MOVABLE ROAD DIVIDER USING IoT

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Abstract: *Road 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. For example, in any city, there is industrial area or shopping area where the traffic generally flows in one direction in the morning or evening. The other side of Road divider is mostly either empty or under-utilized. This is true for peak morning and evening hours. This results in loss of time for the car owners, traffic jams as well as underutilization of available resources. This project is to formulate a mechanism of automated movable road divider that can shift lanes, so that it can have a greater 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. With the smart application proposed, it will also eliminate the dependency on manual intervention and manual traffic coordination and the smarter traffic control can be implemented all over the city. An automated movable road divider can provide a solution to the heavy traffic and also for the emergency vehicles. This is possible through IoT.*

Keywords: *Traffic Management, IoT, Road Divider.*

I. INTRODUCTION

In this 21st century, where traffic is increasing day by day especially in major cities like Hyderabad there are many difficulties which are arising while controlling traffic. There are many different situations where different strategies are applied to solve them, this project came up with a solution which solves a type of traffic issue. Now-a-days usage of private automobiles is making urban traffic more and more rush area as a result traffic control has become one of the most important problems which is resulting in vain attempt and pollution in surrounding area. Hence it has become necessary to find an effective solution for traffic control. Road divider is generally used for dividing the road for ongoing and incoming traffic. The static road divider divides the number of lanes into equal halves where the divider is fixed Whereas in this project a movable road divider which moves depending on the flow of traffic is designed. The IoT compiles the real-time data of vehicular traffic that finds out the current traffic flow conditions.

The main problem faced by the dividers is the paths of the two sides of the road is equal. As there are constrained resources and there is enormous increase in the population, the vehicles used by the public is more and high increase of cars, trucks and autos on roads. Many people face the traffic problem everyday so that they should reach their respective destinations in time. During the peak or busy hours one side of the road is unutilized and the other is full of vehicles. This problem could be rectified using this automated system and the people can reach their destinations in time and lead a comfortable and safe journey. This shows that it makes the best use of the paths which could be accessible.

The automobiles such as cars and trucks are increasing on the roads along with development of metropolitan cities over the world. Due to the misguidance of the roads, they have been magnified and the structure is similar and it could not address the difference in congestion, road accidents that square measure taking the heavy form and the unpredictable travel time delays. Traffic jam is the major concern by the cities instead of taking the measures in reduction of traffic. This concept of movable road dividers was from the 90's, the reason was that there was tie up from that period. At that amount the machine used was Zipper machine which is employed to shift the road divider from one lane to the different lane.

The implemented system is to reduce the response time to emergency vehicles, for example ambulances, fire engines etc. by providing RFID tag for these vehicles. The proposed system shows that the vehicles on the road are taken into count and depending on the intensity of traffic the divider moves. The

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information obtained are updated in website through Wi-Fi module and displayed on LCD. When an ambulance with an RFID tag passes through each monitoring station along the road, the RFID reader at those points will automatically read the tag data related to the ambulance and gives the way by moving the divider. Once system connects to the internet, all information about traffic condition on each road segment is immediately displayed in the website.

II. RELATED WORK

[1] The project is designed to develop a system which perform execution based on density of vehicles (Vehicle Count). After calculating the number of vehicles, we will come to know in which side the density is high based on which signals will be allotted for a particular side. Raspberry pi is used as a microcontroller which provides the signal timing based on the traffic density. And can provide facility to handle emergency vehicles automatically and efficiently.

[2] The paper Reducing Emergency Services Response Time in Smart Cities: An Advanced Adaptive and Fuzzy Approach was an advanced adaptive traffic control system that enables faster emergency services response in smart cities while maintaining a minimal increase in congestion level around the route of the emergency vehicle. This can be achieved with a Traffic Management System (TMS) capable of implementing changes to the road network's control and driving policies following an appropriate and well-tuned adaptation strategy. This latter is determined based on the severity of the emergency situation and current traffic conditions estimated using a fuzzy logic-based scheme. The obtained simulation results, using a set of typical road networks, have demonstrated the effectiveness of our approach in terms of the significant reduction of emergency vehicles' response time and the negligible disruption caused to the non-emergency vehicles travelling on the same road network.

