

# *IOT Based Smart Solar Pole System*

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**Abstract** — The development and endorsement of correspondence headways and the remote IoT end up one of the most broadly perceived sorts of advancement in the late decade. Actuators and sensors can sense information, process and communicates by methods for web inside a framework are known as the Internet of things (IoT). The smart pole is a combination of many states, actuators and sensors realized to distinguish information from veritable conditions inside a framework. The intention of utilizing the solar system is to reduce the cost of energy by replacing all of the traditional lamps with LED (Light Emitting Diode) lamps than to increase the economic benefit of using the solar-powered LED lights. In this research paper, the researcher will look deeper into how to decline control dissolution and IoT based lamp structures are accomplished with the internet. The conventional light consists of a Wi-Fi module, various sensors, and a controller for energy estimation and item credentials. There belongs an important monitoring station that needs to control and screen the pole. Public conveyance, energy consumption, and total population are expanding at extraordinary rates; the smart pole can dispose of these difficulties by utilizing data and Communication innovation to convey feasible economic advancement and higher eminence of life. While drawing in citizens and successfully handling natural resources.

**Keywords**—Solar System, IoT, Wi-Fi, Web based control, Cloud account, Intelligent On/Off switching.

## INTRODUCTION

Urbanization is prospering and setting out on a superior stage. It is progressively worried about the environmental quality of the city and social reconciliation. It is more demanding on-road lighting as a crucial part of urban appearance. Conventional street lights have outstanding defects as high-cost electricity charges, environmental pollution, and other difficulties. With respect to such problems, the solar-based smart pole is a unique way to achieve a smart city mission. This paper shows the thought of building up an IoT based application to screen and control streetlights proficiently and improve its maintenance facilities. Presently, road lights are the most significant part of the city as it prompts the vast majority of the mishaps because of low light. Lighting makes

a huge measure of a burden when utilized in workplaces and a huge campus. The energy-saving potential is frequently disregarded. As per the data, about 4400MW of intensity is spent in India on road lightning. To identify the shortcomings in the lights in the remote areas, the proposed framework is very beneficial. Based on the previously mentioned concerns, advancements in proficient road light control structures is an absolute necessity. We recommend a versatile complete and proficient answer that gives lighting just when important (predictable with the immediate climate conditions) with the objective of bringing down the related expense of the municipality, supporting the budgetary rebuilding. The establishment cost will be diminished to the insignificant with the utilization of remote interchanges and autonomous execution modes. A large portion of these upgrades should be contemplated to get a sizeable decrease of the energy intake in lights and consequently add to the maintainable improvement. It will likewise make enormous commitments to the wellbeing and security of the city streets by means of displaying pole in leaning position because of any ecological effect or human intervention than without fail to inform the concerned authorities. Likewise, an over-current circumstance may cause short-circuiting which may prompt deadly mishaps. Accordingly, sensors are used to detect the current flow in order to avoid any mishaps.

The customary avenues lights are power devouring just as some of the time they are on in day time likewise because of the carelessness of the branch of power. And furthermore, because of the quick development in the urbanization, the electric shafts, road lights are expanding step by step. Along these lines, presents an opportunity to spare the vitality/control and use that capacity to the private and business zones. So, for sparing the power/vitality, this paper proposing the brilliant sun-oriented road light framework to use the greatest regular vitality by limiting expense. Figure 4 portrays the proposed model to actualize the brilliant sunlight-based road lights framework.

The smart road lighting framework can be made sun based utilizing the sun powered boards which would guide the vitality source to be the sun which is a sustainable wellspring of vitality, consequently making the principle criteria of the shrewd lighting framework, i.e. to expend power significantly more power and vitality productive since the no non-inexhaustible assets are utilized to create power. The

information that has been recorded will be examined and will ensure that the example where the lighting framework works will be utilized for 'AI' subsequently making the lighting framework considerably more brilliant later on.

Security alternatives can be expanded by sending the data by means of the cloud to the close-by cop office and the nearest medical clinic if the video vehicle identification sensor catches any mishap on the street by the vehicles or people on foot. This builds the wellbeing and prosperity of the network in case there is a mishap taking place.

Manual controls can be given to the brilliant light to try to change the force of the naturally produced light just as you would prefer. The controls would be given to a solitary individual who deals with the lighting framework.

