MOVABLE ROAD DIVIDER FOR VEHICULAR TRAFFIC CONTROL

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ABSTRACT

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.

I. INTRODUCTION

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. 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.

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 very 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 under utilization of available resources.

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. With the smarter planet application proposed below, we will also eliminate the dependency on manual intervention and manual traffic coordination so that we can have a smarter traffic all over the city.

Objective of the project

A movable road divider is a traffic control device used to separate lanes of vehicular traffic. It is typically designed to be easily moved and repositioned as needed. Movable road dividers serve several objectives in traffic control:

Lane Management: Movable Road dividers help manage traffic flow by creating and separating lanes. They can be used to establish temporary lanes during road construction or events, or to adjust the number of lanes based on traffic conditions.

Traffic Safety: Dividers act as physical barriers, providing a clear separation between lanes. This helps prevent vehicles from merging or crossing into adjacent lanes, reducing the risk of collisions and improving overall road safety.

Traffic Guidance: Movable Road dividers are often equipped with reflective materials or signage, enhancing their visibility and providing directional guidance to drivers. They can indicate lane closures, detours, or specific traffic patterns, helping drivers navigate through complex road layouts.

Flexibility: The movable nature of these dividers allows for flexibility in traffic management.They can be easily reconfigured or relocated to adapt to changing traffic conditions, accommodate temporary roadwork, or facilitate special events.

Emergency Response: In emergency situations, movable road dividers can be used to quicklyestablish traffic diversions or create temporary lanes for emergency vehicles. They assist in maintaining order and facilitating efficient emergency response.Block Diagram
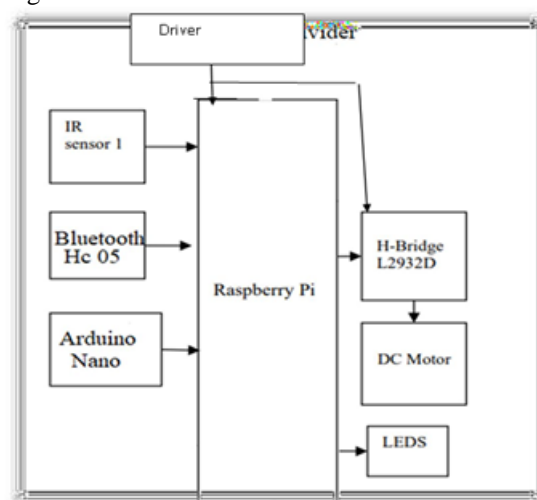

Fig 1.Block Diagram of Movable road divider

II. LITERATURE SURVEY

A study was conducted on Western express road close to Goregaon, Mumbai, in a 10-lane road

was chosen once noting the congestion points. The western express highway was so selected to understand the current traffic scenario for long distances. A survey was carried out for a span of

7.00 am to 9.00 pm, data collected from the survey was no. of vehicle passing a point, speed of vehicle and concluded by saying speed of the vehicle reduces significantly during the peak hours.

suggests an approach to reduce traffic density by making use of two dividers namely normal and extended. The author has shown the results through one way of traffic using ultrasonic sensors, but in real time traffic congestion can be in more than one direction.

A survey was conducted consisting of the traffic

volume of Wag Holi chowk in Pune- Nagar highway and shows the major traffic problem of that area.

A review was given of cost efficiency in implementing movable dividers. The cost of congestion was marked based on fuel burned productive loss by including working hours of a person, the opportunity loss pollution and human loss occurred annually by showing the data of year 2018. An algorithm was developed for function of IoT Traffic Signaling System based on Traffic Density

but the drawback here was traffic density information was not secured while transmitting the information for controlling the traffic signal.

has a proposal that uses an IoT based approach to analyze the traffic density in a particular lane. The images are captured using the traditional camera and are analyzed using a cloud-based approach. The model was implemented using this approach uses raspberry pi and servo motors however the practicality of this approach is a serious concern due to the cost of its implementation.

suggested using a smart temporary divider which will curl in and out of the road. This approach uses RFID based ambulance detection and after being identified clears the lanes for an emergency vehicle. This approach seems to be more appealing due to its practical applications. But implementing this is very difficult.

III. DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

RASPBERRY PI

Raspberry Pi, developed by Raspberry Pi Foundation in association with Broadcom, is a series of small single-board computers and perhaps the most inspiring computer available today.

