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Adaptive Traffic Control System

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Abstract: Whenever we hear the word traffic, we all think of people blaring horns and waiting endlessly, stress is always silent but prominent in the word traffic. We all face traffic daily and have experienced the frustration and stress that traffic induces. Our project focuses on reducing the traffic waiting time significantly and hence reducing air and noise pollution. Less waiting time at traffic means less wastage of fuel leading to energy conservation in the times of a global warming.
Keywords: Traffic Monitoring, Intelligent Transport System, ATCS, Image Processing, Traffic Management System, Adaptive Traffic Control System

I. INTRODUCTION

India a developing country has billions of vehicles on roads and has a never-ending manufacturing of them, minimal infrastructure to handle traffic leads to congestion especially in a metropolitan city. This congestion leads to traffic that are hours long and cause inconveniences in the lives of people. Most of the traffic control systems have fixed signal lengths based on time, problems stated above clearly indicate that a traffic control system that adapts to adversities is needed. Hence Adaptive Traffic Control System comes in and helps reduce the waiting time at a given traffic. This project was made by a team of computer engineers by using several technologies for tracing the vehicles and interfacing the output with the input from Arduino via cameras present on traffic intersections.

II. REVIEW OF LITERATURE

The technologies used for this paper have been previously researched upon for the betterment of the ATCS and platforms related to the same. Some of their works have been reviewed and observed for further research.

A. A Real Time Density Based Traffic System Control System

Air and traffic pollution, precious fuel wastage and heavy traffic compensations can all be significantly decreased with the use of smart traffic control systems. This paper gave an insight of how an adaptive traffic control system would revolutionize most of the adversities we face with traffic in daily life. It gave a detailed insight about making a system which is adaptive using tools like TensorFlow and OpenCV, Density based control of traffic with the help of machine learning using different algorithms. A system which is also real time for optimal functioning.

B. A Self-Adaptive Traffic Light Control System Based on YOLO

You only look once is based on real-time object detection relying on a deep Convolutional Neural Networks to function which is a part of machine learning. YOLO version V3and V4 are discussed in detail with their architecture. Adaptive Traffic Light Algorithm is mentioned, and this paper further discusses how C02 emissions will be reduced significantly using YOLO algorithm and how it is still undergoing different phases of testing to be interfaced with hardware efficiency.

C. Real-Time Adaptive Traffic Control System for Smart Cities

The benefits of using smart/adaptive traffic control system are explained. It estimated that by 2025, those cities which will implement smart traffic control systems they will reduce their commute cycle by 15-20 percent on an average. Architecture of intelligent transport system is explained. Insights on implementation of Adaptive Traffic Control System is given. The working includes Video feed acquisition and Pre-processing of video. The conclusion of paper stated the advantages of smart system and ways to enhance them significantly by using device and sensors which are powered by solar cells.

D. Automation of Traffic Control System Using Morphological Operation

As the traffic related problems are on an all-time high in today's world, with the help of modern technologies most of them can be mitigated using Image Processing, Motion Vector Technique (MVT), Radio Frequency and Regression Analysis (RA). The article talks about all the above-mentioned techniques and tools with the help of which smart traffic control systems can be made and implemented. The article continues and discusses how the above-mentioned technologies can reduce cost and hardware module.

E. An Optimal Adaptive Traffic Signal Control Algorithm for Intersection Group

This paper gave a detailed mathematical explanation of model for a single intersection which included abstract queue length model, objective functions and stated the mathematical working of practical queue model. Detailed working of 4 traffic signal control algorithm for single intersection. The mathematical explanation included two adjacent intersections in Kumming city data from both the intersection was collected from detector then calculated and estimated. The results showed how the abstract queue length model reduced waiting time by 10-16%.

