TrafficWise

A

SYNOPSIS

SUBMITTED TO THE
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(Delhi Skill and Entrepreneurship University)

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For the award of

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SUBMITTED BY

Nidhi (10621343)
Abhishek Roka (10621019)
Rohit (10621432)

UNDER THE GUIDANCE OF

Ms. Komal Dhingra & Mr. Arun Dabas

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DSEU DWARKA CAMPUS,

Sector 9, Dwarka, New Delhi

2023

Title of Proposed Project Work

Name of Student -

Registration Number-

Name of Guide-

Designation-

Student's Signature **Guide Signature**

Head of Department

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Time Plan

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Introduction

In today's fast-paced world, traffic congestion has become a significant issue in our daily lives. It negatively impacts individual productivity and, consequently, society as a whole, as a substantial amount of time is wasted at traffic signals. This congestion is primarily caused by a high volume of vehicles, insufficient infrastructure, and an inefficient distribution of traffic signals. Additionally, it indirectly contributes to increased pollution levels because engines often remain running, resulting in the unnecessary consumption of natural resources such as petrol and diesel without yielding any meaningful benefits. Therefore, in order to address these problems or at least reduce them significantly, we need to implement innovative solutions, such as sensor-based automation in traffic signal systems.

Currently, traffic control relies on hand signals from traffic police officers, traffic signals, and road markings. However, the existing system of traffic lights operates with fixed time intervals, following a predetermined cycle, which often leads to unnecessary congestion in one lane while leaving others empty. The system we propose aims to alleviate this issue by identifying the traffic density on individual lanes and adjusting the signal timings accordingly. In this system, infrared transceivers count obstructions and provide information about the traffic density on a specific lane. This data is then sent to a controller unit, which makes necessary adjustments to the signal timings in real-time.

To implement this model, we utilize embedded systems, and the software is developed using the Arduino IDE. An embedded system is a type of computer hardware with dedicated software designed to perform specific functions, either independently or as part of a larger system. At the core of an embedded system is an integrated circuit responsible for real-time computations. The complexity of embedded systems can vary widely, from a single microcontroller to a combination of processors with connected peripherals and networks. These systems find applications in various domains, ranging from simple devices like digital watches and microwaves to more complex systems such as hybrid vehicles and avionics. Remarkably, up to 98 percent of all microprocessors manufactured are used in embedded systems.

LITERATURE SURVEY

Sk Mahammad Sorif, Dipanjan Saha, Pallav Dutta on a streetlamp control system based on the Bolt IoT platform. Using LDR with LED lights the intensity can be controlled. IR sensors utilized on roadside send signals for the LEDs to get glowing for the next specific section of the road after sensing the density of vehicles. During daytime the LDR keeps the streetlamp off until the light level is low or the light frequency is low and the LDR resistance is high.[1]

Imran Kabir, Shihab Uddin Ahamad, Mohammad Naim Uddin, Shah Mohazzem Hossain, Faija Farjana, Partha Protim Datta, Md. Raduanul Alam Riad and Mohammed Hossam-E-Haider using the GSM-GPRS shield. The whole model has the superiority to be controlled in full-automated, semi-automated and manual method. The GPRS part has the access to internet which can use the sunset and sunrise timing to allow the system to operate in full-automated method. The entire process is controlled by ATmega-328p microcontroller.[2]

Automatic Street Light Controller by Shreyas M. Paralikar, Sayali V. Mahajan, Nihal G. Kolage, Prof. Sulakshana B. Mane, illigent street lighting, also known as adaptive street lighting, slows down when no activity is detected, but flashes when movement is detected. The IR sensors Sense a movement on the road and sends signal to Arduino and thus respective LEDs are turned on. Each sensor has sequence of 3 LED's. When 1st sensor senses the vehicle the first 3 led and turned on.[3]
Dr. Jayalakshmi B, Anjali V, Nithin Raj R, Nakul Nair, Rahul T M on IoT Based Energy Efficient Automatic Streetlight explains the external brightness of the 6 environment is sensed by the LDR and it is given to the Arduino as input and the LEDs brightness is adjusted correspondingly as the output.[4]

Internet of Things (IoT)-based solar powered street lighting system with antivandalisation Mechanism by Archibong, Ekaette Ifiok, Ozuomba, Simeon, Ekott, Etinamabasiyaka where the system is a stand-alone solar PV system which is selfpowered. It automatically switches the street light ON and OFF utilizing the light dependent resistor (LDR) and saves power by utilizing infrared sensor (IR) together with the microcontroller to dim and brighten up the LED as at when required thereby increasing the life span of the lighting module.[5]

