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A Review Smart Traffic Management and Ambulance Detection System using Deep Learning

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ABSTRACT

The problem of urban traffic congestion is continuously spreading. The rapid increase in traffic is due to the growing number of vehicles and the limited expansion of roads. We are trying to propose a system for reducing traffic congestion using image processing. These systems will detect vehicles volume using electronic sensors embedded in the pavement. We also plan to provide a suitable solution for emergency vehicles stuck in traffic to clear the route and give priority to the emergency vehicle. Arduino is an open-source electronics platform that is based on easy-to-use hardware as well as software. Arduino boards read inputs like light on a sensor, a finger on a button, or a Twitter message and turn it into an output for quickening a motor, revolve on an LED, publishing existent online. You will be able to tell your board what to do by dispatching a set of instructions to the microcontroller on the board. For doing so you use the Arduino programming language that is based on Wiring, and the Arduino Software i.e., IDE, based on Processing. ATMEGA328P is a high-performance and it is low-power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on Alfa and Vegard's RISC processor architecture. It is one of the most popular among all AVR controllers as it is used in ARDUINO boards. Protea has 30 years of experience in the application of IR absorption techniques to gas analysis across the industry. Our multigas IR photometers have been proven in hundreds of in-situ emissions analyzers around the world as part of the P2000 product. Our core IR technology can also be used in extractive gas analyzers within our IR analyzer "bench". A wide range of applications is used for single, double, and multipass cells. RFID tagging is an ID system that generally uses small radio frequency identification devices for identification and tracking system. An RFID tagging system incorporates the tag itself, a read and writes device, and a host system application for data collection, processing, and data transmission.

Key words: Arduino, AT Mega 328 P, IR Sensor, RFID Reader.

INTRODUCTION

One of the main concerns that the world is facing with increased population and rapid growth in the number of vehicles is traffic congestion. In countries such as India, the rate of road expansion is just one-third of the vehicular growth rate. Statistics show that the current annual growth of vehicles is around 11% while the annual road extension is only around 4%. [24]

There are many effects of increased traffic congestion. Congestion affects economic growth through delayed services, wastage of fuel and adversely affects the environment. The study says that in one day the traffic congestion cause wastage of around 2.5 lakh litter [23] of non-renewable fuel. Our project mainly focuses on the severe impact caused by traffic congestion on the emergency vehicle transportation system.

In India where the road width and length proved to be impossible to create a separate lane for emergency vehicles, it is difficult for ambulances to navigate through the traffic. Existing project ideas include a control for traffic signal light using timers for each lane or employing electronic sensors to detect vehicles volume and produce a signal that cycles clockwise.

Fuzzy Logic Networks are also used in traffic systems but in such cases dispute over real-time traffic systems proves to be restraints even though the system is very quick. These systems however require the presence of traffic policemen during the hours of the pinnacle traffic system. Also, the above methods do not cater to the necessities of emergency vehicles such as ambulances with lives.

EXISTING SYSTEM

Inductive loop detection works on the principle that one or more tones of insulated wire are placed in a shallow cut out in the roadway, a lead in a wire run from the roadside pull box to the controller and the electronic unit located in the controller cabinet. Whenever a vehicle passes over the loop of the traffic system or stops the induction of the wire then it will change. Due to the change in induction, there is a change in the frequency. This change in the frequency causes the electronic unit to send a signal to the controller: indicating the presence of the vehicle. Inductive loop detection is useful in knowing the vehicle presence, progress, residence, and even the number of vehicles passing through a specific area. But there are hardly any problems with this system. This includes poor reliability due to improper connections made in the pull box and due to the application of sealant over the cut out of the road. If this system is implemented in poor pavements or was digging of the road is frequent then the problem of reliability is aggravated.

Video analysis consists of a smart camera placed which consists of a sensor, a processing unit, and a communication unit. The traffic is constantly monitored using a smart camera. The video captured is then compressed to reduce the transmission bandwidth. The video analysis abstract scene description from the raw video data. This explanation is then used to compute traffic data. This statistic includes the frequency of the vehicles, average speed of the vehicles as well as lane occupancy. The problems correlated with video analysis are: (a) the overall cost of the system is slightly high (b) the system gets high-flown in case of any heavy fog or rains (c) nighttime observation requires proper street lighting.

