Automatic Traffic Light Control System Using Image Processing

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ABSTRACT: "Traffic system is the biggest problem facing growing nation due to the rising number of vehicles worldwide, especially in broad urban areas. When the issue of urban traffic pollution expands and road crash incidence grows, there is a growing need to incorporate new technologies and infrastructure to develop traffic management algorithms to properly meet this rising requirement. For growing step the easiest way to monitor a traffic light is to use timer. Another approach is to use cameras and sensors to monitor automobiles, and to create signals that cycles. To add certain criteria, such as busy paths, emergency services and lane junction, the Intelligent Traffic Control Algorithm is introduced. Smart cameras are attached for taking pictures of each route in real-time traffic flow. The control device will modify the traffic light regulation parameters dynamically due to adjustments in traffic movement in various route, thereby the traffic capacity of road intersection and ensuring better traffic management."

KEYWORDS: Traffic Signal, IR Sensor, Image Recognition, Automobile, Safety, Management and Control.

INTRODUCTION

While the population of large cities is rising day after day due to which vehicle traffic is contributes to question of congestion. Traffic congestion [1] in the big and most heavily developed cities has created numerous serious issues and challenges. Because of this road chaos more energy is lost. The gradual growth in the amount of cars on the road has increased the significance of effectively controlling traffic movement and maximize the usage of available road ability. High fuel prices and environmental issues often offer major opportunities to reduce traffic delays [2]. Another big issue in the real world is traffic crash. When we look closely at the causes of road injuries [3], we find that the key factors behind growing rates of road incidents are narrow roads and significant rise in means of transport. Traffic laws & regulations, road signals and traffic management devices are used to address the above traffic problems. Traffic laws are the laws controlling traffic and regulating cars, while road rules are both the laws and the informal rules that might have evolved over time to promote traffic movement in an organized and timely manner. Traffic signs or road signs[4] are signs placed at roadside to provide road users with details. There are two type traffic control system one is manual controlling and another is automatic controlling.

Manual control of the instance name which involves man power to regulate the traffic. Traffic policies are assigned to regulate the traffic for a specific region or community. To monitor the flow, the flow polices should have stuff like sign board, sign light and whistle. We need more man power in the manual operating method. As we have low traffic police power we cannot manually regulate traffic in any part of a district or province. And we need a proper traffic management system. Automatic traffic light is powered by electric sensors and timers. That step has a constant numerical value loaded in the timer in the classical traffic light scheme. The lights get ON and OFF dynamically, based on the adjustments in the timer frequency. As the classical traffic light scheme is very vulnerable to traffic congestion, sophisticated traffic light systems are required i.e. the density of the vehicles is measured instead of a fixed timer, so the timer is set. Using electrical sensors installed in the pavement is the most common method. This device can detect vehicles, and create timer signal dependent on vehicle number. There was often traffic chaos as the electronic sensors were used to monitor the traffic. Use electronic sensors isn't as effective because it has a strong potential to be influenced by noise and it's costly. The usage of digital editing would remove both of these pitfalls.

LITRETURE REVIEWS

A traffic light system is an automated mechanism that determines the right of way by showing regular red, yellow and green coded signals at an intersection or crossing or street crossing. Additionally, it also functions to grant right of way for traffic passing in accordance with traffic shows. A traffic light, also known as traffic signal, stop light, stop-and-go light, is a signalling system installed at a road junction, a pedestrian crossing or other place to signify that it is appropriate to use a standardized colour code to drive, ride or walk. Nowadays a red signal has indicated the traffic needs to slow in both directions.

A yellow signal indicated the cross-town traffic would have to slow down, and green light would have to move to proceed. Neighbouring towns making use of another scheme exacerbated the difficulties of recognizing this confounding series of colours. Developing an adaptive management system provides an optimal approach for both travel and road traffic users. The traffic management area plays a significant part in our lives and many articles and researches are written to address the traffic problems. Here are some of those articles explained for an intelligent traffic signal simulator.

Albagul developed and introduced an effective algorithm and its emulation. The device established is capable of sensing the presence or absence of vehicles within such range by setting the correct time for the traffic signals to respond appropriately. Mahmoud Taghizadeh et al. proposed a simplified architecture for simulator incorporation and a road traffic [5] simulator for quick prototyping and simulation of specific short-range contact focused on road communication protocols and their smart transport network implementations. The subsequent integrated simulator is used to analyse the efficiency of applications for collision avoidance.

