

Smart movable road divider for controlling traffic and make path for ambulance using IoT

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Abstract: *The static road dividers are the dividers that are not movable, and the main problem or issue with such dividers, the number of lanes on either side of the street is constant. The first problem is the daily increase in population. Many people face this problem every day, which is accompanied by an increase in the number of cars, trucks, and other vehicles. As the number of vehicles increases, the issue regarding traffic occurs. Our main purpose is to form an automatic movable road divider, which will be helpful to shift the lanes and reduce the traffic problem. And one more concept is given by us, i.e., clearing the road traffic for ambulances with the help of IR sensors using IoT. In this paper, we establish a solution for both problems with the help of smart movable road dividers.*

Keywords:- Smart movable divider, IoT, server, Ambulance.

I. INTRODUCTION

Due to the one-lane highways back then, individuals had a lot of difficulty getting where they needed to go. It took longer and there was more traffic on one-lane roads. After that, two-lane roads were built, but they didn't address the issue. In this article, we employ the idea of IoT (Internet of Things) and IR (Infrared) sensors to monitor the traffic. However, it is a demanding job that costs a lot of money and requires significant maintenance expenses. This is the biggest problem and issue. The day-to-day increment in the vehicles causes the traffic problem to occur at a high level, and sometimes an emergency vehicle like an ambulance has to get stuck in the traffic and also cause a risk to the patient's health. Sometimes situations cannot be attended to by ambulances quickly enough. Traffic congestion frequently prevents first responders from getting patients to a hospital in time. In 2017, traffic congestion were to blame for 20% of fatalities among emergency room.[5] According to ministry of road transport, in 2020 driving on the wrong side has caused 6050 accident and 3099 death rate. And in 2021 the accident rate is 5568 and death rate is 2823. There have been 85616 accidents and 32873 deaths in 2020 due to over speed. And in 2021 the accident rate is 95785 and death rate is 40550. In this article, we design a dynamic road divider that will move according to traffic conditions. The actual-time data on traffic is aggregated using IoT in such a way that it will form a link between dividers and traffic using IR Sensors. Sometimes, the road has more traffic

in both directions and vice versa. This road divider will be helpful to reduce the traffic jam situation. When the number of vehicle is stopped for a short time, traffic occurs, and to avoid such problems, the divider will move itself according to the message or signal received from the camera vision module. In this, we will use the concept of cloud computing which will help to manage the traffic by receiving the information from the database. Two cameras will be installed on both sides of the road to directly capture images of the number of vehicles and calculate traffic density. And also, there are several issues with emergency vehicles, such as ambulances, which get caught in traffic and must wait for several minutes or hours for traffic clearance. This condition can put the patient's health at risk. Road accidents, environmental damage, and pollution brought on by this traffic congestion all have an impact on human health as well as environment. Due to delays caused by traffic congestion and uncooperative drivers, more than 20% of patients in need of emergency care have passed away while travelling to the hospital[1]. In Mumbai, there are typically 1500–2000 ambulances on the roads at any given time. A delay in receiving medical care results in almost 24,012 deaths daily and it is a result of the gridlock in big cities.[5] There are many issues that delayed the ambulance:

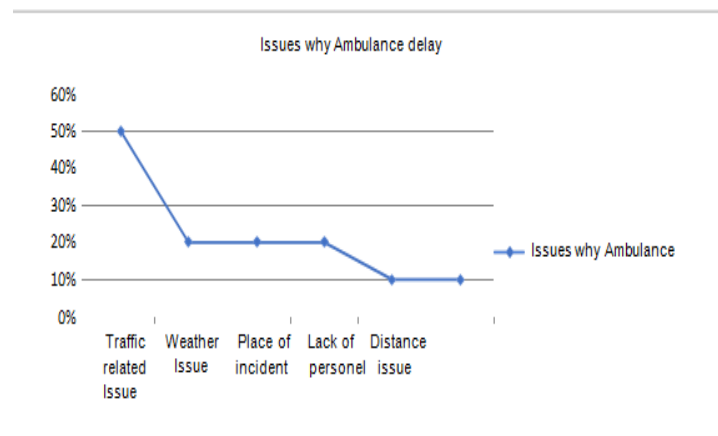


Fig. 1. Issues by ambulance delay

The 10th place on the list goes to accidents, which account for almost 4,40,042 reported instances nationwide each year, 1,39,091 of which result in fatalities. The first hour following the incident, is crucial. A delay in receiving assistance costs



many accident victims their lives. The fire department might be unable to arrive at the scene in time owing to traffic delays, or ambulances may be backed up in traffic. In this paper, we design another path for an emergency vehicle like an ambulance. In the movable road dividers, the IR sensors will be fixed, and these sensors will be helpful to recognize the characters of the ambulance. These dividers will make a different path for an ambulance. With the help of this path, the ambulance will not go through the traffic jam area. It will go through the emergency lane that was created by the smart dividers. After passing the ambulance, the dividers will return to their actual position until the next signal.

