International Journal of Computer Applications Technology and Research
Volume 11–Issue 06, 175-178, 2022, ISSN:-2319–8656
DOI:10.7753/IJCATR1106.1001

Real-Time Traffic Monitoring

Pooja S
Assistant Professor
Department of Electronics and Communication Engineering
K S Institute of Technology
Bangalore, India

C A Sushma
Department of Electronics and Communication Engineering
K S Institute of Technology
Bangalore, India

N Naga Omkar
Department of Electronics and Communication Engineering
K S Institute of Technology
Bangalore, India

Shiva Shankar B
Department of Electronics and Communication Engineering
K S Institute of Technology
Bangalore, India

Rithvik P
Department of Electronics and Communication Engineering
K S Institute of Technology
Bangalore, India

Abstract: As the population increases day by day vehicular travel is also increasing which leads to congestion problem. Traffic congestion causes many critical problems and challenges in the most populated cities. The increased traffic leads to more waiting time and fuel wastages. People miss opportunities, loose time and get frustrated. Traffic load is highly dependent on unpredictable situations such as accidents or constructional activities. These problems can be solved by a traffic control system by continuously sensing and adjusting traffic lights timing according to the actual traffic load which is called an Intelligent Traffic control System. The Intelligent Traffic Control Systems reduces congestion, operational costs, provides alternate routes to travelers and increases capacity of infrastructure.

Keywords: Traffic, Intelligent, Control, System, Alternate Route.

1. INTRODUCTION

Traffic investigate main aim is to optimize traffic flow of goods and citizens which causes lots of trouble especially when there are emergency case sat traffic light intersection which is always busy with lots of vehicles. However there are some restrictions in handling intelligent traffic control systems. The Density Based Signal executive in Traffic System is to solve traffic congestion difficulty which many people face and is a big problem in many cities. The system proposed here increases road safety even during the absence of traffic police and brings their attention to those who break the law. Traffic is coordinated in a circular loop that takes in the inputs in real time basics. NODE MCU with ESP Wi-Fi module is used to transfer and collect all the data from the sensors. All the data are made available at our local servers that are setup which will receive the data from the NODE MCU. The signals help at increasing the traffic-handling capacity at most intersections. They can function without any help from timers, connect to a computer controlled system which operates at few intersections.

2. LITERATURE SURVEY

W. Wen et al. [1] this paper proposed a framework for a dynamic and automatic traffic light control system and developed a simulation model to help design the system. The model adopts average departure times and arrival times which are physically observed at each intersection. Here by controlling light duration and speed limit, traffic congestion in a large city can be solved. Traffic congestion has been causing many challenges in most cities of modern countries. To a traveller, congestion means lost time, missed opportunities, and frustration and to an employer it means lost worker productivity, trade opportunities, delivery delays, and increased costs. By solving congestion problems it is feasible not only for physically constructing new facilities and policies but also by building information technology transportation management systems. Traffic congestion problems cannot be solved by expanding the road infrastructure. In fact, building new roads can actually compound congestion, in some cases, by inducing greater demand for vehicle travel.

K.R. Shruthi et al. [2] the proposed system efficiently utilizes and manages traffic light controllers. An adaptive traffic control system based on a new traffic infrastructure using Wireless Sensor Network (WSN). They are dynamically adaptive to traffic conditions on both single and multiple intersections. In this project an intelligent traffic light controller system with a new method for vehicle detection and dynamic traffic signal time manipulation is used. The project also controls traffic over multiple intersections and follows international standards for traffic light operations. A central monitoring station is used to monitor all the access nodes.

Yousaf Saeed et al. [3] proposed a work which presents an application of fuzzy logic for multi-agent based autonomous traffic lights control system using wireless sensors to overcome problems like speed, traffic irregularity, accidents and congestion. This agent based approach can provide a solution by minimizing the vehicle waiting time especially the emergency vehicles using fuzzy logic control under situations of emergency that normally occur. Two traffic junctions information is taken to calculate effectiveness of this system.

Mario Collotta et al. [4] in this paper a real-time knowledge of information concerning traffic light junctions represents a valid solution to congestion problems with the main aim to reduce accidents as much as possible. The Red Light Running (RLR) is a behavioural phenomenon which occurs when the driver must choose if he can cross the road or no when the traffic light changes to yellow from green. The drivers sometimes cross even during transitions from yellow to red and as a consequence, the possibility of accidents will increases. This often occurs because the drivers wait too much in the traffic and its not well balanced. In this paper we propose a technique that is based on information gathered through a wireless sensor network which dynamically processes the green times of a traffic light in an isolated intersection. The main aim is to optimize the waiting time in the queue and as a consequence reduce the RLR phenomenon occurrence.