[3] Incident detection involves both the collection and analysis of traffic data. In this paper, we take a look at the various traffic flow sensing technologies, and discuss the effects that the environment has on each. We provide recommendations on the selection of sensors, and propose a mix of wide-area and single lane sensors to ensure reliable performance. We touch upon the issue of sensor accuracy and identify the increased use of neural networks and fuzzy logic for incident detection.

[4] The Intelligent Traffic Signal System (ISIG) application uses both vehicle location and movement information from connected vehicles as well as infrastructure measurement of non-equipped vehicles to improve the operations of traffic signal control systems. The application utilizes the vehicle information to adjust signal timing for an intersection or group of intersections in order to improve traffic flow, including allowing platoon flow through the intersection. The application serves as an over-arching system optimization application, accommodating other mobility applications such as Transit Signal Priority, Freight Signal Priority, Emergency Vehicle Pre-emption, and Pedestrian Mobility to maximize overall arterial network performance. In addition, the application may consider additional inputs such as environmental situation information or the interface (i.e., traffic flow) between arterial signals and ramp meters.

[5] This paper uses Internet of Things(IOT) as a medium to propose a solution to the problem of accident detection and collision avoidance using present day technologies and also upcoming technologies. It also aims to reduce the traffic at toll plazas by providing an online payment facility in order to reduce day-to-day traffic. Loss of life due to road accident is a major cause of concern for any country and most of the accident happens due to negligence of the driver or driver is under the influence of the alcohol. Automation of Vehicular Systems can help to minimize the road accidents to a great extent. Using technologies like Global Positioning System(GPS),Smartphones it is easier to avoid collisions with the leader vehicles and obstacles. A car fitted with a Wi-Fi Technology and integrated with a smartphone can easily find a vacant parking lots and it can switch to auto- drive mode whenever required. An efficient fuel monitoring system can help to reduce the fuel theft and improve the performance of the vehicle. It will also be possible to detect the amount of alcohol a person is under when driving so that a car can automatically sense a danger if person has consumed more alcohol, then the permissible limits and it will refuse to start unless someone who is not under the influence of the alcohol is at the driving wheel. This paper proposes an effective system for traffic control and avoidance of car collision bringing down accident rates by a considerable amount.

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III. METHODOLOGY

The proposed system is to reduce the traffic and the response time to emergency vehicles, for e.g. ambulances, police and fire fighter's cars etc., by providing RFID tag for these vehicles. The proposed system shows that the vehicles on the road are taken in to count and depending on the intensity of traffic the divider moves. Two RFID readers are employed here for left and right. The information obtained from these readers are updated in website through Wi-Fi module and displayed on LCD. The Road Divider moves based on the intensity of the traffic (i.e. Here the count of the vehicles is considered) and also when an ambulance with an RFID tag passes through each monitoring station along the road, the RFID reader at those points will automatically read the tag data related to the ambulance and gives the way by moving the divider. Once system connects to the internet, all information about traffic condition on each road segment is immediately saved in the website created.

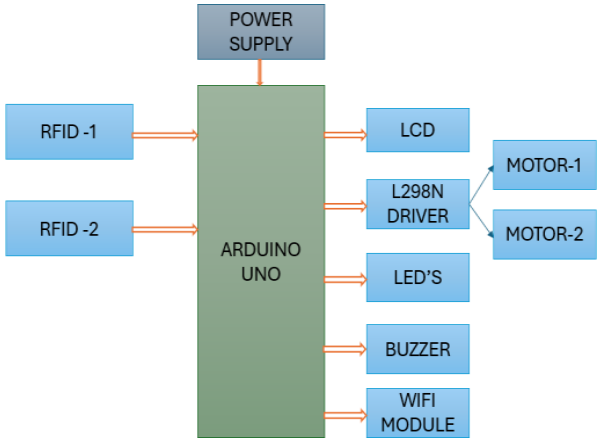

Fig 1. Block diagram of movable road divider using IoT

Arduino Mega 2560:

Arduino is a development board that integrates a microcontroller and its support circuitry with digital and analog inputs and outputs. It has an opensource computing development platform based on an environment for programs creation. The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

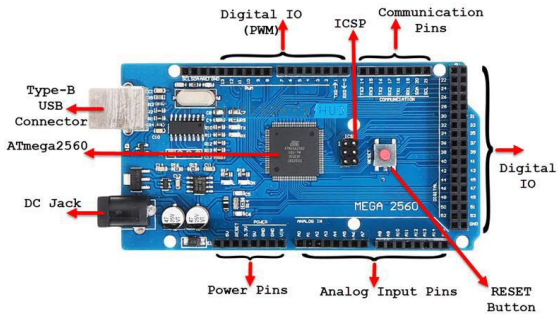

Fig 2. Arduino Mega 2560

ESP8266 Wi-Fi Module:

An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to enable the internet connection to various applications of embedded systems. Espressif systems designed the ESP8266 Wi-Fi module to support both the TCP/IP capability and the microcontroller

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access to any Wi-Fi network. It provides the solutions to meet the requirements of industries of IoT such as cost, power, performance, and design. It can work as either a slave or a standalone application. If the ESP8266 Wi-Fi runs as a slave to a microcontroller host, then it can be used as a Wi-Fi adaptor to any type of microcontroller using UART or SPI. If the module is used as a standalone application, then it provides the functions of the microcontroller and Wi-Fi network.

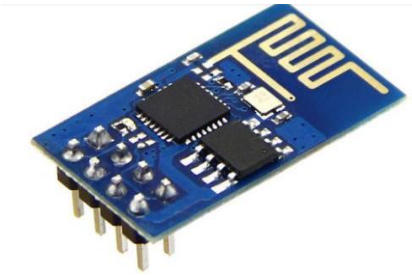

Fig 3. ESP8266 Wi-Fi Module

RFID:

Radio frequency Identification i.e. RFID is a wireless identification technology that uses radio waves to identify the presence of RFID tags. Just like Bar code reader, RFID technology is used for identification of people, object etc. presence. In barcode technology, we need to optically scan the barcode by keeping it in front of reader, whereas in RFID technology we just need to bring RFID tags in range of readers. Also, barcodes can get damaged or unreadable, which is not in the case for most of the RFID. RFID based system has two basic elements: RFID Tag and RFID Reader.

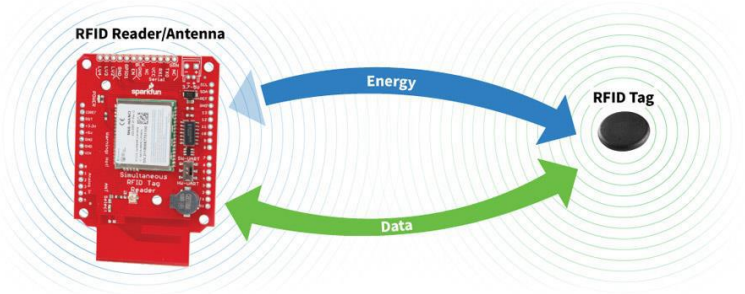

Fig 4. RFID Tag and RFID Reader

L298N Motor Driver:

A motor driver module is a simple circuit used for controlling a DC motor. It is commonly used in autonomous robots and RC cars. A motor driver module takes the low voltage input from a controller like Arduino. This input logic controls the direction of DC motors connected to the driver. To put it in simple words, you can control the direction of DC motors by giving appropriate logic to the motor driver module. The L298N motor driver is based on the H-bridge configuration (an H-bridge is a simple circuit that lets us control a DC motor to go backward or forward.), which is useful in controlling the direction of rotation of a DC motor. L298N Motor Driver module consists of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in an integrated circuit.

