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Implementing Smart Control of Traffic Light System using Artificial Intelligence

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Abstract: *The rise in population and automobiles in cities has made traffic congestion a pressing concern that causes stress and delays for vehicles while also increasing energy consumption and pollution. Megacities are especially affected by this issue, necessitating real-time traffic density calculations for efficient traffic management and signal control. The traffic controller plays a critical role in affecting traffic flow. Therefore, there is a need to improve traffic management to meet the increasing demand. Our proposed solution involves the use of artificial intelligence and image processing to detect traffic density in real-time via traffic junction cameras. The system will also feature an algorithm that adjusts traffic signals based on vehicle density to reduce congestion, improve travel times for commuters, and lower emissions.*

Keywords: Traffic, congestion and traffic density

I. INTRODUCTION

To determine traffic volume using YOLO object recognition and set the signal countdowns appropriately, this dynamic signal timing timer uses live images from vehicle intersection camera systems. As a result, there is less traffic on the roads, people can travel faster, and less fuel is used. With enormous increase in population, traffic congestion is becoming highlighting issue of today's era. Congestion on Pakistan roadways are never been really worse, and with increasing traffic accidents our roads are life threat of everyday routine.

The key to this solution is to suggest a traffic signal that can detect areas of high traffic and highlight a schedule of which lane is congested and at what times. The next step will be to analyse the data and determine a logical and practical schedule for applying intelligence. Traffic lights can communicate once we have a proper congestion schedule. Congestion can be lessened by this communication.

People frequently end up in life-threatening situations because they lack traffic sense and do not obey the rules of the road (Cohen 2014). We waste tens of thousands of hours each day driving around and honking at people. Future generations will be gasping for a breath of fresh air as a result of the threat getting worse every year.

Congestion can be lessened by this communication. Imagine a signal in the middle of an intersection where traffic is flowing from four different roads at once. Therefore, we will propose a traffic signal that can act in accordance with provided data and adjust themselves to display red, yellow, and green lights in order to ease congestion.

II. METHEDOLOGY

Initially, the current traffic situation in an Indian city is observed to identify any problems. Subsequently, a critical s analysis of the existing traffic control system reveals several limitations and opportunities for improvement. is carried out to determine its ability to address the current traffic issues. This is followed by a review of past research on traffic control systems. Finally, four systems are proposed to effectively regulate traffic control at various cross-junction points within the city. Traffic flow can be controlled automatically by setting predetermined time intervals for traffic lights to turn on and off, which is regulated by computer programs. To improve the traffic control system, our proposal involves implementing a video processing system that detects the presence and density of vehicles, and subsequently adjusts signals for each traffic phase. We plan to utilize a high-definition camera mounted on poles to monitor the flow of vehicular traffic on a lane in real-time. By applying our developed algorithm to analyse the video frames, we can accurately detect the number of vehicles on the road.

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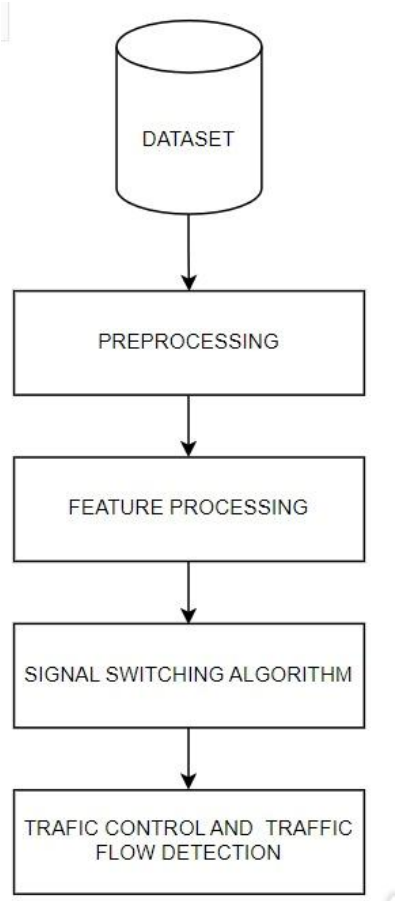

Figure 1: Methodology for Smart Control of Traffic Light System

III. IMPLEMENTATION

Implementation is the final and critical phase of software development, which involves accepting specific requirements or calculations and using computer programming to convert them into a framework, program, or product component. The end result is then released into the intended environment, where it is designed to operate and used by the intended audience.

