to save energy and this method the sunshine status information is accessed from anytime and anywhere. It clearly tackles the two problems that world is facing today saving of energy and also disposal of incandescent lamps, very efficiently.



Figure 12: Circuitry of project

#### 7. CONCLUSION

IOT BASED STREET LIGHTNING SYSTEM could be a multi-functional element because of their ability to include the software and therefore , the hardware controls of the electrical network. Thus we are saying that these are the foremost effective means of operating and controlling the intensity of the road lights being installed at the

problems that world is facing today, saving of energy and also disposal of incandescent lamps, very efficiently. With the advances in the technology and good resource planning the pricethe project are often slow down and also with the employment of fine equipment the upkeep may also be reduced in terms of the periodic checks.

The LED'S have the long life, emit cool light, donor have any toxic material and may be used for fast switching. For these reasons our project presents far more advantages which can overshadow the present limitation. Keeping visible the long run benefits and therefore the initial cost would never be an issue because the investment return time is extremely less. The project has scope in various other applications like for providing lightning in industries, campuses and parking plenty of huge shopping malls. This may even be used for surveillance in corporate campuses and industries.



Figure 14: Display of information on LCD Screen



Figure 13: Display of information on IOT pane

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