Vikramaditya Dangi et al. [5] proposed a paper to implement an intelligent traffic controller using real time image processing. The image sequences from a camera are analyzed using various edge detection and object counting methods to obtain the most efficient technique. The number of vehicles at the intersection is evaluated and traffic is efficiently managed. This system also implements a real-time emergency vehicle detection system in which case if an emergency vehicle is detected, the lane is given priority over all the other lanes.

Jiancheng Zhang et al. [6] proposed a paper for developed a probabilistic neural network (PNN) classifier for object classification using roadside Light Detection and Ranging (LiDAR). The objective is to classify the road in urban road into one of four classes: Pedestrian, bicycle, passenger car, and truck. Five features calculated were selected to show the difference between different classes. The data were collected at three different locations that represent different scenarios. The performance of the system was evaluated by comparing the results of the PNN with those of the support vector machine (SVM) and the random forest (RF). The results showed that the PNN can provide the results of classification with the highest accuracy among the three investigated methods. The overall accuracy of the PNN was 97.6% using the testing database. The errors in the results were also diagnosed.

Feihu Zhang et al. [7] proposed a paper presenting a sensor fusion based vehicle detection approach which fuses information from both LIDAR and cameras. The proposed approach is based on two components: a hypothesis generation phase to generate positions that potential represent vehicles and a hypothesis verification phase to classify the corresponding objects. Hypothesis generation is achieved using the stereo camera while verification is achieved using the LiDAR. The main contribution being vehicle detection. This system leads to an enhanced detection performance and in addition maintains false alarm rates compared to vision based classifiers. The experimental results suggest a performance which is comparable to the current state of the art, albeit with reduced false alarm rate.

Mathias Perrollaz et al. [8] the proposed paper will detail a novel approach to compute occupancy grids from stereo-vision, and shows its application for the field of intelligent vehicles. In the proposed approach, occupancy is initially computed directly in the stereoscopic sensor's disparity space. The calculation accounts for the detection of obstacles and road pixels in the space and partial occlusions in the scene. In a second stage, this disparity-space occupancy grid is transformed into a Cartesian space occupancy grid to be used by subsequent applications. This transformation includes temporal and spatial and filtering. The proposed method is designed to be easily processed in parallel. Consequently, we chose to implement it on GPU, which allows real-time processing for the demanding application. In this paper, we present this method and we propose an application to the problem of perception in a road environment. Results are presented with real road data, comparing qualitatively this approach with others.

Madhurima Pandey et al. [9] the proposed system uses an automated intelligent system that can handle traffic easily compared to our current scenario where we provide manual power to handle it which is not possible each and every time. This paper discusses about some of the standard traffic control system and their drawback, image processing technique which helps in finding traffic queue length and some of the methods of it.

Sheena Mariam Jacob et al. [10] proposed a paper that aims to overcome traffic congestion caused by ineffective traffic management systems that are outdated and work on a predefined countdown. These traditional systems allot timings irrespective of the actual density in traffic on a specific road thereby causing large red light delays. The system we propose ensures traffic lights respond to real time values of traffic, thereby allowing proper management of time and resources. In order to do this we first calculate the density of traffic which is determined using a combination of ultrasonic sensors and image processing techniques. This information is processed by a Raspberry Pi, which in turn controls the traffic light indicators. In addition to that, the data that is collected is sent to the cloud, and can be used to monitor traffic flow at periodic intervals. In case of sensor system failure, the values stored in the cloud will also be useful in predicting the density of traffic based on long term periodic analysis.

3. LITERATURE GAPS

In [1], a new framework has been proposed for automatic traffic light control systems for improving traffic congestion problem. To automatically set the time duration of red and green light signals, a simulation model is used for improving traffic problem in peak hours according to the traffic conditions in the street. The simulation results prove the efficiency of the simulation model as the average waiting time and number of cars are dropped down sharply when the red light duration is 50 seconds. Further analysis also shows if we set the red light durations of the three intersections to 50 seconds, the total performance of the model is the best. Although this paper presents and the DATLCS, there are still several aspects where we can further improve its functions. In particular, the simulation model can be extended to add some more as well as different directions road to relate the model more close to the reality. In addition we can collect traffic flow and average car speed by using RFID technology, the method of dynamically finding a best route or a second optimal route for road navigation systems will be also a major research issue in the future.

