WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Smart Movable Road Divider for Clearance Ambulance Path and Traffic Control

Gunjal Aditya[1], Erande Shubham[2], Shelge Pavan[3], Prof. Shinde S. P[4]

[1] (Computer Engineering, SGOI's COE, Belhe / SPPU, Pune India)
[2] (Computer Engineering, SGOI's COE, Belhe / SPPU, Pune India)
[3] (Computer Engineering, SGOI's COE, Belhe / SPPU, Pune India)
[4] (Computer Engineering, SGOI's COE, Belhe / SPPU, Pune India)

A B S T R A C T

This mechanism only shifts the divider when there is more traffic on one side than the other, or vice versa. If there is less traffic on one side than the other, the divider cannot be relocated. For safety reasons, the partition is moving extremely slowly. The traffic condition is now being collected by deep learning, and the data will be stored in clouds via cloud computing and large data management via IOT. To move the divider to the left or right, an embedded device receives a message from a cloud database via IOT protocols.

Keywords: Traffic Management, Smart Traffic System, Smart Moveable Divider, Automatic road divider, Density of traffic, traffic control.

1. Introduction

Effective emergency medical services are essential to save lives in the fast-paced world of today. The introduction of Clearance Ambulance Paths with the use of a Smart Moveable Road Divider System is one creative way that has arisen to improve the efficacy of ambulance services. A one-lane road was built in the past, which caused numerous issues and made it inefficient for people to get to their destinations owing to traffic congestion. At that time, there were also no more facilities, security measures, or flexibility. Following that, two lanes were added to the route, although this did not relieve the traffic jam. Following that, the road features four lanes, dividing it into four sections, yet this does not lessen traffic. According to numerous suggested publications, people utilise IOT and embedded systems to control traffic congestion by utilising infrared sensors to observe the flow of traffic. However, these systems are inefficient at correctly recognising traffic and require a large number of expensive connections that require frequent maintenance. The road infrastructure stays essentially unchanged as the number of vehicles grows daily, making it unable to adapt to changes such as erratic travel delays, traffic jams, and accidents. The largest problem facing modern society is road traffic. There are a lot of issues with emergency vehicles, such ambulances. They often get stopped in traffic and have to wait for hours, endangering the patient's health because of the congested roads. This paper presents the concept of a road divider that can be moved in response to traffic conditions. IoT-compiled real-time traffic data that will use machine vision to create a link between the traffic and the divider.

There are two phases to the road: the entering and departing phases. During rush hour, the incoming route frequently has more traffic than the outgoing side, or vice versa. Traffic jams occur when a large number of vehicles are halted for a brief period of time. to stay away from these traffic congestion issues. This divider will move in accordance with the information that the camera vision module sends. Emergency vehicles are given more priority under this method. In order to handle the traffic database that is obtained from camera vision and fixed on the roadways, we leverage cloud computing in this process. There is having two cameras on both the side of roads which directly acquires the image of number of vehicles and calculate the density of traffic using deep learning.

2. Literature Review

1. Mrs G .Anitha Chowdary (Associate professor) 2. N. Ganesh 3. M. Venu 4.M. Ranjith Kumar (2,34-Students of Btech, ECE Department -Tkr college of engineering and Technology)© 2023 IJCRT — Volume 11, Issue 4 April 2023 — ISSN: 2320-2882

Divider is generically used for dividing the Road for ongoing and incoming traffic.This helps keeping the flow of traffic; generally there is equal number of lanes for both ongoing and incoming traffic. The problem with Static Road Dividers is that the number of lanes on either side of the road is fixed. Since the resources are limited and population as well as number of cars per family is increasing, there is significant increase in number of cars on roads. This calls for better utilization of existing resources like number of lanes available. Our aim is to formulate a mechanism of automated road divider that

can shift lanes, so that we can have number of lanes in the direction of the rush. The cumulative impact of the time and fuel that can be saved by adding even one extra lane to the direction of the rush will be significant.so that we can have a smarter city traffic all over the city.

