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Traffic Control System Using Image Processing

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ABSTRACT: Artificial intelligence (AI) was created as a result of the rapid development and advancement in technology that characterises our modern society. Human intelligence refers to intelligence displayed by people, whereas artificial intelligence refers to intellect displayed by computers. And We have exposed ourselves to certain new vulnerabilities as a result of this ongoing shift in technology, and humans are unable to gauge and foresee such threats. On the other hand, modern AI has such potential that it may be used to track and foresee many threats. The population of the city and the number of automobiles on the road are both growing daily. Controlling traffic on streets and highways is necessary due to the growing urban population and the resulting increase in vehicles

KEYWORDS: Population of city, Traffic congestion, Image processing, Traffic density, Adaptive Signal Controlling

I. INTRODUCTION

In today's fast-paced world, traffic congestion in cities has grown to be a major problem. Longer travel times, fuel waste, and environmental pollution are all effects of the growing number of vehicles on the road. Systems for traffic management have become an essential response to these problems. Using image processing techniques, which can efficiently analyse and interpret data from various sources, including cameras, sensors, and satellite imagery, is one way to improve traffic management. This essay offers a thorough introduction to the idea of an image-based traffic management system and emphasises its importance in raising transportation productivity, security, and sustainability.

1.1 Traffic Congestion: An Ongoing Challenge

An urgent problem in urban areas around the world is traffic congestion. Unprecedented growth in the number of vehicles on the road is a result of the rapid urbanisation and expanding population. As a result, traffic congestion has grown to be a major source of worry and has a detrimental effect on the local community's standard of living, economy, and environment. According to estimates, traffic congestion costs billions of dollars annually in lost productivity and fuel, underscoring the urgent need for efficient traffic management solutions.

1.2 Traditional Traffic Management Approaches

Physical infrastructure like traffic lights, road signs, and physical barriers is the mainstay of traditional traffic management strategies. Although these techniques have shown to be somewhat helpful, they have limitations when it comes to efficiently optimising traffic flow and adjusting to changing traffic conditions. Additionally, manual monitoring and intervention take a lot of time and are prone to human error, which reduces their effectiveness in addressing the challenges of contemporary traffic.

1.3 Traffic Management System Using Image Processing

An intelligent system that makes use of computer vision and image processing methods to track, assess, and manage traffic conditions in real-time is known as a traffic management system using image processing. This system can automatically detect, track, and classify vehicles, pedestrians, and other objects of interest by processing data collected from various sources such as surveillance cameras, aerial imagery, and sensors. In order to improve traffic flow and lessen congestion, the processed data is then used to implement adaptive control strategies and make informed decisions.

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II.RELATED WORK

IMAGE PROCESSING LAGA FOR REAL-TIME TRAFFIC LIGHT CONTROL (2000)
In this essay, a proper solution to the issue of image-based traffic management is proposed. Utilising a timer for each phase of a traffic light is the easiest method of control. Utilising electronic sensors to detect vehicles and generate a signal that cycles is another method. We suggest a system for automating traffic light control through image processing. Instead of using electronic sensors buried in the pavement, the system will detect vehicles using images. There will be a camera set up next to the traffic light. It will record video clips. After that, a vehicle will be detected from the image sequence using digital image processing, and the traffic light can be adjusted based on the flow of traffic.

A TRAFFIC MANAGEMENT SYSTEM APPROACH WITH THE IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE ALGORITHMS (2020).
We conducted a thorough analysis of previous works that used artificial intelligence techniques to suggest new applications and services, or to solve issues with intelligent transportation systems. In particular, a distributed smart system with the application of cutting-edge artificial intelligence algorithms is required. This system must be able to address issues with traffic monitoring and control, congestion prediction, incident management, and adaptive communication to the problem domain and provide a workable solution for all of these. In order to address transportation-related issues such as traffic management, urban mobility, and public transportation, this paper will provide an overview of the AI techniques that could be used.

INTELLIGENT TRAFFIC LIGHT CONTROL OF ISOLATED INTERSECTIONS USING MACHINE LEARNING METHODS SAHAR ARAGHI, ABBAS KHOSRAVI, MICHAEL JOHNSTONE, DOUG CREIGHTON (2020).

Here, a comparison between Q-learning and neural networks is presented from this study. Consideration of continuous green time in Q-learning necessitates a sizable state space, rendering learning virtually impossible. The neural network model can quickly set the right green time to fit the traffic demand, in contrast to Q-learning techniques. Two conventional traffic light control methods are contrasted with the performance of the proposed neural network. According to the simulation results, applying the suggested method significantly reduces the overall network delay when compared to the alternative methods.