1. Conduct a literature review - Conduct an extensive review of the relevant literature on smart traffic light systems and artificial intelligence. This will help you to gain a better understanding of the current state-of-the-art techniques, methodologies, and algorithms used in this field.
2. Define the problem - Identify and define the specific problem that you aim to solve with the smart traffic light system. This could include reducing traffic congestion, improving traffic flow, and minimizing waiting times for both vehicles and pedestrians.
3. Choose AI techniques - Based on your literature review, select the most appropriate AI techniques that can be used to solve the identified problem Utilizing machine learning algorithms such as neural networks, decision trees, or deep learning can optimize traffic light cycles based on traffic patterns.
4. Develop the system architecture - Develop a system architecture that outlines the necessary hardware and software components required for the smart traffic light system. This may include sensors to detect traffic, cameras to capture images of the traffic, and a computer system to process the data and control the traffic lights.
5. Implement and test the system - Based on the developed system architecture, implement the smart traffic light system and conduct thorough testing under various conditions to validate its performance. Testing can be done using simulation software or real-world scenarios.

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6. Analyse the results - Analyse the results of the system's performance to evaluate whether the smart traffic light system is achieving the desired outcomes. To determine its effectiveness, compare the results of the smart traffic light system with those of traditional traffic light systems.
7. Refine the System - Based on the analysis of the system's performance, refine the system to improve its effectiveness. This may involve adjusting the hardware components or tweaking the algorithms used in the system.
8. Compose the Final Report: Compose the final report, which includes an introduction, problem statement, methodology, system architecture, implementation details, results, analysis, and conclusions of the project. Ensure that the report highlights the key findings, including the effectiveness of the AI techniques used and the overall performance of the smart traffic light system. Additionally, the report should include any limitations and future directions for the project. Proper citation and references should be included for any sources used during the project.

IV. RESULTS AND DISCUSSION

The image below illustrates how the video is recognized in different signals. The output is displayed in a separate window using cv2 library, and it depends on the objects detected in the displayed video. When the video from the webcam is detected, the identified object is displayed in an appropriate posture.