In [2], the system can be extended by using GPS navigation system installed in vehicle and can be used to detect VIP vehicles and send message to authority.

In [3], Data is collected from the two junctions and a traffic control system for multi-agents is proposed, the emergency vehicles passes these two junctions quickly with less traffic and at the same time collisions are also avoided in case of multiple emergency vehicles coming from different directions. In case of new hardware technology and algorithms, the proposed system is flexible enough to enhance and handle future traffic aspects using FPGAs based microelectronics chips to control traffic signal lights.

In[4],the paper proposed a technique for managing traffic light cycles in order to reduce the queues in road and as a consequence, accidents due to the RLR phenomenon. Therefore, a wireless sensor network has been used with the aim to gather real time information about roads congestion. These information are later processed by a central node which is equipped with a

International Journal of Computer Applications Technology and Research
Volume 11–Issue 06, 175-178, 2022, ISSN:-2319–8656
DOI:10.7753/IJCATR1106.1001

special module and is based on an algorithm that dynamically processes the traffic light cycles reducing, reduces waiting times and drivers frustration. The results, clearly demonstrate how the proposed algorithm improves the queue management around a traffic light.

In [5], The focus shall be to implement the controller using DSP as it can avoid heavy investment in industrial control computer while obtaining improved computational power and optimized system structure. The hardware implementation would enable the project to be used in real-time practical conditions. In addition, this system can identify the vehicles as they pass by, giving preference to emergency vehicles and assisting them in traffic on a large scale.

In [6], The future transportation system must rely on multiple sensors including LiDAR, camera, radar et al. The data from different types of sensors overcome the limitations of one single sensor and provide more features for classification. As an example, thermal imaging may be used for object classification considering that different users may have different temperatures. Therefore, it is also necessary to use the data from different sensors to further improve the accuracy of object classification. Integrating the data from different sensors is another research topic for future studies.

In [7], The results illustrate that the proposed approach achieves a lower false alarm rate in urban environments, which may be helpful in future autonomous navigation system. Future work concentrates on modeling contour parameters to 3D models from 2D models.

In [8] The future work are as follows. First, the algorithm must be tested extensively, in conjunction with laser scanners for Bayesian sensor fusion. Then adding sub-pixel estimation of the disparity values will provide improved accuracy, without modifying the method itself. The problem is to use an approach which provides actual separation between the road surface and the vertical objects.

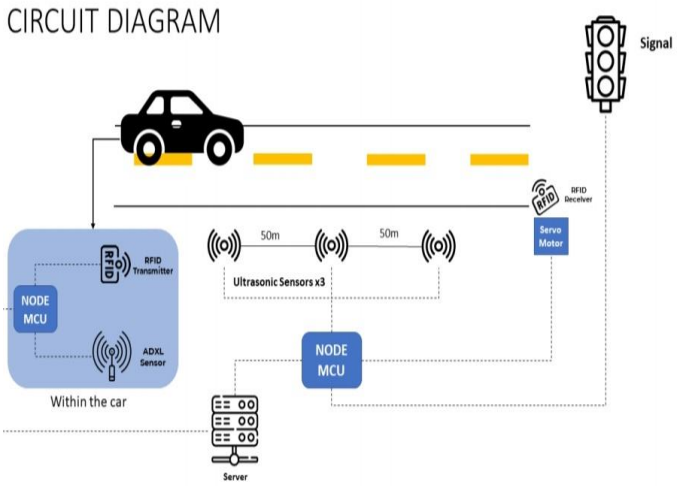
In [9] This work can be enhanced further by proposing a system which identifies the presence of emergency vehicles and by giving preference to those emergency vehicles. Secondly, it can be enhanced by using VANETs(vehicular Ad-hoe Networks) as it provides road safety and intelligent transport system.

In [10] This project still has space for improvement and can be extended by displaying traffic data in an application that can be accessed by the public. As an addition the system can be made efficient by using a camera with high resolution or by replacing the HC-SR04 ultrasonic sensors with industrial grade sensors that serve the same purpose. Further changes could also be made to the system which gives highest priority to emergency vehicles in any situation.

