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Intelligent and Futuristic Road Traffic Monitoring and Management System

[1]Mr. Vivekanand Thakare, [2]Damini R. Singh, [3]Sonam J.P. Sharma, [4]Prajwal R. Badwe

[1]Ass. Professor, Department of Computer Eng., Suryodaya College of Engineering and Technology, Nagpur, India
[234]UG students, Department of Computer Engineering, Suryodaya College of Engineering and Technology, Nagpur, India
[1]vivekanand.5977@gmail.com, [2]daminirsingh261999@gmail.com, [3]sonamsharma8087@gmail.com, [4]prajwalbadwe77@gmail.com

ABSTRACT

Traffic management system is a future of smart city. In the current problems of the world, urbans life is one of the major problems, especially in metropolitan cities. Previous traffic management systems are not capable enough to overcome this growth of traffic on the road networks. [3] The purpose of this paper is to propose a smart traffic management system using the deep learning and a decentralized approach to optimize traffic on the roads and intelligent algorithms to manage all traffic situations more accurately. [4] This proposed system is overcoming the scarce of previous traffic management systems. [1] The system takes vehicles density in traffic as input through IR sensor which is object identifying technique and sensors data, resultantly giving output of number of vehicles in signals management. An algorithm in IR sensor is used to predicts the vehicles density in traffic for future to reduce the traffic congestion. Besides this, RFID Reader is also used to prioritize the emergency vehicles like ambulance, police vehicles, etc. by implementing RFID Reader in such emergency vehicles. [12] In the case of any complex emergency situations, such as fire explosion or burning of something in traffic, fire and smoke sensors are also used on the road which is used to detect such situations. [2] According to vehicles density in traffic, time of signal for particular lane will change. In this way, time management in traffic will help to people for waiting less time in traffic. Arduino, Express PCB and Proteus Software will help to implement software in traffic system. This system is used to control traffic congestion due to wait for long time in traffic.

Key words: Arduino, Time Management in traffic, RFID Reader, Controlling traffic congestion, Priority to emergency Vehicles.

INTRODUCTION

Focusing on preventing congestion in traffic and improving the overall traffic efficiency, [6] many large cities rely on traffic management system which aim to reduce traffic congestion and any related problem. The traffic system takes vehicles density as input from digital cameras which is abstracted from digital image processing technique and IR sensors data, and after that it will provide resultantly giving output as signal management. [9] According to density of vehicles, the time will reduce or increased. If in one lane the vehicles density is less than the other then the time will get added to that lane. An algorithm is used to predict the traffic density for future to minimize the traffic congestion.

Besides this the system gives in modern society, quick mobility is one of the most basic needs. Therefore, people are able to use different transportation facilities such automotive vehicles, subways and bicycles. [13] However, among all this transportation facilities, automotive vehicle is still the most adopted due to its comfort and practicality. In this way, by considering a continuous growth in population, the number of vehicles in large cities will also increases continuously day by day, but much faster than transportation system: consequently, traffic congestion will become a complex issue. [15] It creates many several negative concerns for the environment and society such as increasing and many numbers of traffic accident, economical impact, and high level of green house emissions. First priority to the emergency vehicle like Ambulance irrespective of the traffic density.

EXISTING SYSTEM

Several factors in traffic signal can cause a road to have too many cars and thus create a traffic jam. [5] Most people consider traffic happens from cars accidents or a vehicle which is stop in between traffic. Construction of road also takes a lot of blame for causing traffic.

Traffic congestion mainly focuses on the signal's failure, and decreasing law enforcement in traffic system and non-proper traffic management. [1] Because the existing traffic system cannot be expanded further, the only option is to improve traffic management. As a result, many traffic system is used to effectively address to control traffic congestion and make controlling of vehicles in system and very easy to implement in traffic. [7] Many different and advance ways have been developed to manage traffic and reduce congestion. Some are Infrared sensor, inductive loop detection, video data analysis, wireless sensor network, [13] and other are used to somewhat solve the congestion in the traffic and to manage the traffic smartly. The papers reviewed based on the following points:

- Some approaches used to make traffic routing and a signal traffic controlling decision, [11] i.e., adaptive versus non adaptive, simulative versus real-time and hybrid strategies.
- Types of parameters like input and output such as traffic quantity, waiting time of traffic signal, previous and [14] current traffic data information/knowledge to make free from traffic congestion.
- Traffic signal collection of data methods used and communication methods applied or considered.
- The way of improvement in the performance of traffic control [17] to avoid traffic congestion in this system.

OBJECTIVE

Traffic management is focusing on achieving maximum efficiency [19] from the existing road network while minimising other impacts of traffic system without any sort of problem.

A. Reducing traffic jams

The objective behind the traffic system is to limit the stoppage time and also regulate the traffic flow by means of the introduction of some sensors for all controlling traffic signals. [20] The proposal aims at reducing the traffic jams in order to reduce traffic congestion, optimize traffic flow and help proactively manage traffic conditions. [1] If numbers of vehicles decide the signals time, then automatically people have to wait less time in traffic and will get in touch their work soon without any delay.