II. LITERATURE ANALYSIS

1. Hemlata Dalmia et al in 2018 presented a system for IOT-based ambulance clearance. Utilize the IR sensor to detect traffic. It explains the idea of an RFID tag. Only emergency vehicles, such as ambulances and police cars, should have this tag. Before the divider moves from its place and the ambulance arrives, the RFID tag is first scanned by the sensor, which then turns on the red light and buzzer [6].
2. M. Vardhane et al. proposed a technology for controlling real time traffic. In this ambulance only make siren when the patient in it. The detection of the ambulance is done by its siren. After that it gives the announcement to the hospital. Also use the CCTV to detect the vehicle in case when anyone vehicle will not adhere the rules [13].
3. Naveen et al. proposed a technology for controlling traffic using IoT technology. In this study, they proposed a smart application for traffic control, it will help to decrease the manual dependency & mediation to monitor the traffic [9].
4. Satya Srikanth Palle et al proposed a technology for controlling traffic by using the IoT. It uses the IR sensor for detecting the density of the traffic which move according to the volume of traffic. Unless the density of the divider is relocated to the opposite side since there is heavy traffic on one side. This paper gives the concept of controlling the traffic for metropolitan area. Using RF (Radio- frequency) module to clear traffic for ambulance is created by regulating [10].
5. Roopa ravish et al. Present a strategy for putting in place an automatic road divider system as well as several tailored solutions. This study also discusses various approaches for highly specialised contexts to construct the aforementioned system. Simulation is used to demonstrate this [11].
6. G Manasa et al. gives the concept of the micro-controller based module has been built that consists of two dividers normal and extended and an IR sensor that, in this case, measures traffic density. Traffic density is measured when the signal is red, and action should be taken before the light changes to green. When traffic is heavy, the extended divider

risers and the regular divider drops to the ground. Due to the heavy traffic, an LCD message warning of high, protracted left- or right-side traffic is displayed. The closest traffic control room is located up the partition. If traffic volume is normal, nothing is done, and the regular divider is up [8].

7. Vikram Bali et al. Proposed a system for traffic management by using IoT technology. Give the concept of RFID tag for emergency vehicle detection, which will pass the message to traffic signal light. When the message goes to traffic signal light the green light will be on. They also gives the concept of "Green Corridor" for emergency vehicle [4].

8. Kishore Kumar et al give the concept of medial strip. Use the IoT technology for clear the path for emergency vehicle and also use the Ultrasonic Sensor to detect the obstacle when the road divider are shifting from its position [7].

9. In 2021 Sonal Agrawal et al. proposed a technology on traffic controlling system and clear path for emergency vehicle using smart movable road divider. In this, the camera will detect number of vehicles at real time and store the vehicle's information over cloud. The embedded system which is a microprocessor-based computer hardware which will handle real time situation and the divider will move according to traffic. Also gives the concept of for mode of controlling the traffic. First mode contains, if the traffic congestion on right is higher than the divider will move on left side if the traffic congestion on left is higher than the divider will move on right side. If there is no traffic divider will remain fixed. In case of ambulance divider will be shift according to ambulance presence [2].

10. Sudha Arvind et al. proposed a technology for solution of traffic congestion by using IoT technology. It gives the concept of the embedded system for traffic congestion solutions, which main aims to save people time and their fuel. Use IR sensor for traffic detection and gear motor for move the road divider and buzzer for alert people. In this paper, shows how traffic will be manage using IoT and divider move automatically according to traffic congestion and make path for emergency vehicle e.g. ambulance, police cars etc [3].

III. CURRENT SYSTEM

"Barrier transfer machines, also referred to as Road zippers, commonly referred to as zipper devices vehicles formerly employed in vehicles transport concrete lane barriers similar to jersey barriers that are used to reduce rush-hour congestion in the traffic. They are momentarily employed throughout building in several alternate cities. Zipper lanes are the typical name for the machine-made lanes. Barrier systems have one benefit over other lane control techniques (such as cones and overhead directional lights) in that a strong, positive barrier avoids vehicle crashes caused by drivers crossing into the opposing direction of traffic.