4. PROPOSED METHODOLOGY

This project is being designed to increase road safety even during the absence of traffic police and to bring their attention to those who break the law. The traffic is coordinated in a circular loop that takes in the inputs on real time based on the density of the vehicles on road. NODE MCU with ESP Wi-Fi module are used to transfer and collect all the data from the sensors and are made available at our local servers that are setup and will receive the data from the NODE MCU.

The proposed system utilizes the Wi-Fi capabilities and Microcontroller present in Node MCU and the accuracy achieved by Ultrasonic sensors. By pairing up 3 US Sensors at a calculated distance, we can successfully judge the densities of traffic into distinct levels. Levels can be used to control the signals vehicle movement and hence the traffic can be managed better. The addition of RFID enables to justly find all the traffic rule violators by catching them jumping a red sign and by the presence of an ADXL sensor that is paired with a Node MCU inside the car, we are able to capture data of any rash driving incidents made by the driver of the car at any point in time and on any street. Thereby, allowing the respective authorities to take further steps. The Server plays an important role of making aware all the information to the public for their general needs as well as the Local Authorities to correctly handle all the fines handed out to rule violators.



5. CONCLUSION

The proposed mechanism provides a real time traffic monitoring system that enables the respected departments to monitor traffic patterns from the cloud. Valuable data can be extracted for road planning. The live control of signals is enables such that the traffic can be maintained at all times to be at optimal levels and the altering of signal lights can be done automatically. This ensures better flow of traffic at peak hours and the best possible setting during other times based on live values. It also makes the process of finding the law breakers easier and automates the entire process where no law enforcement officer's presence would be required locally at signals or junctions. The systems provide a platform to store the data as well where all data can be accessed by the law.

6. FUTURE WORK

The system currently is developed for a single junction which takes in 2-way traffic. The system can be expanded to integrate a greater number of such junctions with higher lanes merging, enabling the system to act as a unified traffic managing hub, where data from all over the city can be collected and can be integrated for data analysis and traffic patterns. The managing of signals also becomes more streamlined when data can be used from all signals leading up to another signal, enabling the smooth flow of traffic. The system can also incorporate bigger RFID systems that can scan multiple cars braking signal at once. Higher powered ultrasonic sensors can be used for wider roads and lower powered ones for narrower roads, enabling the best suitable outcome without any power loss as such.

7. REFERENCES

1) R. M. Cardoso, N. Mastelari, and M. F. Bassora, "Internet of things architecture in the context of intelligent transportation system a case study towards a web-based application deployment," presented at 22nd International Congress of Mechanical Engineering (COBEM 2013), 2013.

2) Wen and Yang, “A dynamic and automatic traffic light control system for solving the road congestion problem” WIT Transactions on the Built Environment (Urban Transport). Vol. 89 , 2006, pp 307-316.

3) Chen and Yang, “Minimization of travel time and weighted number of stops in a traffic-light network”, European Journal of Operational Research. Vol. 144, pp565-580.

4) Pappis, C.P. and Mamdani, E.H., “A Fuzzy Logic Controller for a Traffic Junction”, IEEE Transactions on Systems, Man and Cybernetics, 1977, pp 707-717.

5) Road Traffic Congestion Monitoring and Measurement using Active RFID and GSM Technology by Koushik Mandal, Arindam Sen, Abhijnan Chakraborty and Siuli Roy, IEEE | Annual Conference on Intelligent Transportation Systems, 2011.

6) Priority Based Traffic Lights Controller Using Wireless Sensor Networks by Shruthi K R and Vinodha K, International Journal Of Electronics Signals And Systems (IJESS) ISSN: 2231- 5969, Vol-1 Iss-4, 2012

7) Image Processing Based Intelligent Traffic Controller by VikramadityaDangi, AmolParab, KshitijPawar and S.S Rathod. Undergraduate Academic Research Journal (UARJ), ISSN : 2278 – 1129, Vol-1, Iss-1, 2012.

8) Intelligent Traffic Signal Control System Using Embedded System by Dinesh Rotake and Prof.SwapniliKarmore, Innovative Systems Design And Engineering, ISSN 2222-1727 (paper) ISSN 2222-2871 (online), Vol. 3, No. 5, 2012

9) Xia and Shao, “Modelling of traffic flow and air pollution emission with application to Hong Kong Island”, Journal of Environmental Modelling & Software. Vol. 20, 2005. pp 1175- 1188.

10) Stoilova and Stoilov, “Traffic Noise and Traffic Light Control”, Journal of Transportation Research, Vol. 3, No. 6, 1998, pp 399-417.