III. WORKING

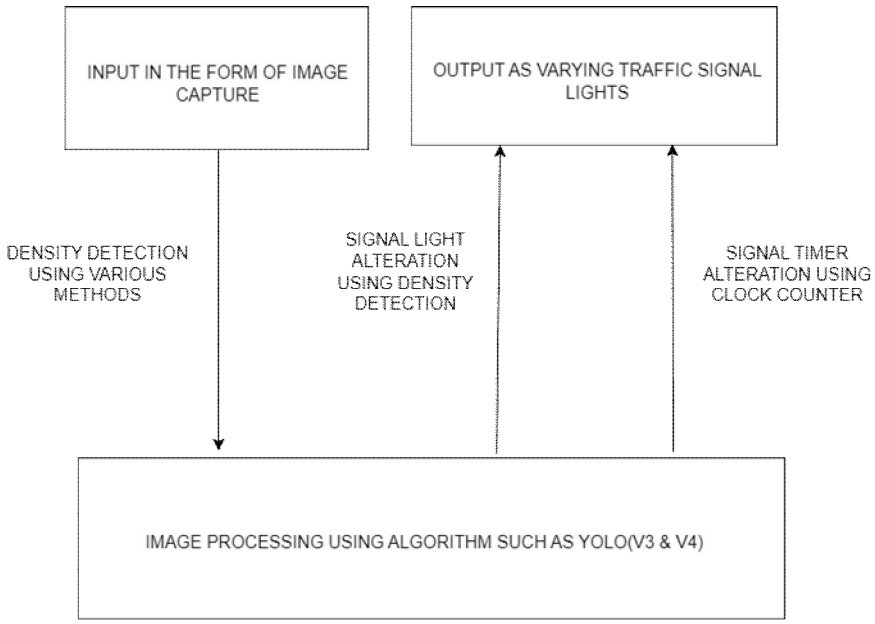

Fig. 1 The Design

The Adaptive traffic control system working is shown in the figure above. There are two main tasks: Input, in the form of image capture from the cameras present at traffic intersections and second is Output, which will be change in traffic signal timer based on density detection with the help of tools like OpenCV library SciPy and NumPy libraries. In this project the image attainment is done by capturing multiple images by cameras present on traffic signals itself, the acquired image is then processed with the help of algorithm YOLO in python. Density is then calculated from the images processing which uses artificial intelligence and machine learning. The counter which assigns the time at traffic signal is interfaced such that it updates the time based on density detection, which will be our output here. In Adaptive Traffic Control System, a prototype was made by us to simulate the project on a smaller scale, it detects moving toy cars and changes counter time accordingly. We made a website specifically dedicated to our future clients to post feedbacks and suggestions if required. We choose to make a web-based platform since we didn't want our project to be limited to a particular platform. The Input part of this project has been made using Python libraries, OpenCV, Machine Learning and Artificial Learning. The Prototype was made using Arduino, LEDs, Digital Display and a CCTV Camera.
Adaptive Traffic Control System Front-end was made using have been made using HTML, CSS, JavaScript and React,

The following technologies have been utilised for the development of ‘Adaptive Traffic Control System:

1) OpenCV and TensorFlow
2) Python Libraries
a) SciPy
b) NumPy

3) Machine Learning & Artificial Intelligence
a) YOLOv3
b) YOLOv4

4) Front-end Design
a) JavaScript
b) React
c) HTML
d) CSS

IV. UML DIAGRAMS

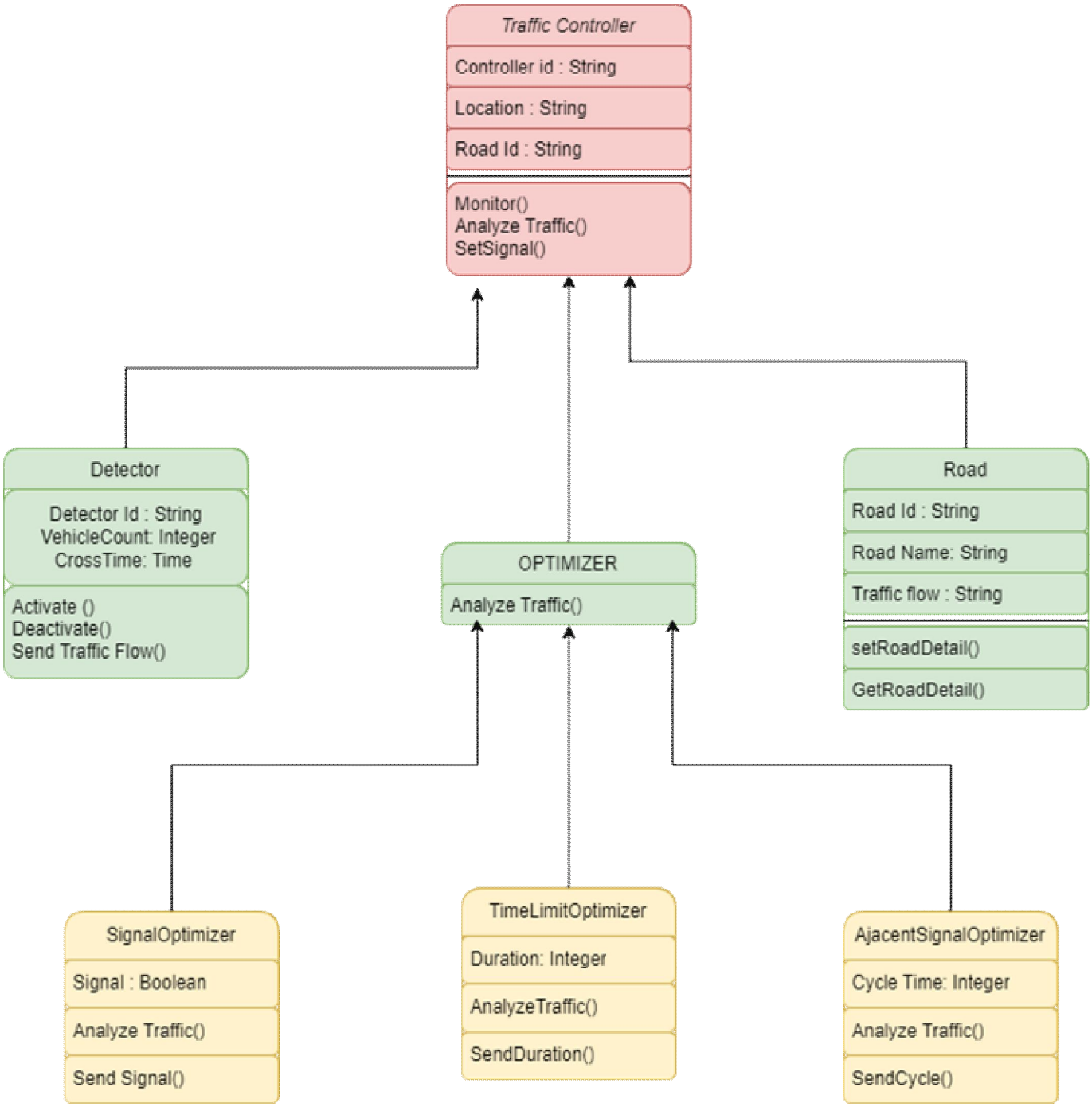

Fig. 2 Class Diagram for ATCS

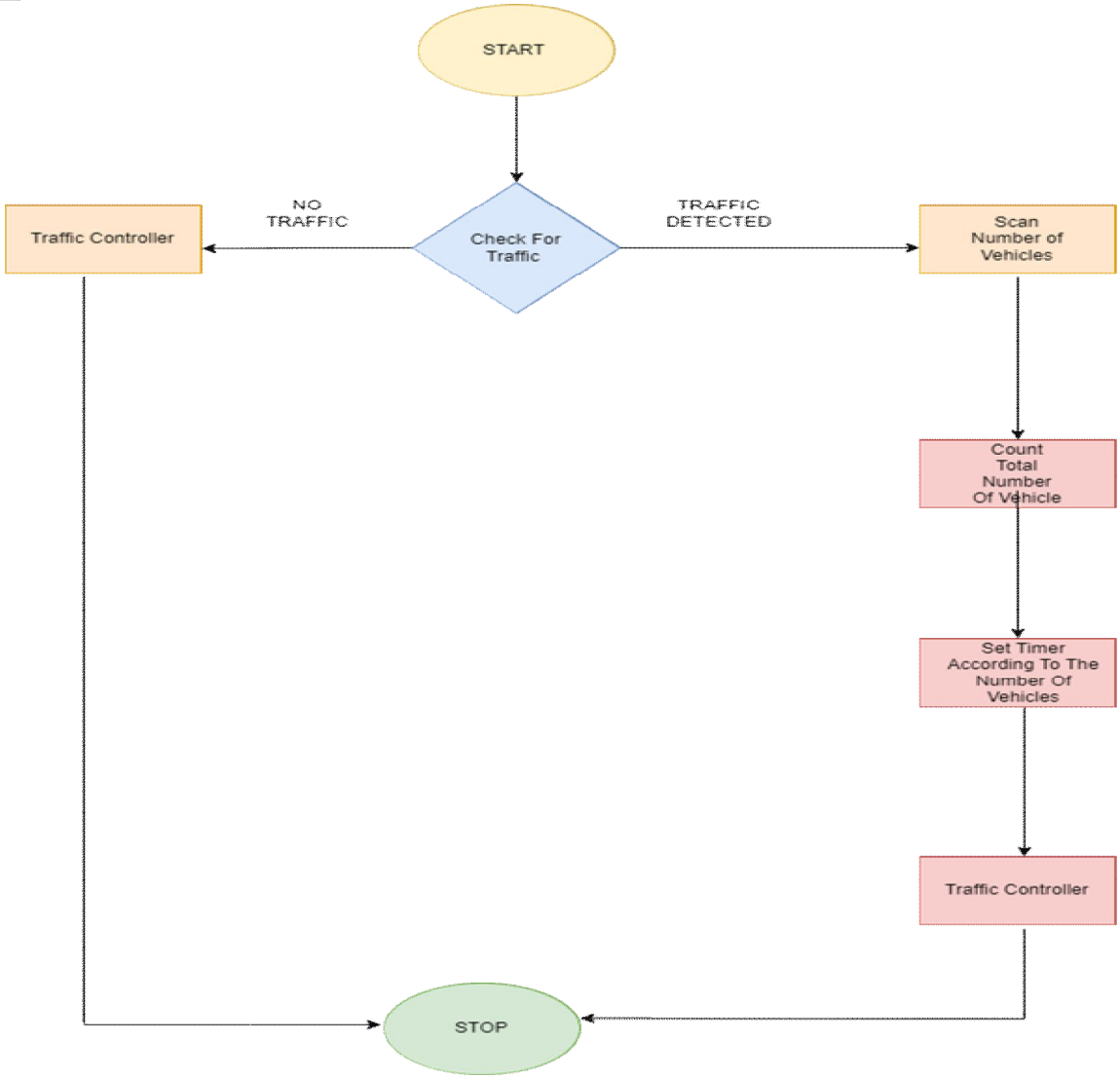

Fig. 3 Flow diagram of ATCS

V. FUTURE SCOPE

Adaptive Traffic Control System can be improved in the future by

1) Integrating with number plate detection.
2) Thermal Image Processing to improve efficiency.
3) Solar powered detectors to minimize power dependency.
4) Synchronize all traffic squares to improve accuracy.

As time and technology proceeds, Adaptive traffic control system will be making everyone's life better, from decreasing waiting time in traffic to reducing noise and air pollution. This theoretically guarantees that Adaptive traffic control system sole purpose to relieve traffic stress to make our daily life easy.

VI. CONCLUSION

In this age of technology, we still struggle with the daily hassle of being struck in traffic. Contributing to air and noise pollution and wastage of fuel. All this aggravating climate change and global warming. With Adaptive Traffic Control System, we tried to provide an extra set of hands in easing the above stated problems and reducing the time we spend being struck in traffic. With the help of ATCS, there will less traffic waiting time and reduced commute cycles leading to reduced air and noise pollution. Fossil fuel is being consumed at an alarming rate and our project would also aid in reducing fuel wastage.