Infrared sensors are used to determine the energy that is released from vehicles, road surfaces, and other objects. The energy captured by these infrared sensors is focused onto an infrared-sensitive material using an optical system which then converts the energy into electric signals. These signals are firmly upward to view the traffic. Infrared sensors are used for signal control, detection of pedestrians in crosswalks, and transmission of traffic information. The basic drawback of infrared sensors is that the operation of the traffic system may be affected due to fog also installation and maintenance of the system is monotonous.

PURPOSED SYSTEM

Congestion: Relieving congestion is achieved by optimizing management of traffic signals; detecting and managing incidents on the highway network, access control systems; High-Occupancy Vehicle (HOV) lanes; journey time information; speed management. The increase in traffic on road is closely related to a region's economic prosperity. An increased rate of economic activity stimulates transport demand for individuals, goods, and freight, which puts pressure on the road network.

Safety: Improving safety requirement measures such as adaptive speed control, collision detection, and avoidance, enhanced vehicle safety systems, weather or road condition information. Other systems, for which safety was not the primary motivation, will nevertheless affect safety because their use results in changes in travel and driving behavior – for example, travel information system gives forward warning of an accident ahead which may prevent the occurrence of secondary collisions.

Security: Maintaining security is done through evacuation route by providing signing and priority, homeland security initiatives such as deployed in the USA, hazardous load monitoring, and assistance for vulnerable road users. Changes in the use of technology create vulnerabilities. These are open to exploitation for numerous reasons such as risking interference with vehicles and infrastructure. A security-minded approach is necessary to assess and minimize potential risks to manage incidents and evaluate measures taken.

Environmental protection: Ensuring environmental monitoring and protection requires a reduction in traffic congestion, the creation of low-emission zones, and the promotion of public transport alternatives. Managing demand can be a cost-effective reason to increase capacity, and also has the potential to deliver better environmental outcomes, improved public health, and more liveable and attractive cities. A major tool to implement TDM is the Travel Plan, which may be site-based, organization-based, or area-based.

Support for business & commerce: Increase in productivity and operational efficiencies can be achieved by fleet management, computer-aided dispatch, automatic vehicle location, automatic cargo tracking, electronic pre-clearance, vehicle compliance, checking, and driver monitoring. For hundreds of years, information about any cargo or load could travel at only the same speed as same as the cargo, internationally at least, for sailing ships brought both cargo and post. However, in the nineteenth century, the development of the telegraph enabled information to travel significantly faster than the goods it was carrying.

Road user services: Providing comfort to users of transportation systems who need to feel confident and secure is the motivation for applications such as route confirmation, journey time estimates, and clear advice on approaching interchanges and connections. Relevant ITS services include real-time traffic and public transport information; dynamic route guidance; automotive vehicle location (AVL); smart card payment systems for toll highway and public transport use. To provide the directory information to people and give access to the other location-related services the internet, mobile phones, and navigation devices can be used. These traveler services are often developed collaboratively between the public and private sectors. Travel information is, in fact, the doorway to a whole new generation of commercially viable, value-added, travelers' services developed by private sector service providers.

There are many viewpoints on traveler information. The relevance of information changes as we progress on a journey. It is important to recognize that the level of detail needed changes, depending on the user and where they are in their journey. For example, information about a platform on which a train departs is unlikely to be of much interest several hours on from when the information was needed.

Traveler services can be divided into four distinct types:

- pre-trip Information
- en-route Information
- location-based services
- social media/social data functions

Pre-trip information is vital to ensure users of transport networks are informed of the choices available, and any pre-existing conditions associated with the transport networks concerned. Its traveler information applications that can assist the traveler before their journey include:

- Single-mode internet journey planners
- Multi-mode internet journey planners
- Phone-based journey planning
- TV and radio base travel bulletins
- Kiosk page.

LITERATURE SURVEY

1. **Rongrong Tian, Xu Zhang** suggested using the TRANSYT traffic modeling software to find the optimal fixed-time signal plan and VISSIM micro-simulation software to affirm and evaluate the TRANSYT model and to help assess the optimal signal plan; build an adjustable frame signal plan and refine and evaluate the plan using VISSIM with VS-PLUS emulator. Through little duplication, it was shown that the delay in the malleable signal control was abbreviated noteworthy than that in the fixed time control [1].
2. **Jianhua Guo et al** introduced a new method for area broad traffic signal timing enhance under user equilibrium traffic. The optimization model was formulated as a multi-dimensional search problem aimed to achieve minimized product of the total travel time associated with an urban street network and the variance of travel time for a unit distance of travel [2].
3. **Gustav Nilsson Giacomo Como** focused on a class of dynamic feedback traffic signal control policies that are based on a generalized proportional allocation rule. There results in a differential inclusion for which there prove the existence and, in the special case of orthogonal phases, uniqueness of continuous solutions via a generalization of the reflection principle. Stability is then proved by explaining the nonexclusive proportional allocation controllers as minimizes a certain randomness-like function that is then used as a Lyapunov function for the closed-loop traffic system.