2. Subhashitha D, [2] Dr. Mukthi S L [1] PG Student, [2] Asst. Professor [1][2] VLSI Design and Embedded Systems,Bangalore Institute of Technology, Bengaluru, INDIA International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE) Vol 8, Issue 7, July 2021

Basically a road divider is used as a barrier to separate the road for the vehicles which are moving in two different directions. As we have seen around us these road dividers are static i.e., they cannot be shifted/moved from one place to another. We have also witnessed a very high traffic only on one side of the road during peak/rush hours. When there is a high traffic it causes accidents and also many emergency vehicles get stuck in this traffic, which may result in loss of life. Therefore an efficient system is proposed here where smart movable road divider is implemented which will work based on the road density. The ambulance priority system is also included here which provides a free path for the ambulance using RFID tags and RFID reader. Vehicle signal violation can also be detected in this proposed project.

3. Sandeep S Baragoor, Thanmai N, Sandeep S Javaller International Journal of Engineering Research Technology (IJERT) Published by : Vol. 10 Issue 07, July-2021

Traffic congestion is one of the biggest problems faced in recent times. So the main aim of this project is to reduce it but providing an effective solution to it. Generally, there's equal width of lanes for both on-going and incoming traffic. The problem with Static Road Dividers is that the number of lanes on either side of the road is fixed. Population as well as number of cars per family is increasing, thereby increasing the number of cars on roads. This involves better utilization of existing resources like number of lanes available. Even though with the advancements in technology, there has been no proper solution to overcome this problem. Traffic congestion has been one among the main concerns faced by the metropolitan cities today in spite of measures being taken to mitigate and reduce it. It has emerged together of the most challenge for developers in urban areas for planning of sustainable cities. The main focus of this study is aimed to provide a better, effective and efficient way of solution.

4. Sowjanya K N1 , Nikhil Jamadagni H M2 , K Unnimaya3 , Bhavana G4 Student, Dept. of Electronics and Communication, KS Institute of Technology, Bangalore, Karnataka. International Advanced Research Journal in Science, Engineering and Technology Vol. 8, Issue 7, July 2021

"This paper presents Smart Movable Road Divider for controlling the traffic congestion in metropolitan cities and to provide a free path for the ambulance. The work presented in this paper focuses on reducing the latencyin traffic and free path for ambulance. The existing Road Dividers consists of equal number of lanes. Usually, in morning and evening peak hours the opposite side of the Road Divider is generally underutilized. To overcome this, Smart Movable Road Divider is implemented where the divider is moved based onthe density of the traffic using IRSensors. If the density of the traffic is high on one side, the divider is moved to the other side. Then the density of traffic is stored in cloud which is possible through IoT. A free path for Ambulance is provided using RF Module by controlling the traffic signal. A Prototype is developed and tested for the Congestion control which also works on safety measures by intimating the drivers about the movement of the Divider.

Methodology:

- **Traffic Monitoring:** Real-time traffic data is collected using various sensors, such as inductive loop detectors, ultrasonic sensors, or cameras. These sensors continuously monitor traffic density and provide accurate information about the traffic flow on both sides of the road.
- **Data Analysis and Decision Making:** The collected traffic data is fed into a central control unit, which employs algorithms and machine learning techniques to analyze the data and determine the optimal position of the median barrier. The system considers factors such as traffic volume, vehicle speed, and the presence of emergency vehicles.
- **Divider Movement Mechanism:** A robust and reliable mechanism is employed to physically move the median barrier. This mechanism may involve hydraulic, pneumatic, or electric actuators that are controlled by the central control unit. The movement should be smooth, controlled, and synchronized to ensure the safety of road users.
- **Emergency Vehicle Detection and Prioritization:** The system incorporates sensors or communication technologies to detect emergency vehicles approaching the area. Upon detecting an emergency vehicle, the system prioritizes its passage by adjusting the median barrier position to create a clear path for the emergency vehicle.
- **System Integration and Communication:** All components of the smart movable road divider system are integrated seamlessly, ensuring efficient communication and synchronized operation. The system should be able to communicate with traffic management centers and emergency services to provide real-time updates and coordinate responses.
- **Security and Redundancy:** The system should incorporate robust security measures to prevent unauthorized access or manipulation. Redundant components ensure continuous operation in case of component failure.
- **User Interface and Feedback:** A user-friendly interface provides real-time information about the system's status, traffic conditions, and emergency vehicle movements. This interface can be accessed by authorized personnel for monitoring and control purposes.