Raspberry Pi Pico W is a new Raspberry Pi product that adds Wi-Fi capability to the Raspberry Pi Pico, allowing you to connect the device to a Wi-Fi network. In this guide, you will learn how to use a Raspberry Pi Pico W, how to connect it to a Wi-Fi network, and then how to turn it into a web server to control digital outputs from a browser, and to receive sensor data.

Raspberry Pi Pico W offers 2.4GHz 802.11 b/g/n wireless LAN support, with an on-board antenna, and modular compliance certification. It is able to operate in both station and access-point modes. Full access to network functionality is available to both C and Micro Python developers. Raspberry Pi Pico W pairs RP2040 with 2MB of flash memory, and a power supply chip supporting input voltages from 1.8–5.5V. It provides 26 GPIO pins, three of which can function as analogue inputs, on 0.1"-.
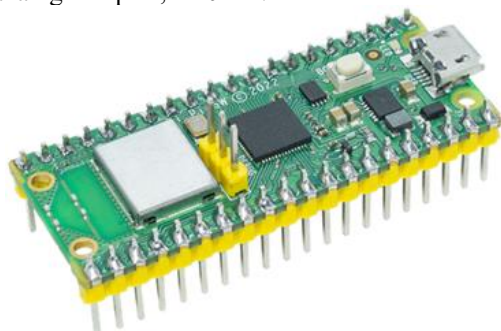
POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".
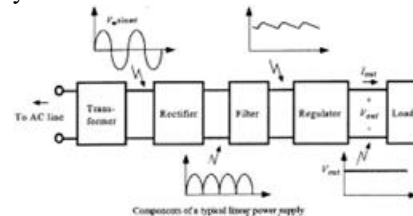

Fig: 2.Block Diagram of Power Supply

LCD DISPLAY

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.
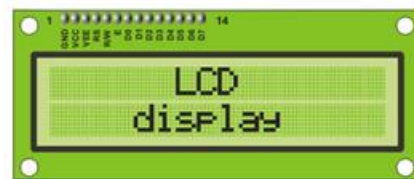

Fig:3. LCD

BUZZER

Digital systems and microcontroller pins lack sufficient current to drive the circuits like relays, buzzer circuits etc. While these circuits require around 10milli amps to be operated, the microcontroller's pin can provide a maximum of 1-2milli amps current. For this reason, a driver such as a power transistor is placed in between the microcontroller and the buzzer circuit.
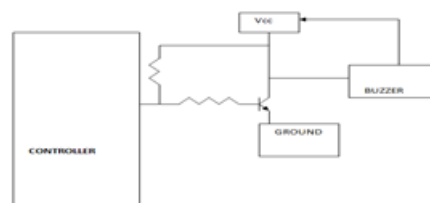
LED:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated.[5] When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than

1 mm^2) and integrated optical components may be used to shape the radiation pattern.

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays and were commonly seen in digital clocks. Recent developments have produced LEDs suitable for environmental and task lighting. LEDs have led to new displays and sensors, while their high switching rates are useful in advanced communications technology.

LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, and lighted wallpaper. They are also significantly more energy efficient and, arguably, have fewer environmental concerns linked to their disposal.

L293D:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

DC MOTOR

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.
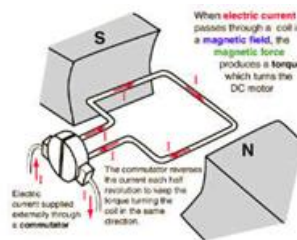
IR SENSOR

Infrared is a energy radiation with a frequency below our eyes sensitivity, so we cannot see it Even that we can not "see" sound frequencies, we know that it exist, we can listen them.

Even that we can not see or hear infrared, we can feel it at our skin temperature sensors. When you approach your hand to fire or warm element, you will "feel" the heat, but you can't see it. You can see the fire because it emits other types of radiation, visible to your eyes, but it also emits lots of infrared that you can only feel in your skin.

INFRARED IN ELECTRONICS

Infra-Red is interesting, because it is easily generated and doesn't suffer electromagnetic interference, so it is nicely used to communication and control, but it is not perfect, some other light emissions could contains infrared as well, and that can interfere in this communication. The sun is an example, since it emits a wide spectrum or radiation.

The adventure of using lots of infra-red in TV/VCR remote controls and other applications, brought infra-red diodes (emitter and receivers) at very low cost at the market.

Bluetooth

This project work consists of two main modules: the android mobile phone and the Arduino BT board (Bluetooth module). The android mobile phone consists of several Bluetooth apps which enables the user to access the petrol bunk pumping motor. In this project we are targeting Android platform since it has huge market and open source. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android OS is based on Linux. Android Applications are made in a Java-like language running on a virtual machine called 'Dalvik' created by Google. The Android SDK provides the toolsand APIs necessary to begin developing applications on the Android platform using the Java programming language. Accessory mode is a feature of Android OS since version 2.3.4 Gingerbread and 3.1 Honeycomb and above.