4. **Junchen Jin and Xiaoliang Ma [7]** suggest a group-based signal control proposal that is capable of making decisions based on its comprehension of traffic conditions at the convergence level. The control problem is formulated of stochastic optimal control multi-agent system in which each signal group is modeled as an intelligent agent. The proposed system is designated to be compatible with the prevailing signal system. The parameters were offline enhanced using a heritable algorithm. Simulation results show that the proposed adaptive group-based control system outperforms the optimized GBVA control system mainly because of that's real-time adaptive learning capacity in response to the change in traffic demand. [3]
5. **Huajun Chai et al** apprehend the interaction between traveler's route choice and traffic signal control in a reasonable substructure. They tested algorithm and control strategy by simulation in OmNet++ (A network communication simulator) and SUMO (Simulation of Urban Mobility) under several scenarios. The duplication results show that with the proposed dynamic routing, the overall travel cost is remarkably reduced. It was also shown that the proposed adaptive signal control reduced the average delay effectively, as well as reduced the fluctuation of the average speed within the whole network. [8]
6. **Ekinhan Eriksen et al** indicates a new method for designing traffic signal timing at overwhelmed intersections was demonstrated as "the erasure pairing system". An object purpose with vehicle retard and stop or start numbers has been generated. The Total cost value has been calculated according to the objective function. Obtained results were compared with Webster as a traditional traffic signal timing design method and Transit14 signal timing software. While Webster gives overemphasized results, Transit 14 and erasure Pairing Systems provided better results. As a result of that study, the erasure pairing system could be used for optimizing the traffic signal timings. [4]
7. **The author Shailendra Tahilyani** at expanding a new lane diversion algorithm for route redirection given a result in plane traffic flow on the town road network. Genetic algorithms are utilized for parameter optimization. [5]
8. **Ishant Sharma and Dr. Pardeep K. Gupta** proposed to replace existing traffic signals with a system that are monitored the traffic flow automatically in traffic signal and sensors are fixed in which so the time feed is made dynamic and automatic by processing the live detection. [6]
9. **Prof. Jayesh Juremalani and Dr Krupesh A. Chauhan** author described various soft computing techniques to tackle control systems, which are fuzzy approaches, neural network, genetic algorithm, particle swarm optimization, simulation model. [9]
10. **Chandrasekhar.M.et.al.** suggested a system that implements an image processing algorithm in real traffic light control that will control the traffic light efficiently. [10]
11. **Naren Athmaraman and Srivathsan Sundararajan** introduced adaptive traffic control systems with VANET, focused on reliable traffic prediction approaches and various types of adaptive traffic control algorithms also proposed a mobile crowdsensing technology to support dynamic route choices for drives to avoid congestion. Suggested crowdsourcing can be one of the best options for an Adaptive traffic control system for India. [11]

OBJECTIVE

Road Network Operations are the strategical approach to maximize the efficiency of existing as well as future road infrastructure. At the tactical level, this will convert it into improving operations to reduce traffic delays and operate day-by-day more efficiently. At a strategic level, this system combines the operations concept early in the development of all road infrastructure projects, beginning with the planning and design process and ensuring adequate resources, both fiscal and personal.

The road network operator has to consider all the methods, organizational structures, and resources that are required to support strategies for road network operations, maintenance, and incident response [12].

- Objectives of the network operators include the following:
- Improving safety on the road network
- Enhance traffic flow on interstate and freeway networks
- Reducing congestion within and between cities
- Coordinating agency traffic/transit operations
- Managing accidents, reduce delays and some effects of in informing congestion, weather, roadwork, special events, emergencies vehicles, and disaster situations
- Effectively managing maintenance and construction work to minimize the impact on safety and congestion
- Informing travelers with timely and accurate convenient
- Improving the interaction between modes of transport for passengers

- Eliminating bottlenecks due to inadequate road geometry
- Providing reliable and convenient public transport services.

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