3. Proposed System:

1. Traffic Sensors and Data Collection:

- Inductive Loop Detectors: Embedded in the road surface, these sensors detect the presence of vehicles by measuring changes in the inductance of the coil when a vehicle passes over it.

Inductive Loop Detector

- **IR Sensor**

IR sensors are a vital component of many electronic devices, from smartphones and remote controls to security systems and medical equipment. Here are a few pictures of different types of IR sensors:

- IR Sensor Module

Image of IR Sensor Module

This is a common type of IR sensor that is used in a variety of applications. It consists of an infrared emitter and an infrared receiver. The emitter emits infrared radiation, which is reflected off of objects in the sensor's field of view. The receiver detects the reflected radiation and generates an electrical signal that is proportional to the amount of radiation that is detected.

Ultrasonic Sensor

- **Cameras:** Analyze real-time video footage to identify and track individual vehicles, providing detailed information about traffic volume, vehicle types, and lane occupancy.

Traffic Camera

The data collected from these sensors is transmitted to a central control unit for processing and analysis.

Camera board capturing or detecting the presence of vehicles and calculate the density of traffic on roads. Due to the different sizes of vehicles, it's also a big challenge to count the number of cars present on the road and also calculate the accuracy of vehicles counts. The cameras directly captures the image in the form of a rectangular box which makes it easy to understand for us and also count the frequency of present vehicles on the road and sent the data on the cloud database management system.

If, camera captures the emergency vehicle like as ambulance by using an alphabet word that is "A M B U L A N C E" in which the camera directly reads the alphabet, and sends an alert message of presence of an ambulance to data cloud.

2. Central Control Unit and Decision Making:

- Central Control Unit (CCU): The CCU receives data from the traffic sensors, processes it using algorithms and machine learning techniques, and determines the optimal position of the median barrier.
- Traffic Management Algorithms: These algorithms consider factors such as traffic density, vehicle speed, and the presence of emergency vehicles to calculate the ideal barrier position that minimizes traffic congestion and prioritizes emergency response.
- Machine Learning Techniques: Machine learning algorithms can be employed to analyze historical traffic patterns, identify recurring congestion patterns, and predict future traffic conditions to optimize barrier movement proactively.

The CCU sends commands to the barrier movement mechanism based on the determined optimal position.

3. Barrier Movement Mechanism:

- **Actuators:** Hydraulic, pneumatic, or electric actuators provide the physical force to move the median barrier. These actuators should be powerful, reliable, and synchronized to ensure smooth and controlled movement.
- **Control Mechanisms:** The actuators are controlled by signals from the CCU, ensuring precise positioning of the barrier according to the optimal position determined by the traffic management algorithms.
- **Safety Features**: Safety mechanisms, such as sensors and feedback loops, monitor the movement of the barrier and prevent collisions with vehicles or pedestrians.

The barrier movement mechanism should be robust and efficient to handle frequent adjustments while maintaining safe operation.

4. Emergency Vehicle Detection and Prioritization:

- RFID Tags and Readers: Emergency vehicles can be equipped with RFID tags that emit unique signals when approaching the road divider area. RFID readers detect these signals and identify the presence of emergency vehicles.and identify the presence of emergency vehicles.

RFID Reader chevron_right

- GPS Tracking: Emergency vehicles can also be equipped with GPS trackers that provide real-time location information to the system. This information can be used to prioritize their passage even without RFID tags.
- Dedicated Lane Detection: Image processing algorithms can analyze camera footage to detect dedicated emergency vehicle lanes and prioritize vehicles approaching from these lanes.

Upon detecting an emergency vehicle, the system triggers the barrier movement mechanism to create a clear path for the emergency vehicle to pass through efficiently.