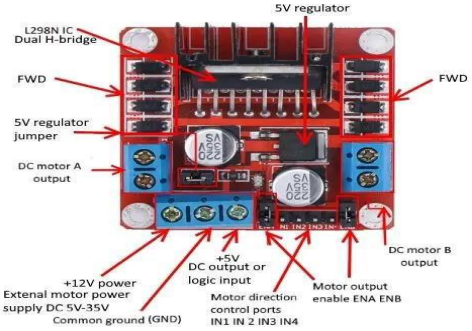

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Fig 5. L298N Motor Driver

Liquid Crystal Display:

A liquid crystal display (LCD) is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other.

Fig 6. LCD

IV. FLOWCHART

The Movable Road Divider using IoT works as mentioned in the flowchart given below.

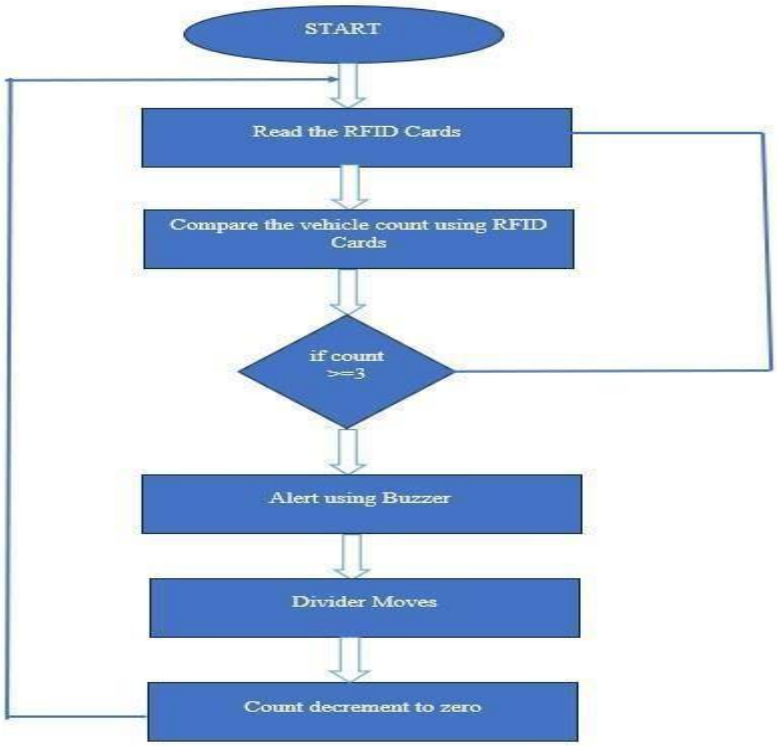

Fig 7. Flow Chart for traffic intensity

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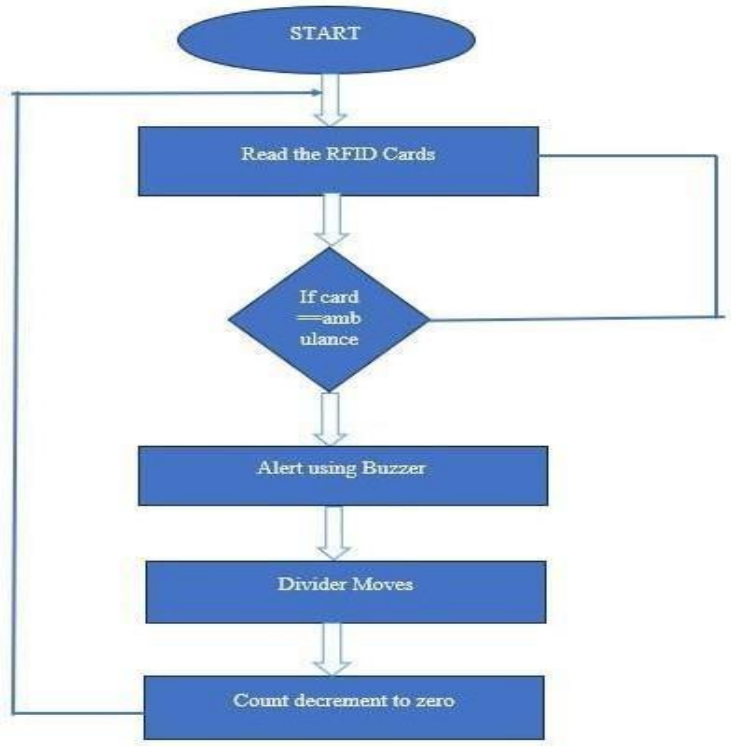