The application consists of main function of drawing fuel from the petrol bunk by activating the pumping motor through the Bluetooth interface. In addition a feedback message is also received by the android mobile about the balance of thefuel present in the user account. This is just like a prepaid phenomenon. The sameinformation is also displayed in the LCD that is interfaced with the controller.

Fig 4.Bluetooth module BC417
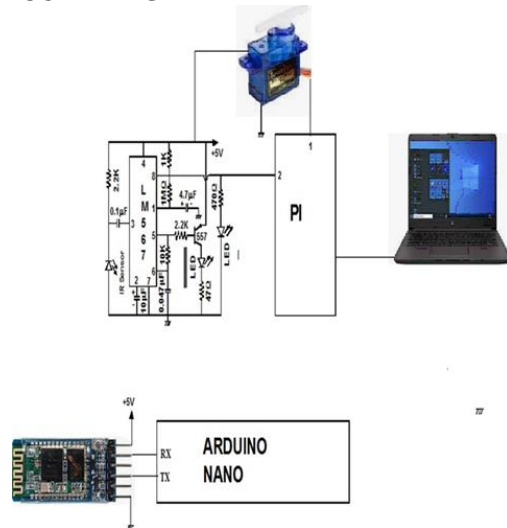
IV. RESULTS
CIRCUIT DIAGRAM

Fig 5. Circuit Diagram

V. RESULTS

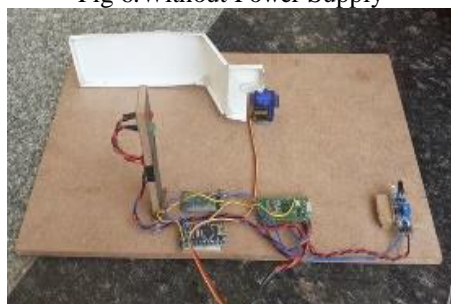Fig 6.Without Power Supply

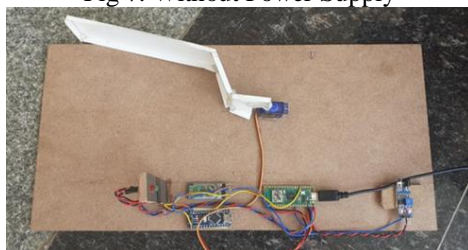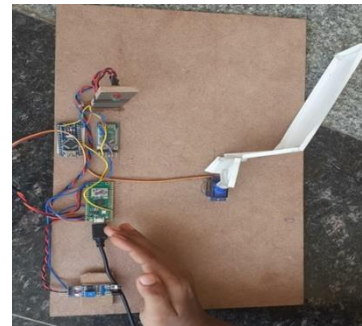Fig 7. Without Power Supply

Fig 8. With Power Supply

Fig 9 With Power Supply

ADVANTAGES

Movable road dividers for vehicular traffic control offer several advantages. Here are some of the key benefits:

Flexibility: Movable road dividers can be easily repositioned or relocated to adapt to changing traffic conditions. This flexibility allows for efficient traffic management during construction, events, or emergencies. Lanes can be created, adjusted, or closed as needed, providing maximum control over traffic flow.

Enhanced Safety: These dividers act as physical barriers, creating a clear separation between lanes. This helps prevent vehicles from merging or crossing into adjacent lanes, reducing the risk of collisions. By improving lane discipline, they contribute to overall road safety and reduce the likelihood of accidents.

Quick Deployment: Movable road dividers can be deployed relatively quickly compared to permanent infrastructure. This makes them particularly useful in situations requiring temporary traffic control, such as road maintenance, work zones, or special events. They allow for rapid adjustments to traffic patterns without the need for extensive construction or road closures.

Improved Traffic Flow: By effectively managing lane assignments, movable road dividers optimize traffic flow. They help reduce congestion and improve traffic efficiency by creating designated lanes, accommodating different traffic volumes, and guiding drivers through complex road layouts. This can result in smoother travel experiences and reduced travel times.

Cost-Effectiveness: Compared to permanent infrastructure, movable road dividers offer a cost-effective solution for traffic control. They can be easily transported, installed, and removed, eliminating the need for extensive construction or costly modifications to the road. Their versatility and reusability make them a more economical choice for temporary traffic management needs.