Khalid A. S. Al-Khateeb clarified that road pollution and tidal flow control were big issues in metropolitan environments, resulting in a lot of dissatisfaction and lack of hours. To solve the congestion problems a smart radio frequency traffic control system[6] was developed. Appreciated algorithm and data base RFID technology are used to establish an effective time control scheme. The concept of an intelligent traffic light control dependent on genetic algorithms was identified by Ayad M. Turky et al. According to Ayad M turkey the algorithm developed is used to simulate the circumstance of an isolated intersection centred on that technology. The genetic algorithm controller's [7] output was then contrasted with the traditional fixed-time controller.

Shwe Yi Aye used LAN networking to illustrate auto traffic control program [8]. The findings showed a decrease in usual chronic, dramatically enhanced usage with tactical resources to efficiently handle traffic collisions, decreased emissions and quicker reaction, better public transit, decreased emergency response times. For modelling an urban traffic light scheme[9], Ta-Hsiang used Timed Colored Petri Net as a graphic formalism. A modern modelling framework for specifying and addressing traffic signal timing strategies is introduced. Then a traffic light network supervisor whose working flow is modelled by TCPN models is installed. This module's expected benefit is that programmers will expand the framework to reach complicated traffic light schemes.

To meet the technology pattern of intelligent transportation networks, Lawrence Y. Deng et al. developed the video detection and self-adapted urban traffic signal control network. The proposed program carried out vision-based methodologies to learn the measures of real time in urban roads well. Danko A. Roozemond et al. concentrated on the applicability of autonomous intelligent agents to traffic light control schemes in metropolitan environments. An adaptive traffic control device is designed based on smart agent technology that pro-acts in real-time on shifts (short and long-term) in traffic. This device will provide the signal control scheme during service with controlled, organized and optimized setting. Martin Molina et al. suggested a program that would enable traffic engineers identify the condition of traffic control systems in real time using data collected on motorways by traffic detector. The program is focused on technical information that applies an established formal problem solving approach.

TRAFIC CONTROL MANAGEMENT SYSTEM

The conventional path intersection traffic light management network as seen in fig.1. The cars approaching the intersection are coloured red while the cars exiting the intersection are painted in light blue colour. Each car has the privilege of reaching the intersection; passing every path through the intersection is a privilege. Any red vehicle that enters the intersection will ram any light blue vehicle leaving the intersection.

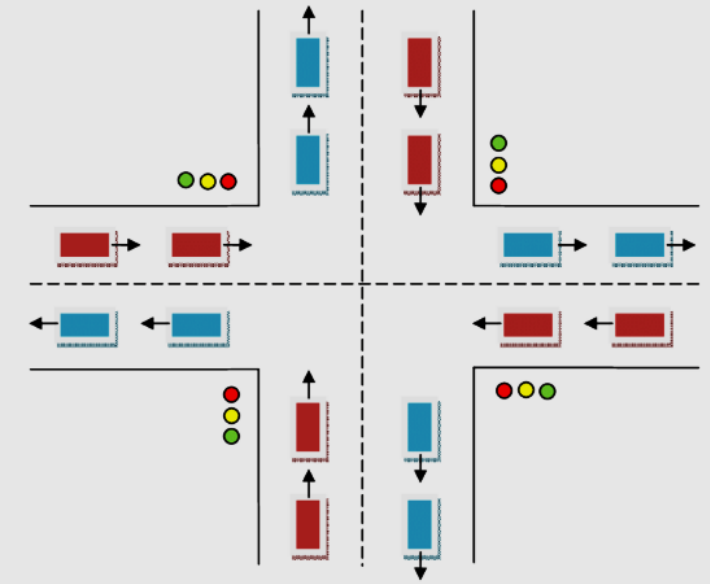

Fig. 1: TRAFIC CONTROL MANAGEMENT

SMART TRAFFIC CONTROL SYSTEM

A standard traffic control system is challenging to enforce in populated areas, owing to the variability in the movement of road vehicles over varying periods of time. To build a certain traffic control system it is important to consider several parameters. Such guidelines reflect on the movement of traffic, the rescue services, the peak hours, the injuries, the important people and the closure of every incoming lane. The planned design comprises of several subsystems operating together in different tasks to maximize the total performance of the network. Such subsystems are shown in figure 2 and shortly described as below.