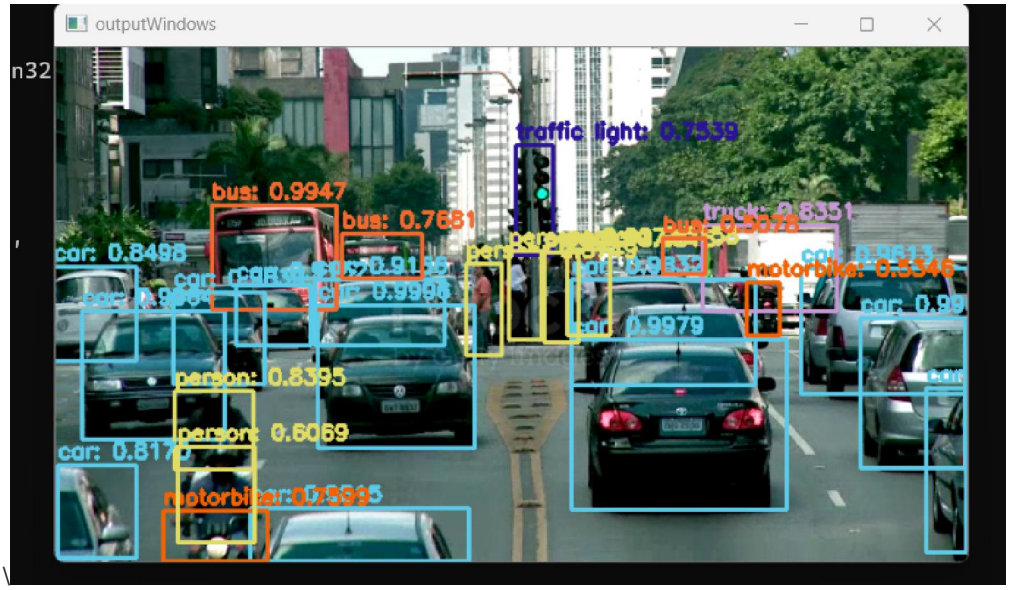

Figure 2: Video Recognition by Providing video of signalas an Input

The smart traffic light control system that uses artificial intelligence is a complex and crucial system that requires comprehensive testing to ensure its functionality, accuracy, and reliability. Different types of testing must be carried out, including integration testing to ensure that all individual components of the system work together seamlessly, validation testing to verify the accuracy and reliability of the system's output, output testing to ensure that the system produces the expected results, and user acceptance Testing is necessary to ensure that the system meets the requirements and expectations. of end-users. These tests are necessary to verify and improve the system's functionality, accuracy, reliability, and user-friendliness, ensuring that it meets the needs of the end-users and operates as intended. In summary, conducting these tests is crucial to ensure the success of the smart traffic light control system that uses artificial intelligence.

V. CONCLUSION

The aim of this study is to enhance the traffic control system by developing and implementing improvements. of a self-adaptive algorithm utilizing artificial intelligence for the control of road traffic. This new system aims to facilitate the movement of vehicles at intersections, which in turn reduces congestion and minimizes CO2 emissions. The proposed

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strategy uses image processing to evaluate traffic systems. The system eliminates the need for sensors by using images captured from a camera or video footage, which are then processed into a sequence of images. Every image is examined independently, The system counts the number of vehicles and compares it to a predetermined limit. If the number of vehicles surpasses this limit, the system takes appropriate action, an alert for significant traffic is triggered automatically. The proposed system's key feature is ambulance priority, which ensures that ambulances are given priority at intersections. This new method offers several advantages, such as the utilization of image processing in place of sensors, simplified setup, and implementation, as well as high accuracy at a low cost and fast speed.In future work, the study The objective of this project is to integrate pedestrians as input into the adaptive traffic light control system to reduce their waiting time. Additionally, the project aims to incorporate sensor fusion into the controller, beyond just utilizing the camera, to enhance adaptability and system robustness in different weather conditions

REFERENCES

[1]. Chandrasekhar. M, Saikrishna. C, Chakradhar. B, Phaneendra Kumar. P & Sasanka. C "Traffic Control Using Digital Image Processing"by Department of Electronics and Communications Engineering, Students of KL University, Greenfields, Vaddeswaram, Guntur District, A.P, India.

[2]. Chunxiao, Shigeru Shimamoto an Open Traffic Light Control Model for Reducing Vehicles' CO2 Emissions Based on ETC Vehicles by IEEE Transaction on vehicular technology in Jan 2021.

[3]. HabibuRaibu, Hassan BashirIntelligent Traffic Light System for Green Traffic Management1st International Conference on Green Engineering for Sustainable Development, IC-GESD 2015 at Bayero University, Kano.

[4]. L.F.P. Oliveira, L.T. Manera, P.D.G.LuzSmart Traffic Light System by Using Artificial Intelligence, Dept of semiconductor, Instrumentation and photonic, University of Campinas,Brazil.

[5]. Ms.Deshna Patil, Ms.NikitaDhankute, Ms.ShubhangiGedam, Prof.AshishPalandurkarTraffic Cop Android Application for Management of Traffic Violations Department of Computer Science and Engineering, Nagpur Institute of Technology Nagpur, Maharashtra, India.

[6]. In their research, Jianhua Guo, Ye Kong, Zongzhi Li, Wei Huang, Jinde Cao, and Yun Wei introduced an intelligent transportation system aimed at optimizing the timing of area-wide traffic signals under user equilibrium traffic conditions.System Research Center, Southeast University, Nanjing, China, Illinois Institute of Technology, IL, USA.s

[7]. M.F.M.Sabri, M.H.Husin, W.A.W.Z.Abidin, K.M.Tay, H.M.BasriTraffic control system based on Field Programmable Gate ArrayInternational Journal of Advanced Research in Artificial Intelligence, Vol. 1, No. 3, 2012

[8]. Pavan Kumar andDr. M. Kamala Kumara presented a research paper titled "Adaptive Traffic Control Systems with VANET" at the Continent Transportation Research Symposium held at Iowa State University in Ames, Iowa in August 2005..

[9]. EkinhanEriskinThe timing of traffic signals at oversaturated intersections was referred to as the elimination pairing system, as discussed in the 10th International Scientific Conference Transbaltica 2017: Transportation and Technology.