5. System Integration and Communication:

- Centralized Communication Hub: A centralized communication hub serves as the backbone of the system, relaying information between the various components.
- Networking Infrastructure: A reliable and secure network infrastructure connects all components, allowing for real-time data exchange and coordinated operation.
- Data Visualization Tools: User-friendly interfaces provide real-time information about traffic conditions, barrier positions, and emergency vehicle movements to authorized personnel for monitoring and control.

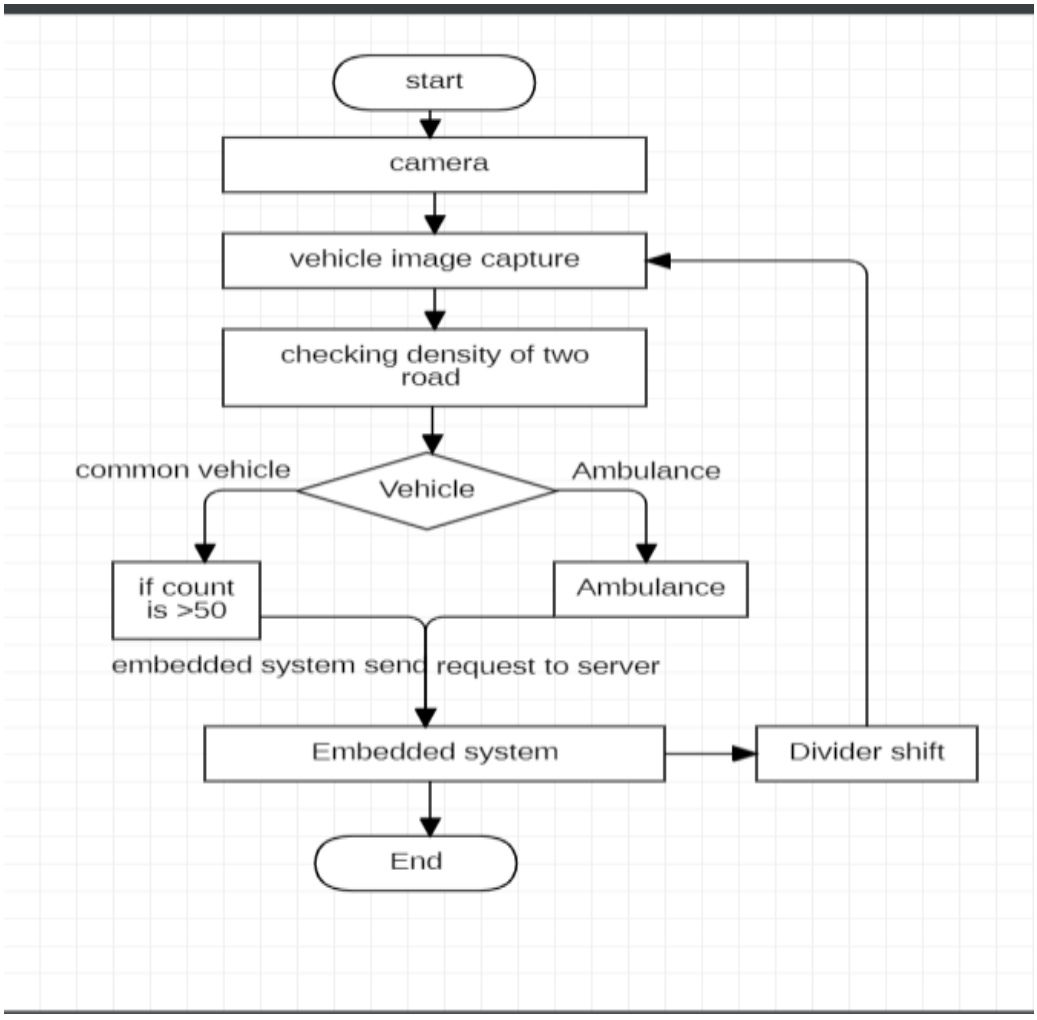
Seamless integration and effective communication ensure that all components work together cohesively to optimize traffic flow and prioritize emergency vehicles.