### LITERATURE SURVEY

*Shaikh at el*, [1] their proposed framework empowers maintenance and control of the road lights and makes it simpler to screen and control its activity. The framework will recognize fault in the road lights to imply the control space to make a prompt move. This application will have the accompanying highlights viz. programmed circuit fault detection, pole tendency recognition, and light detecting. It expects to plan a smart electric pole that is free of any human intercession and gives brisk maintenance functionality. In the present situation, the road lights are turned ON at a pre-chosen time each night and are turned OFF the following morning. It additionally requires check-ups for electric pole deformity. This task gives an answer for quick fixing and expands the capacity to control the road lights remotely and effectively.

*Bhagat at el*, [2] their proposed system contains a system where they have used mesh networks to control the consumption of energy of street lights. Using Wi-Fi Module, the mesh network is actuated in the smart street lights. The system is controlled by the main monitoring station to the street light to get seasonal data. Adafruit.io is used in the base station to as software that is used in the switches controlling system. Then they have attached a panic button to the street pole to detect any fault in that street lamp which helps in the security of the pole. Many sensors have been used in the system to detect environmental situation. The LED light will have 50% intensity when a vehicle is in the zone of the light, if there are no vehicles or people then the intensity of light is decreased to 25%. The cloud storage the data of any sensor and actuators are stored.

*Roshan at el*, [3] gives the knowledge the normal street pole structures need man-made action and moreover takes a lot of energy which are controlled on situation from night to daylight. The traditional man-made worked street lamps structures take a lot of energy, the central heads, and considerable value on the foundation which has been unbelievable disfavor and a zone of notable concern. The expenses of vitality can be decreased promptly to 35% through smart on/off the instrument and focused on dynamic darkening and composed method for power utilization. We can decrease the general utilization expenses by up to 42% by appropriate upkeep. The proposed methodology utilizes a vitality compelling methodology that controls the road lights via consequently exchanging them when there are individuals or vehicles around the post when it is dull.

*Mary at el*, [4] Now a day's conventional street light have many disadvantages in real-time application, it takes more energy and more manpower. But using IoT based street lights that can have solar or wind energy these renewable resources can be used in the smart street light to low the consumption of the energy. The light is switched on/off when it is required as it is automated by the system. There is also an advantage of changing the light intensity to control the excessive use of light energy. Here, they have used Zigbee technology which helps in the connectivity of the Wi-Fi module.

*Gupta at el*, [5] He has explained the concept of using an intelligent electrical device surveillance system. The electric surveillance system helps reduce energy consumption. BY installing the system, the smart light can check the road situation day and night. The surveillance camera will be used as a safety module for humans. It will detect the vehicles, human and other situation occurring in that particular space. IEEE 802.11 has been used as a Wi-Fi module. It is based on publisher and subscriber relationship. The lamp switches are connected with a web application. An MQTT server is used as a communication path between them if a message is conveyed to the publisher it checks the information and reports back to the subscriber.

*Muhamad at el*, [6] depict a technique for changing road light brightening by utilizing sensors at any rate of electrical energy utilization. At the point when nearness is identified, all-encompassing road lights shine at their most brilliant mode, else they remain in the diminish mode. Driven lamps will be executed as they are superior to ordinary smart lamps inside and out. Joined with Solar Smart Pole System, huge essentialness hold assets are envisioned. In like manner, a showing with a constant including expenses and execution process has been created utilizing web of things to envision the continuous changes of road handling happen.

*Bhattacharjee at el*, [7] they have explained a novel planning for public safety utilizing profound knowledge-based edge computing devices. The given framework involves an end-gadget that can be associated with each road light pole in a different zone. The entryway gadget is attached to a long road from end gadgets. CNN based algorithm is utilized to distinguish the outflow of the individual who squeezed the alarm switch on the gadget to decrease negative alert.

*Suseendran at el*, [8] The IoT is exploring day by day so it is used everywhere. By using intelligent Led system, the consumption of energy has been reduced to at least 80%. They have used Raspberry-Pi to connect all the sensors, actuators, and LEDs, etc. The main motive that they have used is vehicle monitoring sensors. The video vehicle detection is a concept of detection the vehicles on the road for safety purposes. This device not only checks the transportation system but also checks the people who walk in the road. In the vehicle detection process, it detects the speed, accident, or other issues happening in the zone of the street light.

*Rudrawar at el*, [9] Proposed system conveys the intensity of street lamps. Here, TRIAC is used as a medium to change the switching of the lamps. They have implemented Arduino microcontroller to the system which helps in stimulating the light intensity. The NodeMCU is also an open-source platform used in IoT. The sensors give the signal to the monitor to control intensity and switch on/off. TRIAC updates

the information in the cloud which will then connect with the lamp and change the required switch.