IV. PROPOSED SYSTEM

Working: "The vehicle has a formed, inverted conveyor channel that the barrier segments are raised, which could weigh more than 1,000 pounds (454 kg)—off the ground and reallocating traffic lanes to make place for more traffic in the direction that is now dominating (peak) and shifts them to the opposite side of the lane. These barriers are connected to steel connections to provide a sturdy but adaptable safety barrier. One hundred feet is the required minimum distance for several barrier systems (30 meters). The length will differ based on the supported application and the amount of barrier needed to successfully deflect an errant vehicle. To boost the frictional constant, certain barrier systems incorporate four rubber feet on the rock bottom of each phase between the road surface and the portion of the barrier. A different design of the machine employs two narrower machines operating in tandem. The narrower machines are less of a hindrance to traffic in either direction, therefore they are typically used in reversible lanes (also known as control flow lanes) once the barrier is used to separate two directions of traffic.

- Road Zipper is a currently used technology for managing traffic during rush hours.
- This vehicle's Road Zipper



Fig. 2. The divider zipper machine [12]

As we see in above system there is no specific lane for the emergency vehicle. When emergency occur, the ambulance faces many problems in previous mechanism. So we propose the system in which the ambulance passes with easy way and without any delay. Our main purpose in research paper is to minimize the response time to the emergency vehicle e.g. ambulance by using IoT. The proposed system shows make the path for the emergency vehicle in traffic congestion situation.

A. Pseudo code for working process to create specific lane for ambulance

Step 1. Start

Step 2. Initialize IR sensor, ambulance, dividers, RST (Right Side Traffic), LST (Left Side Traffic)

Step 3. IR sensor detects the ambulance by its name i.e. AMBULANCE.

Step 4. If ambulance detects, message goes to dividers with the use of sensor.

Step 5. Divider automatically unlock the dividers chain.

Step 6. Dividers will separate from each other.

Step 7. Check ,if (RST>LST) then

Dividers move to left side

else if (LST>RST)

then Dividers move to right side

else

Dividers doesn't move from its position

Step 8. Emergency alert.

Step 9. Ambulance goes.

Step 10. Dividers go to its position with the use of motion sensor

Step 11. Lock the chains.

Step 12. End

The whole working process is explained in the diagram below:-

1.Start: Our system starts when extreme conditions of traffic are detected. There are two modes in our system. The first is for controlling the traffic. Another is given a path to the ambulance. We discuss how our system will provide a path for the ambulance.

2. IR sensor detection: The IR sensor detects the ambulance by its name i.e., "AMBULANCE."

3. If the ambulance is detected, then the message goes to the divider using the sensor.

4. Emergency detects: Which means that the message will be sent to the divider that if an ambulance is coming, it has to be shifted from its position.

5. Unlock the divider chains: In this step, after the emergency detection, the divider chains will be unlocked.

6. The dividers will separate from each other and stay in their own positions.

7. Check traffic condition: When the divider chains unlock, check the condition of the traffic. This means that there may be three conditions. First, the traffic may be heavier on the right side. Second, the traffic may be greater on the left side. Third, the traffic may be equal on both sides.

8. Shifting: If the traffic congestion is greater on the right side, then the even number of dividers will move from their position to the left side. If the traffic congestion is greater on the left side, then the even number of dividers will move from their position to the right side. In cases where traffic congestion is the same on both sides, the divider remains fixed.

The detailed explanation of our system is as follows:

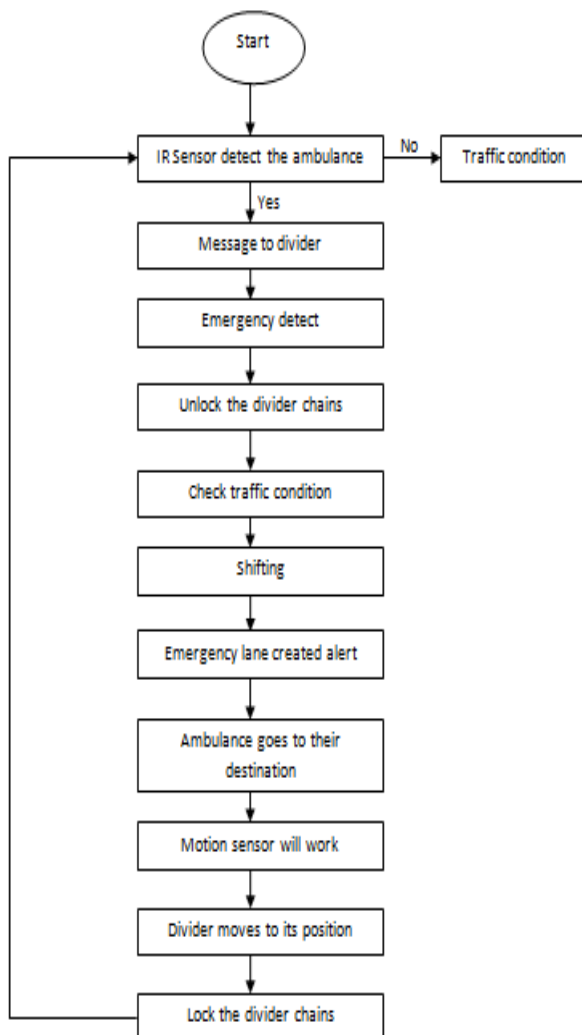


Fig. 3. Working algorithm

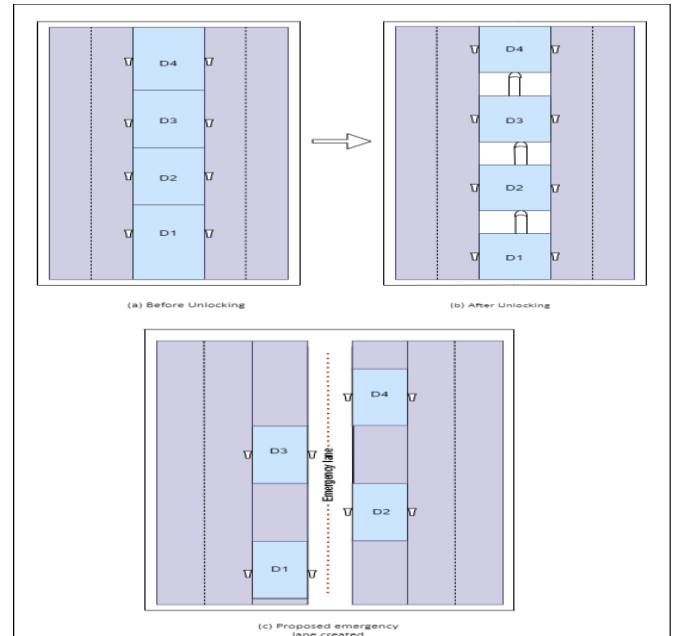


Fig. 4. Divider's shifting

9. Emergency alert: At the time of the shifting of the divider, the alert message will display.

10. Ambulance goes: On the basis of the alert message, the ambulance can go from this specific path.

11. Here motion sensors are working and this sensor control the dividers for moving to actual position.

12. Divider moves to its position: The path divider changes to its new position when an ambulance passes through.

13. Lock the chains: When the divider moves to its own position, the divider's chain locks with the dividers' chains.

B. Pseudo code for working process to traffic control:

Step 1. Start

Step 2. Initialize IR sensor, RST, LST, divider.

Step 3. If traffic exists, then divider shifts from its position according to traffic condition.

Step 4. If $RST > LST$ then
Dividers shifts on left side.

Step 5. If $LST > RST$ then
Dividers shifts on the right side.

Step 6. If $LST == RST$ then
Dividers remains fixed.

Step 7. End.

Detailed working process of the traffic condition:

As we see there are two conditions for sensor. One is YES and second is NO. Now we see the working of the NO

state. It will work for the traffic control.

1. Start
2. IR sensor detection: Firstly, IR sensor detects the traffic.
3. If there is traffic exists, then the divider will shifts from its position according to the traffic conditions.
4. There are the three mode of the traffic condition. The divider will first move to the left side of the road if there is more traffic on the right side of the street.
5. Second, the divider will move from its current position to the right side of the road if traffic congestion is worse on the left side.
6. Third, if the traffic congestion is equal on the both sides of the road, then the divider will not shifts
7. Stop

The whole working process is explained in the diagram (figure 5) below:

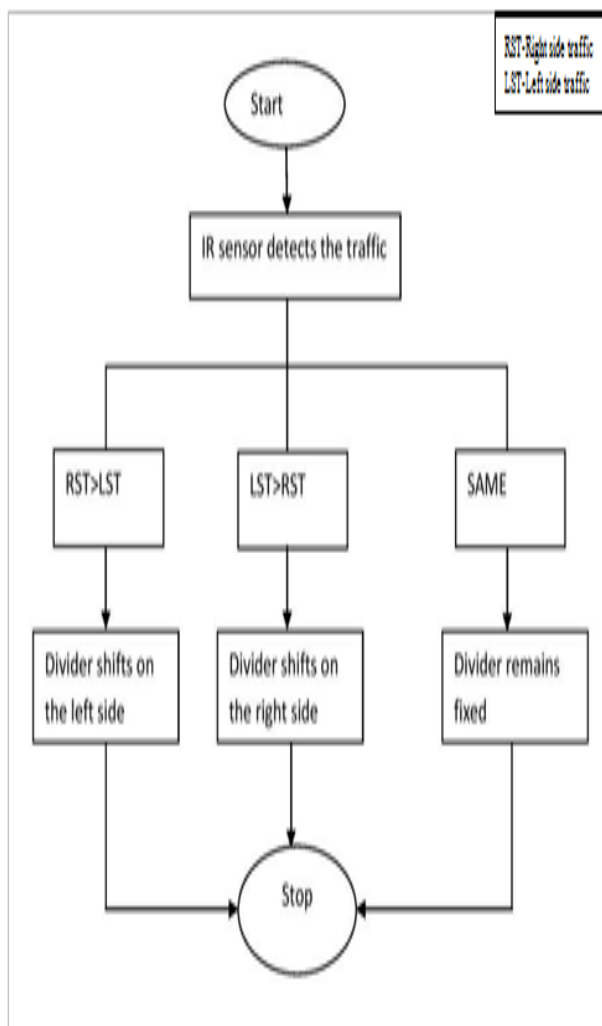


Fig. 5. Working process for traffic control

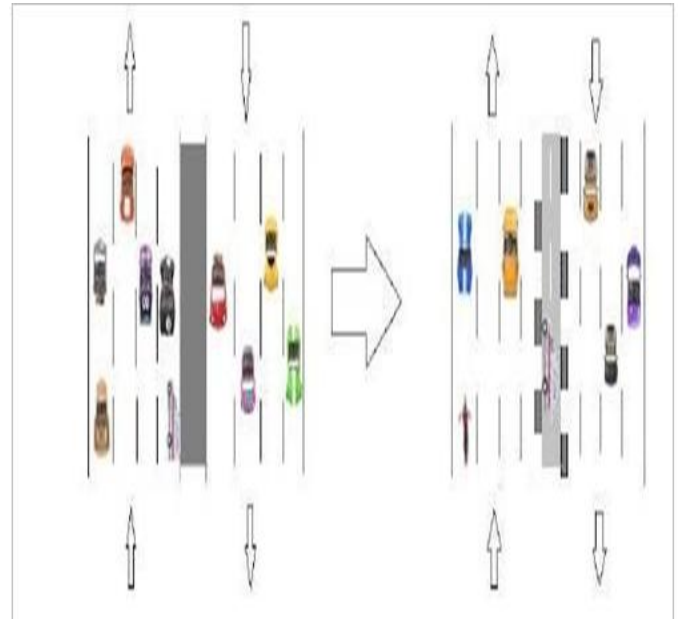


Fig. 6. Specific lane for ambulance

V. RESULT

With the help of this system, it will save time for the emergency vehicle and save patient lives. When this type of emergency was detected by the sensors, the dividers moved from their place in a smart way, as we discussed in the proposed system. And it will create a smart and specific lane for the ambulance and then the ambulance pass away from this lane when the ambulance has passed the lane, then the divider will move itself into position by using the motion control sensors (we discuss the whole working of motion sensors). When the working process of the ambulance is done, the divider smartly works on the traffic control system process and these two processes are working 24/7 in every condition.

- The main advantage of our system is that there is no need for the ambulance to wait in traffic.
- We established a system in which there is no scope for other vehicles to go from the specific lane that we created for the ambulance.
- Our system does not raise any type of barrier on the path of the ambulance, so it gets faster to the hospital, and there are many chances that we save the patient's life.
- On the other side we control the traffic of the road in a smart way.

Dividers are working in a smart way in both conditions (ambulance and traffic control) In this paper we see that one smart divider can do the different -different task simultaneously.

VI. CONCLUSION

The research mentioned above is clear evidence that it is very effective and productive for reducing traffic issues and also eliminates issues or challenges for ambulances. The planned structure helps to lessen the likelihood of traffic bottlenecks and to clear the way for an ambulance. With the suggested work, we hope to clear the traffic in accordance with traffic priority. The highest trafficked road is cleared first, followed by the creation of a special lane for ambulances. Our proposed system is better than the existing system to reduce the traffic congestion and remove the hurdles in front of the ambulance at the time of the traffic condition. In this system we use the sensor like motion control sensor and IR sensor. The smart divider is the major focus of the suggested method. The data detect in form of the alphabets is used to identify emergency vehicle. The suggested system manages traffic congestion and creates a dedicated lane for ambulances.

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