- The central control unit, which is responsible for the initial traffic control for each segment of traffic lights including traffic time.
- Intelligent sensor unit, which is responsible for prioritizing emergency vehicles entering the intersection routes.
- First Stage Smart Cameras Unit, which is liable for automobiles entering the intersection paths.
- Second Stage Smart Cameras Subsystem, which is liable for cars going along next path to the intersection.

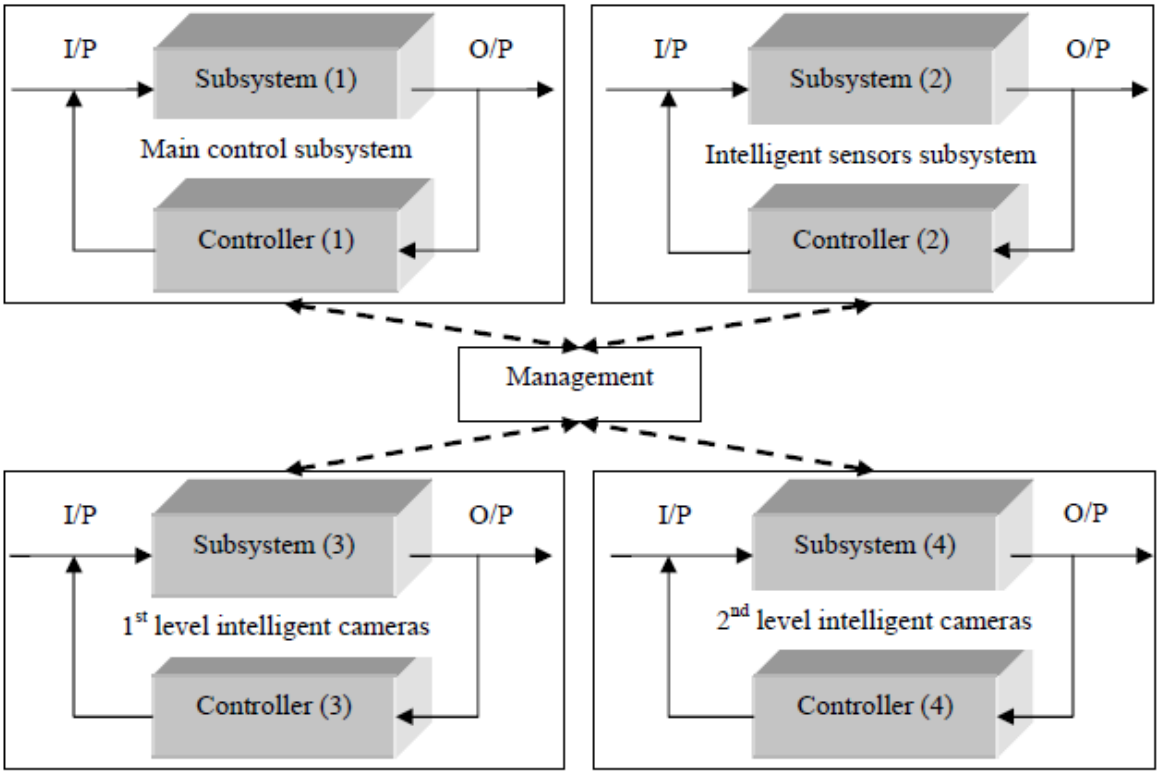

Fig. 2: Subsystem of Smart Traffic Control System

A significant problem should be recognized here that this research involves an extensive analysis of traffic management in the chosen city over a long period of time, in order to understand all the variables that that influence vehicle movement and traffic control, and this analysis may be used as a basis for the implementation of traffic control network.

The suggested intelligent traffic control [10] scheme as seen in figure 3 relies on the road picture strength of the vehicles in which we discern roughly the traffic light time span that needs to be raised. The path is usually lit in black, and the car areas are connected to certain colours. Such vehicle lit areas are measured in comparison to the rest of the road area. Vehicle areas are equal to the ratio of sum of the illuminated area to total road area. The measurement of a certain threshold depends on a flow of vehicles in every entrant lane. And the central control device transmits a signal to raise or decrease the time span for the intersection circle based on this level. In turn, emergency services would take first place, which involved the control panel as an external consideration.