6. Security and Redundancy:

- Multi-layered Security Measures: Robust security measures protect the system from unauthorized access, data breaches, and cyberattacks.
- Redundant Components: Critical components are backed up with redundant units to ensure continuous operation in case of component failure.
- Regular Updates and Maintenance: Regular software updates and hardware maintenance ensure the system remains up-to-date, secure, and reliable.

By implementing these security and redundancy measures, the system maintains its integrity and functionality, even in challenging or unexpected situations.

4. Flow Chart:



5. Expected Result:

The Experiment Was Done On Smart Movable Road Divider With Ambulance Priority System And Traffic Controlling System.

6. Conclusion:

Before starting this project a survey was done regarding the traffic density problem which was faced by many countries. The main aim was to provide a better solution to the traffic problem and to save lives. So this efficient system was designed and tested for the same. With the help of the smart divider traffic blocking problem was reduced. Whereas by using RFID system a free path was provided for emergency vehicles in a two way road and also signal violations were detected easily.

7. References

- [1]. Pranav Maheshwari, Deepanshu Suneja, Praneet Singh, Yogeshwar Mutneja, "Smart traffic optimization using image processing",2015 IEEE 3rd International conference on MOOC's, Innovation and Technology in Education (MITE), ISBN: 978-1-4673-9/15/$31.00, 2015 IEEE.
- [2] Er. Faruk Bin Poyen, Amit Kumar Bhakta, B.Durga Manohar, Imran Ali, ArghyaSantra, AwanishPratap Rao, "Density based traffic control", 2016 International journal of advanced engineering, management and science (IJAEMS) , vol-2, issue-8, Aug-2016, ISSN:2454-1311.
- [3] B.Nandhu Rathi , M.Radha , T.U.Sugitha , V.Tharani and V.Karthikeyan, "Intelligent traffic control system for congestion control, emergency vehicle clearance and stolen vehicle detection",Asian journal of applied science and technology (AJAST), Volume 1, Issue 1, Pages 122- 125, February 2017.
- [4] SabeenJavid, Ali Sufian, Saima Pervaiz, Mehak Tanveer, "Smart traffic management system using IOT", International conference on advanced communication technology (ICACT), ISBN: 979- 11- 88428-01-4, February 2018.
- [5] HemlataDalmia, Kareddy Damini, Aravind Goud Nakka, "Implementation of movable road divider using IOT", 2018 International conference on computing, power and communication technologies (GUCON), Galgotias university, Greater Noida, UP, India. Sep 28-29, 2018
- [6] Satya SrikanthPalle, Sriraksha B M, Vibha H B, Yeshashwin i A ,"Implementation of smart movable road divider and ambulance clearance using IOT", 2019 4th International conference on recent trends in electronics, information, communication and technology (RTEICT-2019), MAY 17th and 18th 2019
- [7] Sinha, M. D., Babu, D. M. R., Patan, D. R., Jiao, D. P., Barri, M. K., & Alavi, D. A. H. (2020). Internet of Things-based Fog and Cloud Computing Technology for Smart Traffic Monitoring. Internet of Things, 100175. doi:10.1016/j.iot.2020.100175.
- [8] Al-Sobky, A.-S. A., & Mousa, R. M. (2016). Traffic density determination and its applications using smartphone. Alexandria Engineering Journal, 55(1), 513– 523. doi:10.1016/j.aej.2015.12.010.
- [9] S. Ahn and M. J. Cassidy, "Freeway traffic oscillations and vehicle lanechange maneuvers," in Transportation and Traffic Theory 2007. Papers Selected for Presentation at ISTTT17, 2007
- [10] Kamal, M. A. S., Taguchi, S., & Yoshimura, T. (2015). Efficient vehicle driving on multilane roads using model predictive control under a connected vehicle environment. 2015 IEEE Intelligent Vehicles Symposium (IV). doi:10.1109/ivs.2015.7225772 [11] Sri, B. D., Nirosha, K., & Gouse, S. (2017). Design and implementation of smart movable road divider using IOT. 2017 International Conference on Intelligent Sustainable Systems (ICISS). doi:10.1109/iss1.2017.8389364