VII. ACKNOWLEDGEMENT

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REFERENCES

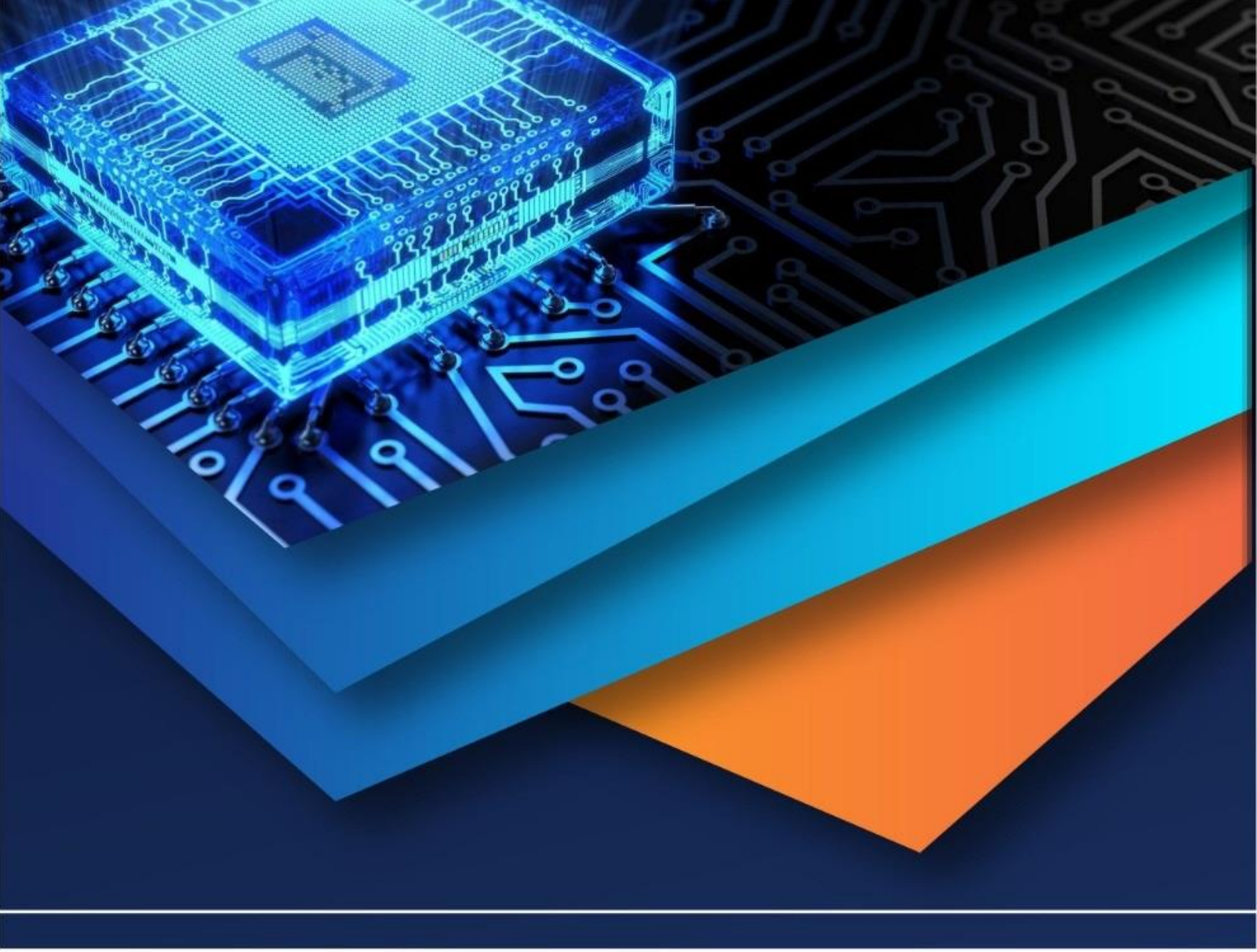
[1] ACJK Chandrasekara, RMKT Rathnayaka, and LLG Chathuranga. A real- time density-based traffic signal control system. In 2020 5th International Conference on Information Technology Research (ICITR), pages 1–6. IEEE, 2020

[2] Prayushi Faldu, Nishant Doshi, and Reema Patel. Real time adaptive traffic control system: a hybrid approach. In 2019 IEEE 4th international conference on computer and communication systems (ICCCS), pages 697–701. IEEE, 2019

[3] Shyam Shankaran and Logesh Rajendran. Real-time adaptive traffic control system for smart cities. In 2021 International Conference on Computer Communication and Informatics (ICCCI), pages 1–6. IEEE, 2021

[4] M. H. Tunio, I. Memon, G. A. Mallah, N. A. Shaikh, R. A. Shaikh and Y. Magsi, "Automation of Traffic Control System Using Image Morphological Operations," 2020 International Conference on Information Science and Communication Technology (ICISCT), Karachi, Pakistan, 2020, pp. 1-4, doi: 10.1109/ICISCT49550.2020.9080051

[5] Wei Cheng, Xiaolan Liu, and Wenfeng Zhang. An optimal adaptive traffic signal control algorithm for intersections group. In 2006 6th World Congress on Intelligent Control and Automation, volume 2, pages 8683–8686. IEEE, 2006



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