III.METHODOLOGY

- Following are the steps involved
  - 1.Image acquisition
  - 2.RGB to gray conversion
  - 3.Image enhancement
  - 4.Image matching using edge detection

- Phase1:
  - Initially image acquisition is done with the help of web camera
  - RGB to gray conversion is done on the reference image
  - Now gamma correction is done on the reference gray image to achieve image enhancement
  - Edge detection of this reference image is done thereafter with the help of Prewitt edge detection operator

- Phase2:
  - After edge detection procedure of real time images are done, traffic lights can be controlled based on density of the traffic at the particular lane.
  - If one particular lane hits the given threshold, then that particular lane is allowed to move through the lane and remaining lanes are stopped
  - This procedure is followed for all the lane (using shortest job next algorithm)

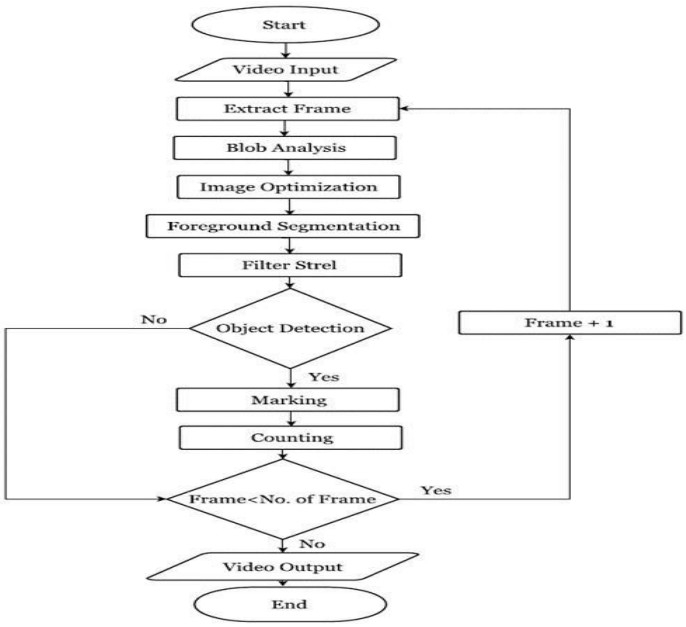


Fig. 1. Flow chart

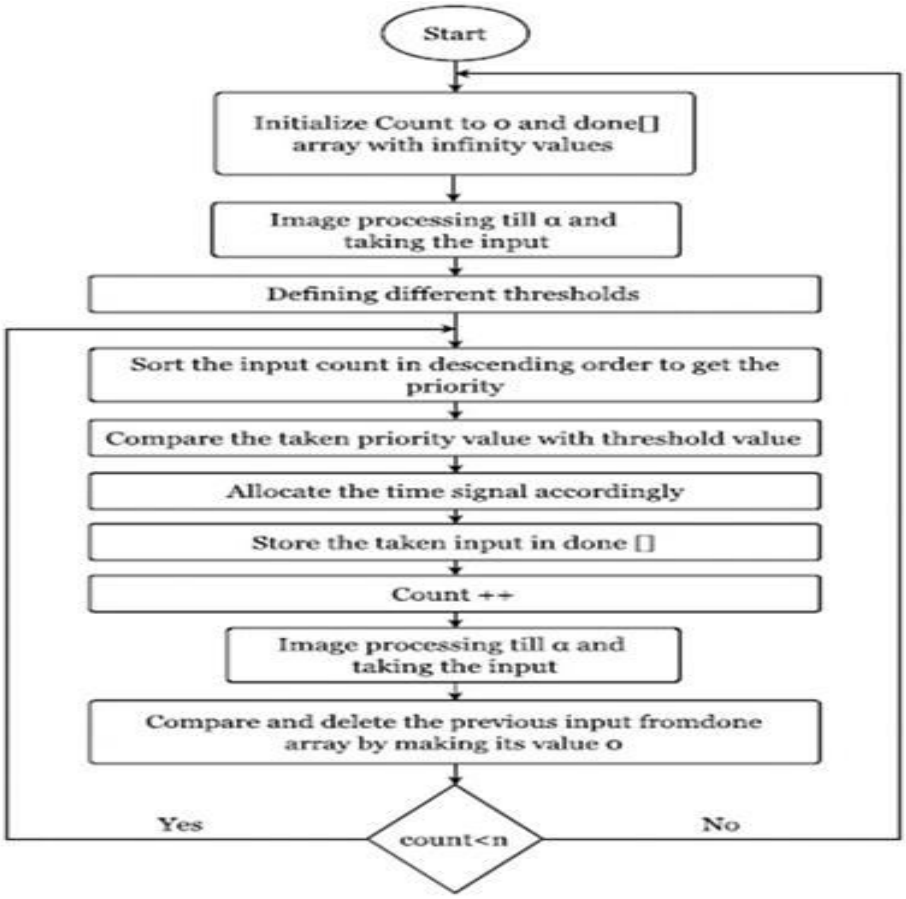
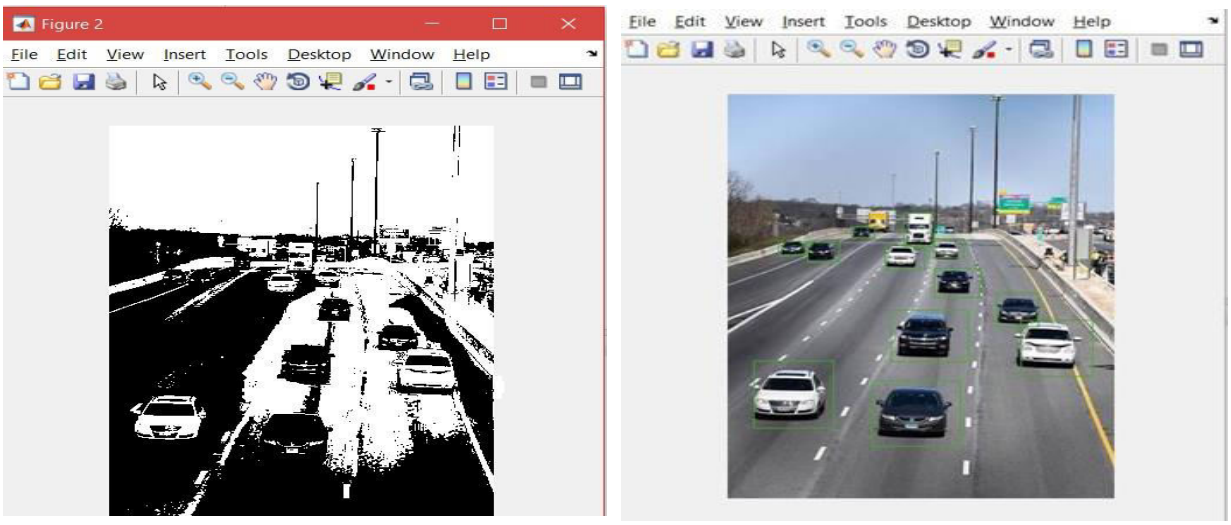
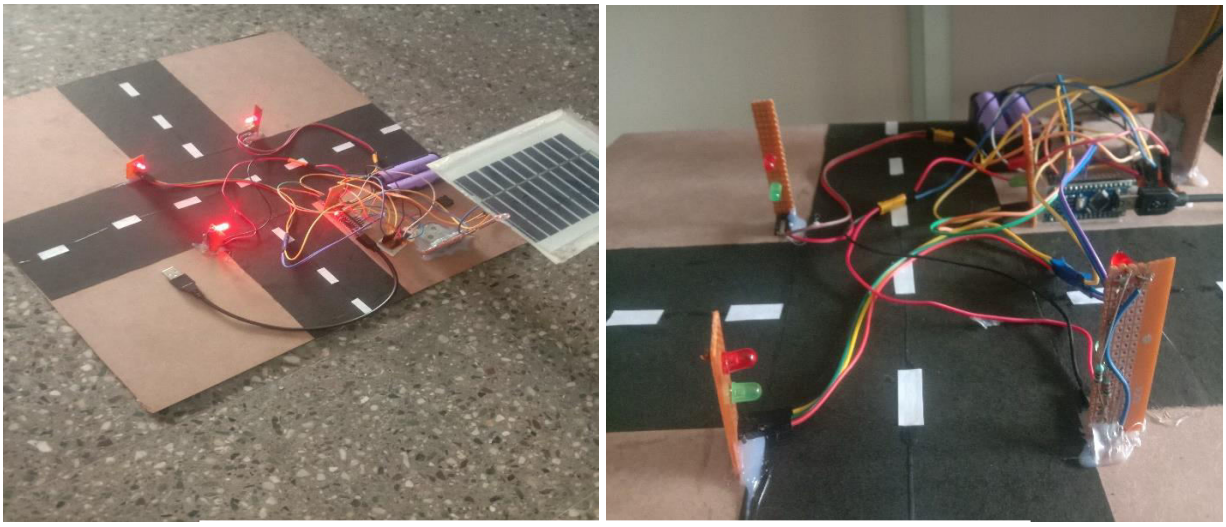


Figure 2: Scheduling algorithms.

