Vehicle Movement Based Street Light Control on Arduino

***Vitthal Kachare, *Rohit Kate, *Aarti Mali, **Somnath Lambe, **Ashish Joshi**

**E&TC Students at KIT Shelve, **Assistant Professor at KIT Shelve.*

[1]*Received: 28 April 2024; Accepted: 17 May 2024; Published: 18 May 2024*

ABSTRACT

An abstract is a concise summary of a paper, providing essential information for readers to understand the study. In this study, we employ a Micro controller, utilizing code to interface with the IR sensor. The primary objectives include activating LEDs in passed the vehicle These actions occur at passing the vehicle. The LED activation in each vehicle corresponds to specific time slots, ensuring efficient energy consumption during those periods. This research focuses on optimizing resource utilization and enhancing time-sensitive control within vehicle spaces, contributing to overall energy efficiency and automation.

INTRODUCTION

Automation is becoming increasingly important in our world. It means using smart systems to do things automatically instead of manually. For example, there's a clever way to control streetlights called "Smart Street Light Sensing." This means that streetlights can change their brightness based on what's happening around them. They get dimmer when no one is around, and they get brighter when people or cars are nearby. This is different from regular streetlights that have a fixed schedule for when they turn on and off. The main goal of this research is to save power by controlling streetlights automatically. This is helpful because it reduces energy waste. Think of it like this: instead of just using machines to help with physical work, automation also uses smart technology to make decisions, like when on or off the lights. Street lighting is an important part of this automation To design a good street lighting system, we found about a few things. We want to make sure that streets are safe at night for everyone, that the lighting is cost-effective, helps reduce crime while being friendly to the environment. So, in simple terms, smart street lighting is all about making our streets safer, efficient, and better for the environment by using technology to control the lights based on what's happening around them.

LITERATURE REVIEW

These study are explore to the sun light tracking system it also like to the saved energy to the day time. it will be the bases of brightness of sun light in the low sunlight the IR sensor will be the activated.

One study in 2015 focused on a traffic flow-based street light system powered by solar energy. Another proposed a ZigBee-based remote control system to detect and manage faulty lights.

There's also a report on successful installations of a system called MINOS, with over 100,000 units in Scotland and Wales. Another approach involves dimming street lights during low-traffic hours to reduce energy waste.

Overall, these studies aim to simplify and enhance street light automated.

Problem Statement

The wastage of light it will be main problem there is many time lights are activate without the vehicle moment. This energy save and to protect the environment.

[1] *How to cite the article:* Kachare V., Kate R., Mali A., Lambe S., Joshi A. (May, 2024); Vehicle Movement Based Street Light Control on Arduino; *International Journal of Advances in Engineering Research*, May 2024, Vol 27, Issue 5, 45-48

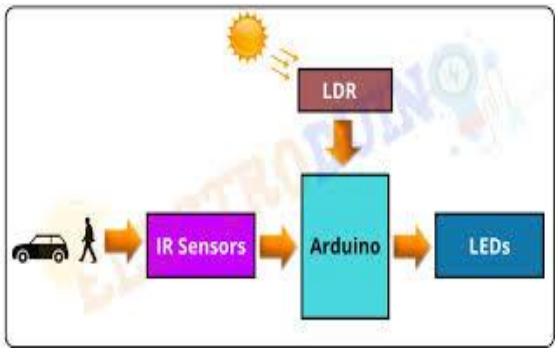
Proposed Method/System

To address this problem, we propose an Automatic Street Lighting that turns lights ON/OFF/DIM based on the time of day and detects vehicle or object movement at night using IR sensors. The system utilizes an LDR sensor measure light intensity and an RTC (Real Time Clock) to schedule the ON/OFF times accurately. The core of the system is a microcontroller, which helps reduce manual power management and ensures efficiency.

SYSTEM STRUCTURE

The model includes four LED lamps and four sets of infrared sensors. We also use variable resistors. The infrared sensor are placed on one side of the lamps, while the photodiodes are placed at the opposite side, directly facing the IR diodes.

Figure 1: Flowchart of system



Consider the situation when there is no vehicle on the highway. For this time, the infrared radiation produced from the infrared sensor straight incident on the object, which is placed facing towards IR sensor. This makes photo sensor to conduct and current flows through it. The current goes through the photodiode and experiences the variable resistor to the base-emitter region of the transistor. From the circuit diagram shows the emitter is connected to ground. The collector of the transistor is associated with the input port (port 1), which goes to ground i.e., rational ZERO. Therefore, when the vehicles are absent, at that time a sensor output to the microcontroller port 1 is ZERO.

arrangement of hardware model, in which consists of PIC micro-controller in series with voltage regulator and transformer at input end. Towards the output, consists of LED lights and IR sensors, the similar arrangement as shown in Fig. 5. n the scenario where a vehicle obstructs the path of IR radiation, the photo sensor is deprived of its input, causing it to deactivate. Consequently, the first transistor ceases to conduct current, resulting in the collector transitioning to a HIGH state. As a result of the blocked IR pathway, there's a transition from LOW to HIGH at pin P1.0. The microcontroller is programmed to respond to this signal by illuminating a sequence of seven lights ahead of the vehicle's movement and setting the pins of port 2 and port 3 to HIGH. This cycle continues: as the vehicle progresses, the intensity of the road lights increases to 90%, while the trailing lights' intensity decreases to 10%.