*Latif et al*, [10] they have disconnected smart lamp essentialness uses into different classes: high moderate and low. The Smart lamp essentialness utilization is low in daylight, medium when no complicated traffic is in the city and high in considerable traffic on the streets. Street lamps switch starts when a transport device enters an area in the wake of recognizing its passageway inside a locale. A segment is a gathering of sensors that distinguishes a transport device and starts all lamps of the zone subject to the Unified Modeling Language (UML) progression outline. The progression architecture is moreover changed over into Deterministic Finite Automata (DFA) by which endorsement of the circuit is changed. The DFA architecture is changed into a legitimate model using Vienna Development Method-Specification Language (VDM-SL). The affirmation of rightness is given by using a VDM-SL device compartment.

*Zhao et al*, [11] proposes a structured plot for a smart Street LED light control framework dependent on NB-IoT organize. The arrangement comprises a cloud network, a remote observing coherence, and a road light control system. Joined with NB-IoT system and Power Line Carrier (PLC) correspondence, this arrangement acknowledges neighborhood insightful remote and control supervision of LED road lamps. During daylight when lights are ordinarily off when the light power sensor recognizes that the characteristic brilliance is inadequate, lamps will be started at a necessary level. During evening time when lamps are ordinarily on, the on-request pole is accomplished by the vitality sparing calculation portrayed in this paper.

*Fleschier et al*, [12] depicted the techniques for vehicle impact recognition and remote alert gadget utilizing Arduino. Highlights of this plan incorporate constant vehicle observing by sending its data concerning the position (longitude, scope), time, and edge to the checking station and to the client/proprietor's versatile that should assist them with getting restorative assistance if a mishap or the burglary happens. At whatever point a mishap happens MEMS and vibration sensor recognizes and sends the sign to the microcontroller, by utilizing GPS specific areas where a mishap has happened are discovered, at that point, GSM makes an impression on approved individuals.

*Chang et al*, [13] Because of quick changes in the atmosphere, requests on natural observing for different applications, for example, creature movement and the nursery of significant expense harvests are expanded. The proposed system a model of a brilliant intelligent lamp framework dependent on Narrowband-IoT correspondence is given for interfacing the back-end framework and roads, for example, open-air nurseries or road lamps. In the results, the diminishing of the lamp is booked and monitored just as checking the natural atmosphere and mugginess of the road. Trial outcomes are appeared to confirm ease of use and favorable circumstances of using Narrowband-IoT to the keen lamp's framework.

*Chen et al*, [14] as the development is growing in the new technologies it is also evolving in IoT. The proposed system has used the NB-IoT concept. The NB-IoT is also one kind of IoT which is a communication network, which gives the reference to the advancement and application. It is relied

upon to give keen, broadened, effective and practical administrations for the brilliant urban communities. IoT set up a monitoring zone where different operations are performed. This network system is widely used nowadays. Using this technology, the lamps can store any information in the cloud network.

### LIMITATIONS

The limitations we have observed from this research paper which is going to be changed using our proposed.

- Requires higher initial investment
- Risk for theft is relatively higher because it has a higher monetary value
- leads to diminished or full stoppage of energy generation
- If there is any fault in batteries it has to be replaced many times.

### CONCLUSIONS

The carelessness of the streetlight's maintenance could have vigorously troubled the administration to surpass expense and postponement in support. The manual controlling of streetlights can prompt postponed support work. The proposed task will wipe out this oddity and improve the productivity and controllability of the city shafts that demonstrate to be a fundamental perspective for the prosperity and wellbeing of the residents. The significant point of this proposed system is to distribute the current. It is fundamentally needed to ensure power proficiently. The power energy will be saved using sensors without any dissolution. Smart road lighting is used for vehicle traffic control. This SSLS effects for traditional Street to highways. It is controlling the wastage of current. Manual work is not needed in the system not required in this system. The primary objective of the framework is to remove the two significant problems that our nation is discovering hard to handle.

- Dissolution of energy.
- Detection of accidents.

This decreases control utilization by a critical sum and furthermore gives security to individuals and vehicles that movement on the streets consistently. This framework underpins just LED lights as they are increasingly productive and don't make any mischief nature when arranged. The LED lamp was utilized, it discharges less warmth when it appeared differently with mercury lights. This framework chops down the expense of regular framework by 50-60% which improves the economy of the nation and recovers an immense measure of speculation as it very well may be used invaluable thoughts. The framework guarantees security to the individuals and it gives incredible security solely to ladies. The smart pole can help women from persecution, robbery, and other risks. Our pole gives a wide range of help to the police to catch any culprits.

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