B. First priority to ambulance in traffic

The aim of smart traffic management system is to give first priority to ambulance, [5] RFID Reader used to scan ambulance in traffic and then IR sensor will manage time and open that signal first where ambulance is present. Some more objectives [10] are as follows:

- Improving efficiency for safety on the road network
- Optimising traffic congestion flow on arterial and freeway networks
- Reducing traffic congestion within and between cities
- Co-ordinating agency traffic or transit operations
- Managing more incidents in signal, reducing delays in traffic while in traffic jams and adverse [16] effects of incidents and congestion, weather, roadwork, special events, emergencies and disaster or some environment situations
- Effectively managing maintenance and construction work of traffic signal to minimise the impact on safety and congestion [14] which generally occurs in traffic jams.
- Informing travellers with timely and accurate information
- Improving the interfaces between modes of transport for passengers and freight

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

PROPOSED SYSTEM

The system is overcoming the flaws of previous traffic management systems. The system takes vehicles density in traffic as input from cameras which is abstracted from RFID Reader. And IR sensors data, resultantly giving as output for signals management. It provides best real-time dashboard to monitor the traffic management system. This can also save their time of waiting for long time and help in reaching to the proposed destination and can prevent the any loss of human life up to very great extent. IR sensor is to manage time in signal according to congestion in traffic. AT Mega 328 P for controlling signal in traffic management system. Congestion detection also enables an adaptive control, which causes one of the best dynamic adjustments to traffic systems including traffic timing on signal.

REQUIREMENTS

Some of the following hardware and software components are as follows:

- ATmega328P- The high-performance Microchip based on single-chip microcontroller combines 32 KB Flash memory with read which is created by Atmel while writing any capabilities, 2 KB static RAM, 23 general purpose input and output lines, 32 general purpose working registers is also used in it, three flexible timer/counters with compare modes, internal and external interrupts, a byte-oriented. It used in many projects and some systems where a simple, low powered and very low-cost microcontroller is needed. Fig. 1 shows ATmega328P microchip.

Fig. 1 AT mega328P microchip

- IR Sensor- Infrared Obstacle Avoidance IR Sensor Module which is in Active Low has a pair of some infrareds transmitting and [17] some receiving tubes. When the transmitted light of IR sensor waves is reflected back, the reflected IR waves of system will be received by the receiver tube. [13] It is now widely used in motion or objects which are in movement. It emits a light to sense some object in the surrounding. Fig. 2 shows IR sensor in system that is used to manage time in traffic system.

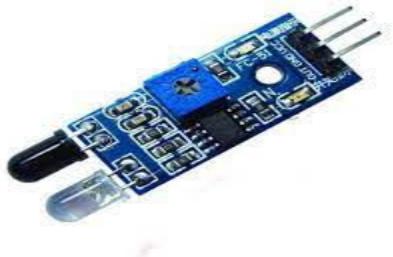

Fig .2 IR Sensor

- RFID Reader- Radio Frequency Identification (RFID) is one of the wireless non-contact uses of radio frequency waves to [17] transfer any type of data in the system. RFID systems usually comprise an RFID reader, RFID tags, and more other related antennas. Fig. 3 shows RFID Reader for scanning Ambulance and give first priority in traffic system.

Fig. 3 RFID Reader

- Arduino Software- The open-source Arduino Software (IDE) makes any software easy to write code and upload in to the board of the traffic system. [17] This software can be used with any Arduino board. All coding that is designed to identify ambulance and manage time in signal will be handle by Arduino software.
- Express PCB software- It has been the free PCB layout in traffic system and design software for over past 20 years, used by many different Engineers, electronic [18] Designers, students and persons who know more technologies and want to design in software. It has helped create designs to explore the bottom of the ocean, outer space and everywhere in today's world with technology. [17] For designing a software Express PCB is used in Smart traffic management system.
- Proteus Software- The software is used mainly by electronic design and circuit designing [18] to building system. Fig. 4 shows how Proteus software will look alike.

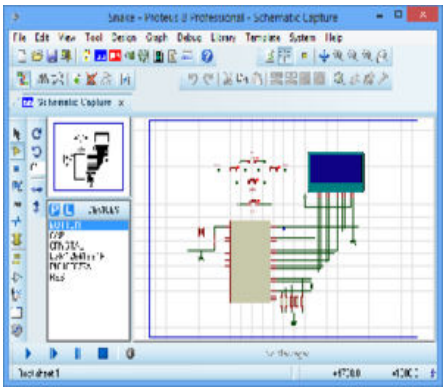

Fig. 4 Proteus Software

- Embedded C – It is some set of language extensions of embedded C same [17] like the programming language by the C standards. Specific compilers are used in embedded C and it is used to develop microcontroller-based applications. [18] It is most popular programming language in many software fields for developing best electronic gadgets.

IMPLEMENTATION

These systems can optimize traffic flow and enhance safety by using sensors and cellular technology [2] to dynamically adjust traffic system. Following are the steps to designing this system:

- Controlling signal: In this system, [11] ATmega328P microchip used for implementing and controlling signal.
- Time management: All traffic management systems aim to reduce congestion in traffic, here also this system is reducing traffic congestion along with time management. IR sensor used to work with time and change according to density of vehicles.
- Detecting Ambulance: In traffic, [2] there are lots of vehicles and due to time allotted to particular lane. Emergency vehicles used to wait and suffers some problem. Here, RFID reader will detect ambulance if it was present in traffic.
- Software designing: For [22] coding and circuit design, Arduino, Express PCB and Proteus Software used in designing traffic system.

CONCLUSION

Traffic jam is become a big issue in every big city that causes many several problems for common people and they get frustrated for waiting in traffic. [2] It also consumes time and energy unnecessarily and hence the loss of the nation. It serves to preserve traffic density and improve the security, safety and reliability of the overall road transport system.

The number of vehicles on the [3] road during traffic decides the time of traffic to a particular lane. And also gives the first priority to emergency vehicles in traffic or on which lane emergency vehicles is present. In that case, lane on which emergency vehicle is present [21] will start first before any other lane. So, it helps to reduce the chances of any bad incident.

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