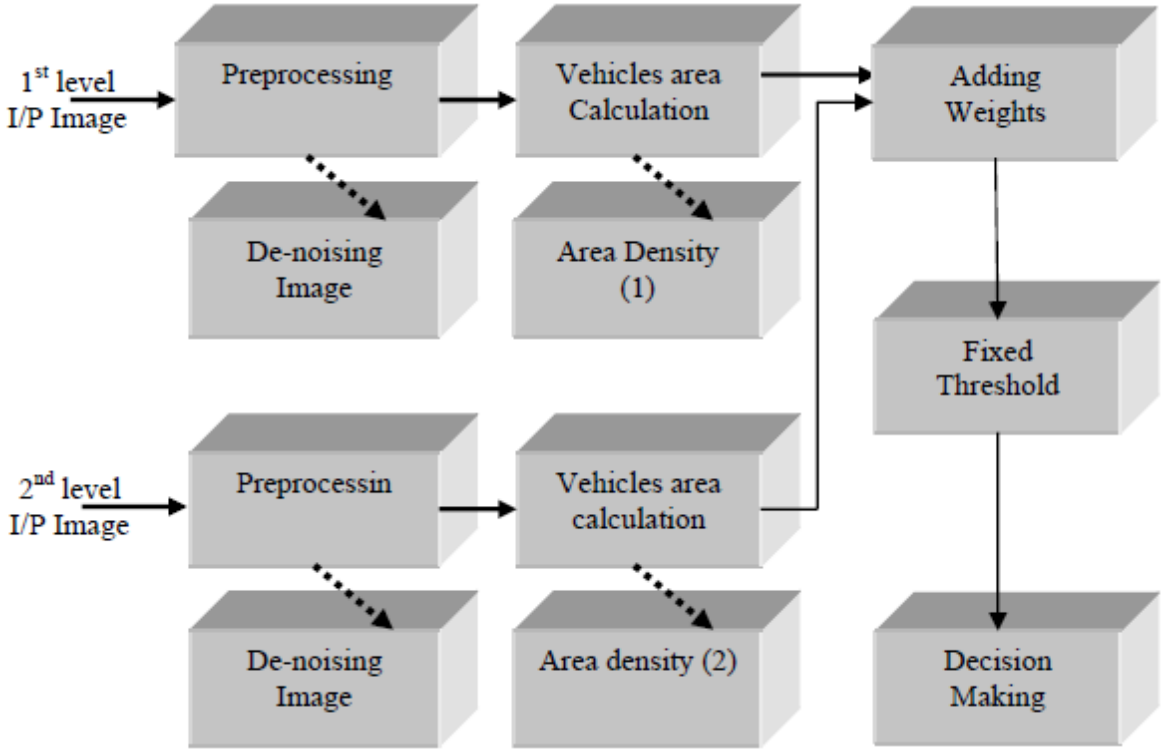

Fig. 3: Proposed Model of Smart Traffic Control System

Fig. 4: Different type of traffic situation

RESULT

Specific picture forms are collected during various amounts of time each day, these images are classified as null, regular and maximum traffic as seen in figure 4. First, the control scheme is configured and applied in compliance with previous calculations to determine the time intervals for each intersection of the route. Secondly, traffic may be divided into three categories, based on the amount of automobiles present on the picked up road:

- First stage shows a limited amount of automobiles present in which the control mechanism has moved to the usual role and over that time frame there is no change.
- Second stage implies a medium amount of vehicles present in which the control mechanism has moved to the congestion place and that a change in time (depending on the congestion size) is implemented to fix this case.
- Third level shows an emergency vehicle present in which the control device moved to the emergency location in such a way that a sudden signal enabled this path to be given priority.

CONCLUSION

"Traffic management through image recognition" the methodology we suggest overcomes the drawbacks of the existing traffic control technologies used,in the existing traffic control system lot of time is wastage when

no one is on the road when it is green signal. By using this technique this wastage time can be prevent easily. This strategy reduces the need for external equipment including sound sensors & magnetic loop inserted in pavements. The major benefit is the variance in signal period which uses picture matching to monitor acceptable traffic intensity. The precision of time measurement due to single moving camera depends on the direction of the register while each time facing the lane. The proposed program provides many benefits such as: reducing travel time for automobiles and passengers which minimizes noise, mitigating traffic congestion as possible which saves electricity and decreases emergency response time. The lighted areas of the vehicles are calculated in the proposed system with respect to the rest of the road area. This device is versatile to move between the supporting three stages.

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