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A PILOT PROJECT ON AUTO ILLUMINATION OF RURAL ROADS THROUGH MODERN DETECTION SYSTEM

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Abstract: Transportation sector plays a vital role in the civilized development of human society. It includes highways, roads, streets, lighting, and railways. Highways that have to be adequately illuminated so that safety of the road users can be increased. Consider the fact; now the streets lights are lightened around 10 to 12 hours daily. Streets lights consume much electrical energy, and it costs very high. Street Lights account 50% of the energy from outdoor lighting. The street lights are in use all night even if there are no movement of vehicles, and nowadays energy saving is in one of the most important factors as Earth is facing "Green House Effect." This project aims energy efficient lighting "Smart Street Light" which reduces the power consumption when there are no movement of vehicles on the roads and will dim when no vehicles are detected through motion sensor which will be fixed to the pole of the street lights.

Keywords: Sensors, Street Lights, Solar Photo Voltaic



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INTRODUCTION

Transportation is a critical factor for countries like India as a result of it permits trade between people, that is crucial for the growth of civilization. Although the transportation sector plays a significant role in the development of any nation, In India road accidents are one of the most negative externalities associated with expansion due to many factors that are fatal and non-fatal casualties. Within the case of India, road injuries are one of the highest four Leading causes of death. This proposed system is based on motion detection which can automatically activate the Road lights as soon as there will movement of the vehicle on the road, providing full light ahead and dims down for energy saving once there's no movement of the vehicle. This technology can save significant amounts of energy while not compromising the safety.

LITERATURE REVIEW

1. The Plot of Study:



FIG.1 Conceptual Image

Transportation sector concerned with government authorities in order to the development of country due to its importance for economic and social stability. Improper lighting wastes financial resources and poor lighting causes an unsafe condition for road users. Energy efficient systems in the transportation sector can reduce the cost[1]. In India, the lighting system provided at remote highways works throughout the night. The present system of street



Fig.2 Mov-U Radar

Lights also works when there is no movement of vehicle. It describes the auto illumination of the street light due to the movement of the vehicle. MovU Radar is the radar sensor which can detect the speed of the vehicle, which can be used as an indicator for the street light to turn ON and will dim when the vehicle leaves. Street light present on the curvature of roads and the lights near to the rural area will not have any kind of sensor. The typical lighting system will be provided in the non-urban region because of continuous flow of traffic and pedestrians.

2. The Requirement of Particular Project:

The vehicles are passing over invariably, and a locality of places are going to be consisting of fewer density areas and even no vehicle movements itself in few areas. However, throughout the night all street lights are going to be 'ON' in typical street lighting system. To overcome from this issue, a correct energy-saving way and lighting management are to be enforced[2].

3. Importance of the Conceptual Idea:

The Greater degree of energy consumed by the normal street lights and the energy is wasted when there is no movement of the vehicle on the road. By implementation of this proposed system, the rate of the fatal collision can be reduced, and it is also energy saving.

4. Examining Technicality with Prototype Making:

The proposed system of street lights is designed such as the light will be continuous on the Black spot identification like the curvature of the road, approach of bridge and intersection of roads. The number of streetlights is designed according to Stopping Sight Distance to reduce the head-on collision due to poor visibility. When the movement of vehicle is detected by the sensor the designed number of street light will be switched brighter.

5. Comparative Analysis and Interpretation of the Idea:

The energy consumed in this typical lighting system is more than the auto illuminated lighting system. Therefore, it also saves energy. The cost of this proposed system will be higher than the typical system, but it will be more reliable in the future, compared to the typical lighting system. The system of auto illuminated street lights can also reduce the rate of collision due to poor visibility.

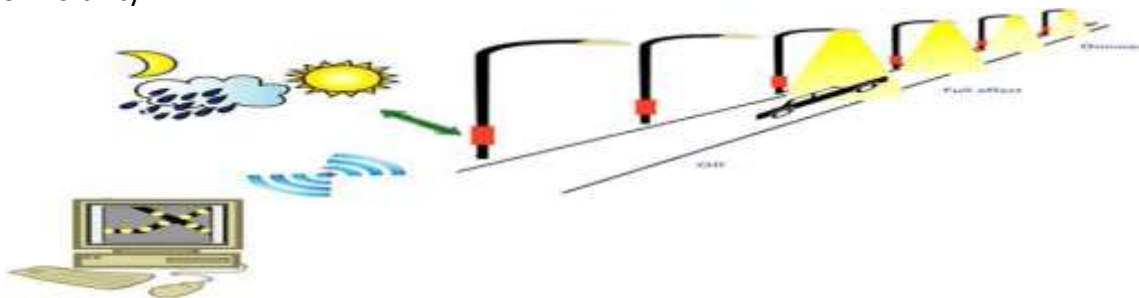


Fig.3 Schematic diagram of E-street light system

6. Methodology

Problem Statement: On remote highways, it is often seen that the lights are 'ON'