Arduino UNO Based Visitors Counting System for Vaccination Rooms by Sakshi Gupta, Sreenitya Mandava, B. Chandrakanth Reddy, Arduino is interfaced with an ESP32 Wi-Fi modem to connect with an internet router and access the cloud server. sensors. The Arduino passes the count of the visitors in the room to the cloud.[6] Intelligent Traffic Light System Using Computer Vision with Android Monitoring and Control by Jess Tyron G. Nodado, Hans Christian P. Morales, Ma Angelica P. Abugan, Jerick L. Olisea, Angelo C. Aralar, Pocholo James M. Loresco discussed an approach in developing traffic signaling system capable of prioritizing congested lanes based on real-time traffic density data using cctv photages and integrated with an automated and manual control ported in a mobile android-based application.[7]

A Hierarchical Framework for Intelligent Traffic Management in Smart Cities explained by Zhiyi Li, Reida Al Hassan, Mohammad Shahidehpour, Shay Bahramirad, and Amin Khodaei outcomes traffic efficiency improvements can be 7 achieved by the utilization of a closed-loop management system. Interactive simulations are conducted in this paper to examine the performance of the proposed framework in a real-world transportation system.[8]

A hybrid Particle Swarm Optimization and Tabu Search Algorithm for adaptive traffic signal timing optimization is proposed by Maryam Alami Chentoufi and Rachid Ellaia. A novel algorithm that uses the information of the particle best neighbor in updating velocity and position, a new way of moving for each particle depending on her best historical position and whether it is included in the Tabu list. Second, we prove the effectiveness of the proposed algorithm for solving the real time traffic at isolated intersections.[9]

A Cyber-Physical System for Freeway Ramp Meter Signal Control Using Deep Reinforcement Learning in a Connected Environment by Yi Hou, Xiangyu Zhang, Peter Graf, Charles Tripp, and David Biagioni, three deep RL methods—proximal policy optimization (PPO), Ape-X deep Q-network (DQN), and asynchronous advantage actor-critic agents (A3C)—are explored for ramp meter signal control.[10]

Objective

The primary objective of this project is to design and implement a Density-Based Dynamic Traffic Signal System with the following key goals:

Traffic Congestion Mitigation: Develop a system that effectively addresses the serious issue of traffic congestion, which adversely impacts cities worldwide, by automatically adjusting traffic signal timings based on real-time traffic density.

Automation and Decision-Making: Shift from manual or fixed timer-based traffic signal systems to an automated system with intelligent decision-making capabilities. This transition aims to optimize traffic flow and reduce congestion.

Efficient Resource Allocation: Replace the conventional fixed-time traffic signalling system, which can lead to inefficient traffic management when one lane has significantly different traffic density from others. The project aims to allocate green light time based on actual traffic conditions.

Customized Signal Timing: Implement a mechanism that dynamically assigns green and red-light durations based on the density of traffic present at any given time. This approach ensures that the traffic signal system adapts to real-time traffic demands.

Sensor-Based Data Collection: Utilize Infrared (IR) transceivers to count obstructions and accurately measure traffic density on specific lanes. This data will serve as the basis for making informed decisions regarding signal timing adjustments.

Intelligent Traffic Control Framework: Develop an intelligent traffic control system that can autonomously make necessary adjustments to traffic signal timings to minimize congestion and optimize traffic flow.

Enhanced Traffic Management: Create a system that not only reduces congestion but also improves overall traffic management efficiency, contributing to safer and more efficient urban transportation.

Work Plan and Methodology

- **Phase 1: Learning (Duration: 1 Weeks)**
  - Gain insights into traffic signal systems and congestion management.
  - Familiarize yourself with sensor-based traffic control technologies.
- **Phase 2: System Design and Planning (Duration: 2 Weeks)**
  - Requirement Analysis
  - System Architecture Design
- **Phase 3: Development and Testing (Duration: 4 Weeks)**
  - Embedded Software Development
  - Hardware Implementation
  - Testing and Calibration
- **Phase 4: Deployment and Field Testing (Duration: 3 Weeks)**
  - Pilot Deployment
  - Fine-Tuning and Optimization
- **Phase 5: Documentation (Duration: 1 Weeks)**
- **Phase 6: Project Conclusion and Reporting (Duration: 1 Week)**
  - Presentation and Evaluation
  - Project Closure

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