Fig 8. Flow Chart for emergency vehicle detection

V. RESULTS

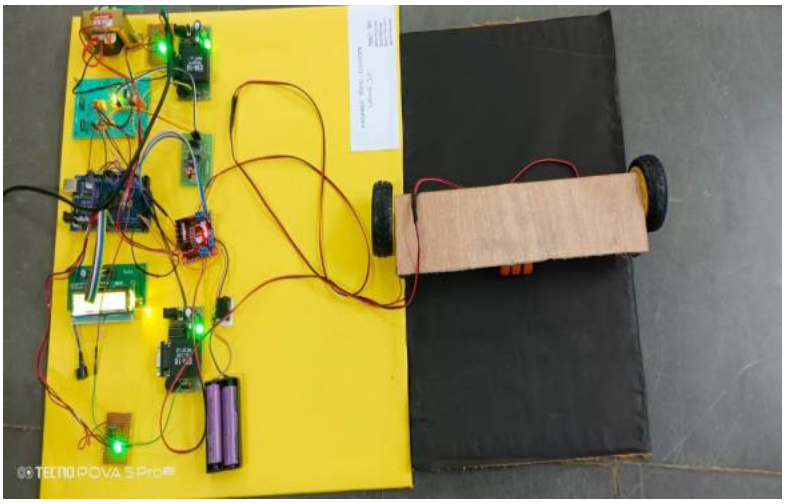

Fig 9. Movable Road Divider using IoT

When the traffic at left side of the road is high, the divider moves towards right as shown in Fig 10 and when the traffic at right side of the road is high, the divider moves towards left as shown in Fig 11.

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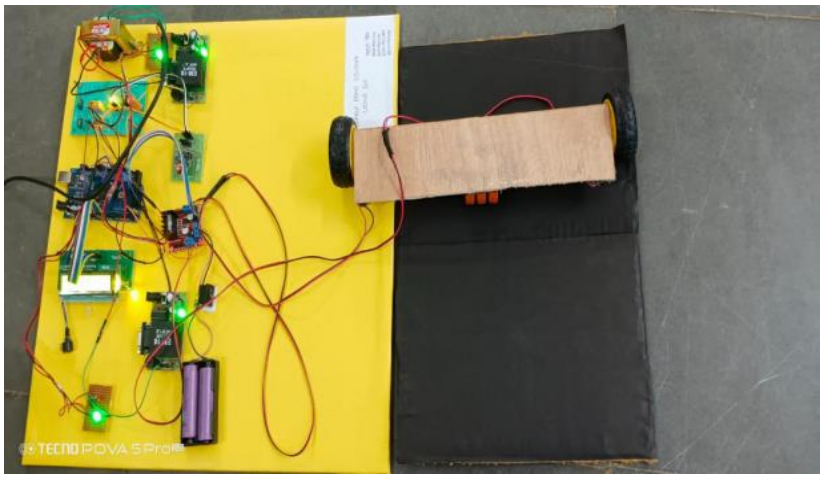