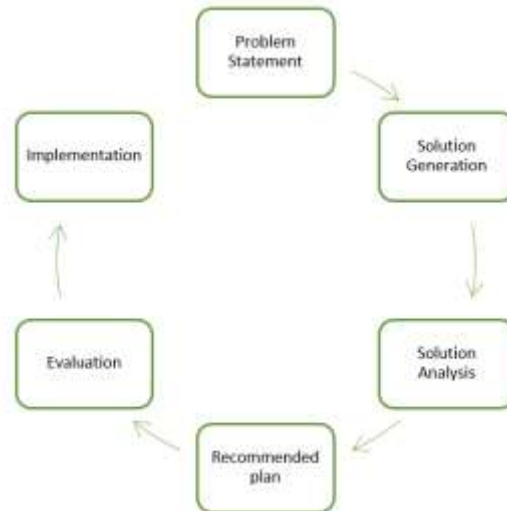


Fig.4 Methodology cycle

Throughout the night even when there are no vehicles on the roads. This wastes much valuable energy, which could have been used for other purposes. In today's world where the demand for energy is increasing and its supply is decreasing[2]. When street light has any fault, the existing system like registering the complaint is time-consuming, the new method of auto illuminated system and fault detection without manpower is more reliable. The proposed system of street lights eliminates the existing system of street light [3].

Solution Generation: This project aims of saving maximum energy possible by switching 'ON' the street lights only when vehicles are passing through the road. The project also has a dim mode in which the lights will be in low intensity when there is no movement of vehicle and when the vehicle moves, the intensity in that region increases. Thus, the project saves up to 80% of the energy per day. In the dim mode, the lights need not be switched 'OFF' completely but be kept 'ON' at low intensity. Whenever a vehicle arrives, it sends a signal to the microcontroller, which in turn sends a signal to the LEDs which are half a kilometre in front of the vehicle. The lights automatically go back to the dim mode when the vehicle moves ahead thereby saving energy[2].

Solution Analysis: One of the alternative methods for cost reduction is the usage of energy-efficient lamps with advanced lighting technology. The newer technologies, such as light-emitting diode (LED), are reported to reduce energy consumption in comparison to the high-pressure sodium (HPS) lights[4].

Table 1 LED-HPS Energy Consumption (Source: Internet)

Fixture Type	Wattage	Lifespan (in hrs)	Energy Use(24hrs/day) Annually	Annual Cost(₹4/kWh)
LED	78 W	50,000	683 kWh	₹2,732/-
HPS	191 W	24,000	1674 kWh	₹6,696/-

Recommended plan: Particular phase of this methodology is the follow-up procedure of the preceding phase. It aims to generate a plan concerning more significant degree of satisfaction for resolving this particular lighting issue.

Evaluation: The main aim of this proposed lighting system is reduction of operating cost of street lighting, power consumption, powered by renewable energy through solar panels with no harmful emissions and reducing light pollution. Light Emitting Diode (LED) could reduce the amount of time needed exchange defective fixture, and LED system would be maintenance free. LED lighting can fully replace previously used light sources i.e. HPS within our lifetimes. Supposing that one lamp is switched on for 4,000 hrs/yr. One streetlight has a median consumption of 200 W yearly. With the system presented in this paper, every lamp uses about 20-25 W 95% of energy consumed by the LEDs[5].

Implementation: After going through some debate and in-depth discussion on the implementation of this system. It was decided to be carried out with the development of the prototype. The particular prototype is itself developed in such a way that all the particular implantation can be observed through varies elements like LDR, Motion detection sensor.

RESULT AND DISCUSSION

As a result this proposed system is beneficiary in many sectors like accident rate and the energy sector. As per discussion the maintenance cost, as well as rate of collision, were reduced the illuminated auto system has been designed based on traffic density, the frequency of vehicle. There are no such norms mentioned in IRC for providing street lights on Non-Urban Highways. The sensor used in street lights is designed in such a way that in case of any collision the street lights would not switch to dark mode. After adding Artificial Intelligence (AI) in this system, if any fault in street light is detected it directly inform to the maintenance department. So, they can fix street light as soon as possible saving time.

CONCLUSION

The executed model is an affordable, Eco-friendly and the most secure way to save energy. As per the statistical information 35%-40% of electrical energy is currently utilized by the Lighting provided at NH, SH and local street lights. This saved energy can be used for another sector like

providing lighting for office, building, grounds, walking paths and parking garages of large shopping centres. This can also be utilized for security surveillance in corporate buildings, businesses centres, school premises[2].

After having implemented this Intelligent System, what remains is the scope for improvements. Firstly, we could directly go for Wireless Power Transmission which would further reduce the maintenance costs and power thefts of the system, as cable breaking is one of the problems faced today. This Intelligent system can also provide information about the pole which is damaged. Which can easily identify the exact location of the damaged pole and fix it without reducing the time[4].

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