RESULTS AND DISCUSSIONS

They set up some hardware and tested how well it worked in two different situations: one where there's less space between things (like buildings) and one where there's more space. They used special sensors and lights for streets.

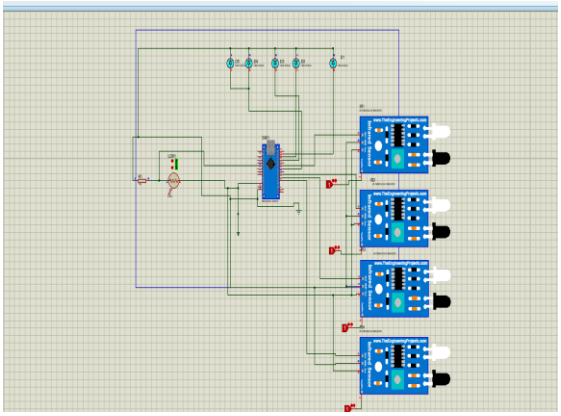
When there's no car around the sensor the light become off condition. But then the condition vehicle are passed the infrared sensor or light then that time light are glow. and then driver easy to watch street. Then vehicle are passed the light the light again off condition.

Direction	Time (microsecond)	Speed (mm=55/sec)
Left to Right	*689*	*37.9*
Left to Right	*1045*	*57.5*
Left to Right	*2568*	*141.2*
Right to left	*897*	*49.3*
Right to left	*1423*	*78.3*
Right to left	*2164*	*119.0*
Both sides	*Left(2215) Right(1986)*	*Left(121.8) Right(109.2)*

Table 1 Derived results after implementation

In less crowded areas, the lights transition from being dark to bright gradually. When no object is detected, the lights stay off. They use a special system called pulse width modulation to control when the lights turn on and off. When there's no vehicle, the lights flicker very quickly, giving off a dim light. But when a vehicle is detected, the lights it turn on fully, while the rest stay dim.

In more crowded areas, the lights start off at a low brightness. When no object is detected, they stay at this low brightness. But when a vehicle is detected, the lights in front of it brighten up to full intensity, while the rest stay at the low brightness. So basically, the system adjusts the brightness of the lights bases on how many vehicles are around.



In Fig. 2, Schematic Diagram

CONCLUSION

We conducted a literature review and proposed an efficient Low Cost Automation (LCA) system. Our system helps save electricity by managing street lights more effectively than traditional methods. It can automatically turn lights on and off as needed and can even predict vehicle speed, time, and the direction in which the lights should shine brightest.

Looking ahead, we see potential to enhance our system. For instance, we could use LASER sensors instead of infrared sensors for broader areas like expressways or flyover bridges. By improving our system, we could also transmit predicted vehicle speeds to traffic cameras for greater accuracy. In cases of criminal activity, law enforcement at checkpoints could use our system to determine if a vehicle has passed through by counting them.

ACKNOWLEDGEMENT

We like to express our gratitude to all those who contributed to the completion of this project. Especially thanks are extended to the developer of the microcontroller and the IR sensor the essential hardware components necessary for our research. additionally we acknowledge the invaluable assistance of our colleagues who support us in the implementation of code and the execution of experiments. Without their expertise we are also grateful for the guidance and mentorship provided by our advisors throughout the research process.

Device Name	Input Data	Verified Results	Remarks
Arduino Board testing	*Digital Signal*	*Switching of LEDs at different intervals*	*Hardware is accurate*
Light Dependent Resistor	*Outside light intensity values*	*Dim/High LEDs glows according to light intensity and noted on the Serial monitor*	*Hardware is accurate*
IR Obstacle Senor	*Sense Motion*	*High LEDs glows wheneverit detects motion*	*Hardware is accurate*

Table 2- is shows the testing result

REFERENCES

1. Payal Rodi, Leena Chandrakar, Saylee Ginde Sivanantham S and Sivasankaran K, "Energy Conservation using Automatic Lighting System using FPGA", International Conference on Green Engineering and Technologies, 2015. https://doi.org/10.1109/GET.2015.7453795
2. Deepak Kumar Rath," Arduino Based: Smart Light Control System", International Journal of Engineering Research and General Science Volume 4, March- April, 2016.
3. Rajeswari et al. "Survey Of Data and Storage Security in Cloud Computing." IEEE International Conference on Circuits and Systems (ICCS), 2017. https://doi.org/10.1109/GET.2015.7453795
4. Gouthami. C, Santosh. C, A. Pavan Kumar, Karthik. A, and Ramya. K. R, "Design and Implementation of Automatic Street Light Control System using Light Dependent Resistor", International Journal of Engineering Trends and Technology (IJETT) – Volume 35 Number 10 - May 2016. https://doi.org/10.14445/22315381/IJETT-V35P293
5. Ahmed Sharique Anees, Anupriya, Ayushy Chowdhary, Shalini Dubey and Shweta Verma, "Solar Powered Led Streetlight With Automatic Intensity Control", International journal of innovative research in electrical, electronics, instrumentation and control engineering, Vol. 3, June 2015.