IV. EXPERIMENTAL RESULTS

Figures shows the results of the image processing of the traffic video.





(a) (b)

V. CONCLUSION

In summary, using image processing techniques in traffic management systems has enormous potential for addressing the growing issues related to urban congestion and road safety. These systems can help with decision-making for effective traffic flow, improved transportation infrastructure, and increased road user safety by analysing and interpreting the visual data obtained from cameras and other imaging devices.The ability of image processing-based traffic management systems to accurately and reliably monitor traffic conditions in real-time is one of their main advantages. These systems can detect and track vehicles, pedestrians, and other objects by using sophisticated algorithms and machine learning models, making it easier to analyse traffic flow, find incidents, and adjust signal timing. This real-time data may be extremely useful.

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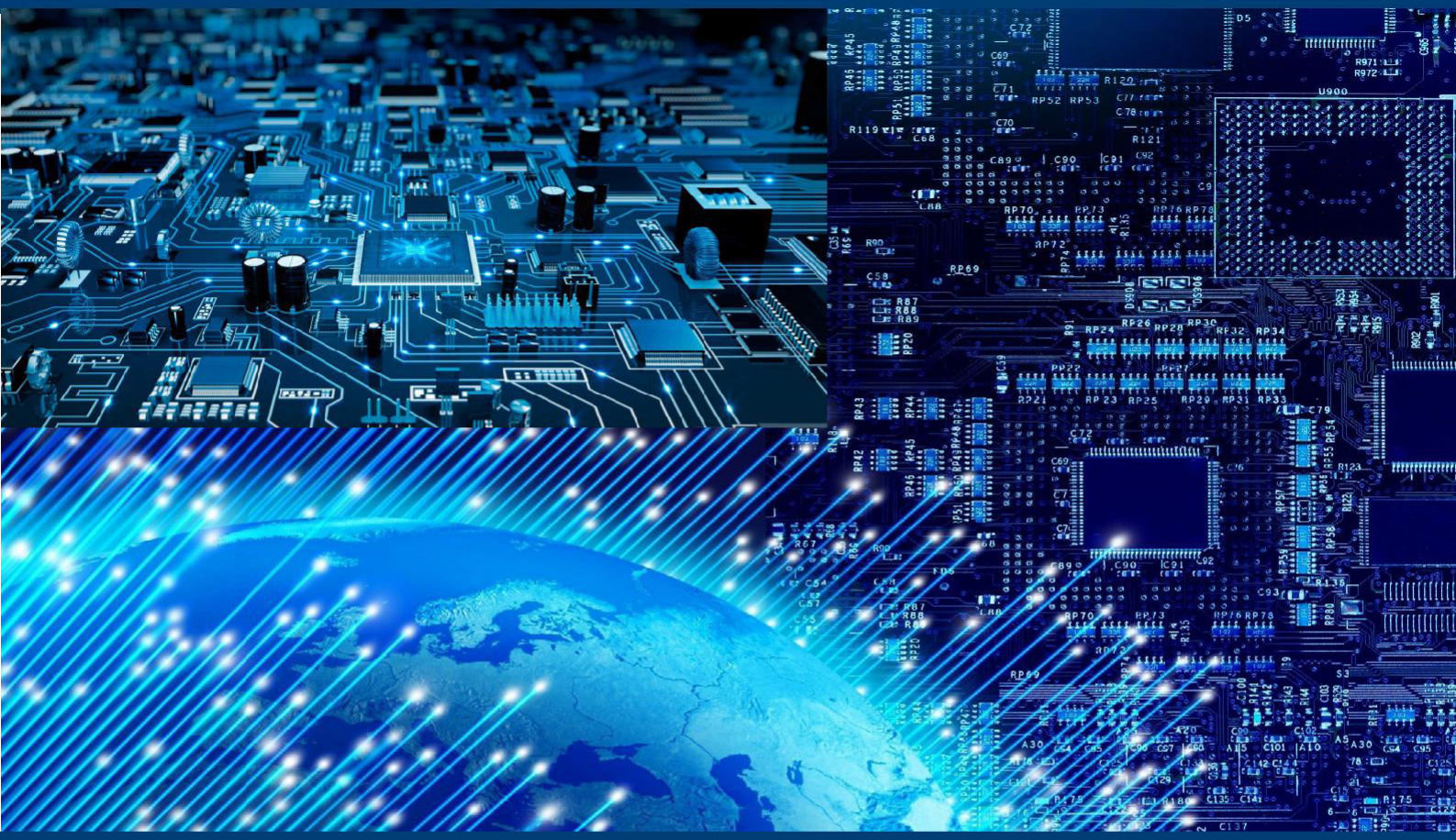

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