Fig 10. Divider moves towards right

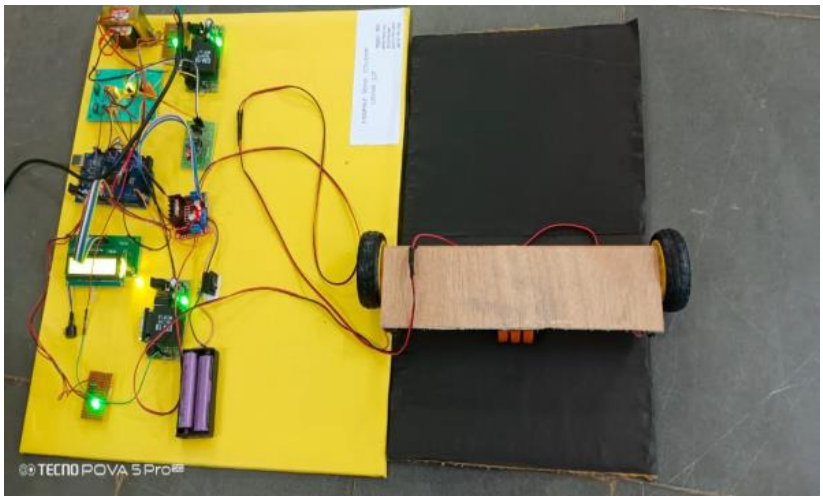

Fig 11. Divider moves towards right

The output through IoT module is shown in the Fig 7 and Fig 8. It displays the vehicle count at each side of the road (i.e. count of the vehicles at right side and count of the vehicle at left side). It also shows the side at which the emergency vehicle arrived.

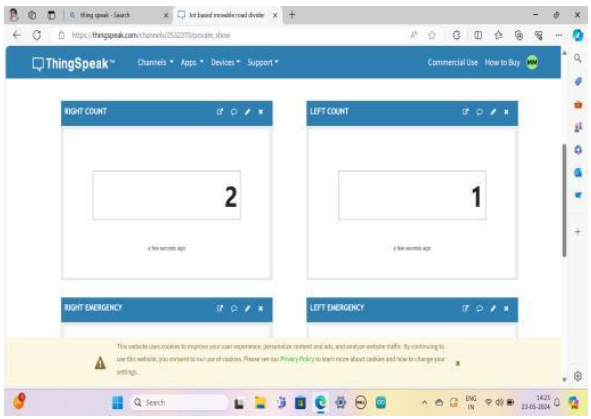

Fig 12. Vehicle count through IoT

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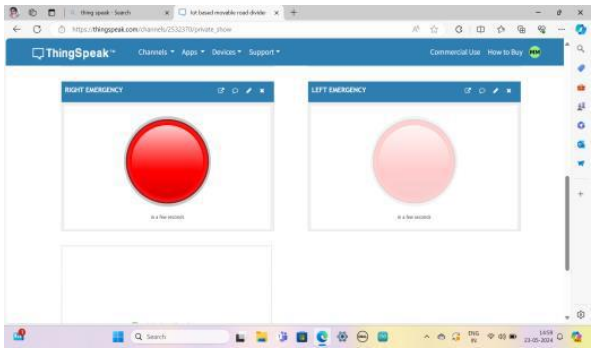

Fig 13. Emergency Vehicle

VI. CONCLUSION & FUTURE SCOPE

Many emerging countries all over the world are facing the poor traffic network. Many metropolitan cities have poor traffic networking management with most of the population and automobiles. This system is incredibly helpful compared with the existing system which could be able to facilitate the general public to travel quick in significant traffic in time. With this smarter system proposed below the manual traffic coordination is reduced and this also reduces the manual dependency.

This System also provides the solution to save the life by providing the way to the emergency vehicles. This system is to move the road divider automatically with respect to the traffics density. It uses Internet of Things as the source. In the future, we can use Convolutional Neural Network (CNN) for detecting the traffic congestion. If the architecture of CNN is robust then it can detect traffic congestion accurately.

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