Increased Visibility and Guidance: Movable road dividers are often equipped with reflective materials or signage, enhancing their visibility and providing clear guidance to drivers. This helps ensure drivers are aware of lane closures, detours, or specific traffic patterns, promoting safer and more efficient navigation.

Emergency Response Support: In emergency situations, movable road dividers play a crucial role in establishing traffic diversions and creating temporary lanes for emergency vehicles. They assist in maintaining order and facilitating efficient emergency response, allowing emergency personnel to reach their destinations more effectively.

It's important to note that while movable road dividers offer numerous advantages, their proper usage and adherence to local regulations are essential for maximizing their benefits and ensuring safe traffic control.

DISADVANTAGES

While movable road dividers have several advantages in vehicular traffic control, they also have some disadvantages to consider:

Limited Physical Barrier: Movable road dividers, compared to permanent barriers such as concrete barriers, may provide a lesser degree of physical separation. This can potentially lead to a higher risk of vehicles crossing over or breaching the divider, especially in high-speed or heavy-traffic situations.

Vulnerability to Impact: Movable road dividers are typically designed to absorb some impact force in the event of a collision. However, they may still be susceptible to damage or displacement if struck by a vehicle, particularly if the impact is significant. This can result in the need for repairs or replacement, causing potential disruptions and additional maintenance costs.

Reduced Stability: Compared to permanent barriers, movable road dividers may have less stability due to their design and construction. Factors such as wind, uneven ground surfaces, or improper placement can affect their stability, potentially leading to unintended movement or collapse.

Maintenance and Inspection: Movable road dividers require regular maintenance and inspection to ensure their effectiveness and safety. This includes checking for any damage, ensuring proper alignment, and replacing any worn-out or malfunctioning parts. Regular maintenance efforts can be time-consuming and resource-intensive.

Limited Durability: Depending on the type of movable road divider used, their durability may be lower compared to permanent barriers. Factors such as exposure to weather conditions, UV radiation, and frequent relocation can contribute to wear and tear, reducing the lifespan of the dividers and requiring more frequent replacements.

Reliance on Human Intervention: Proper deployment and positioning of movable road dividers rely on human intervention. Errors in placement or inadequate training of personnel involved in their setup can lead to incorrect configuration, potentially compromising traffic control objectives and safety.

Cost Considerations: Movable road dividers, especially those with advanced features like retractable barriers or electronic signage, can be more expensive to procure and maintain compared to traditional permanent barriers. The costs associated with their deployment, maintenance, and repair should be considered in the overall budget for traffic control measures.

It's important to assess these disadvantages along with the advantages when deciding whether to use movable road dividers for vehicular traffic control. The specific context, traffic conditions, and available resources should be considered to determine the most appropriate traffic control measures for a given situation.

APPLICATIONS

Movable road dividers have various applications in vehicular traffic control. Some of the common applications include:

Construction Zones: Movable road dividers are often used in construction zones to create a physical barrier between the work area and the flowing traffic. They help protect workers and prevent vehicles from entering restricted areas.

Temporary Lane Separation: These dividers are useful for temporarily creating or adjusting lanes during road repairs, maintenance, or special events. They can establish temporary lanes or divert traffic to accommodate the ongoing work or event.

Traffic Calming Measures: Movable road dividers can be employed as part of traffic calming measures in areas where speed reduction or lane narrowing is necessary. They help in slowing down traffic and improving safety for pedestrians and cyclists.

Emergency Traffic Control: During emergencies or accidents, movable road dividers are deployed to create temporary lanes or detours for emergency vehicles. They assist in maintaining order and ensuring efficient movement of emergency response teams.

Toll Booths and Checkpoints: Dividers are often used at toll booths or checkpoints to guide vehicles into designated lanes. They facilitate smooth flow and orderly collection of tolls or checkpoints.

Event Management: Movable road dividers are crucial for managing traffic during large events or gatherings. They can be used to create specific traffic patterns, control entry or exit points, and direct vehicles to designated parking areas.

School Zones and Pedestrian Safety: Dividers are employed in school zones and areas with high pedestrian activity to create safer pathways for pedestrians and separate them from vehicular traffic.

Traffic Diversions and Detours: In situations where a regular route is closed or under repair, movable road dividers are utilized to establish temporary diversions or detour routes, ensuring a smooth flow of traffic.

Work Zone Safety: Movable road dividers play a vital role in improving work zone safety by providing physical separation between traffic and workers. They help minimize the risk of accidents and injuries.

Lane Reversals: In certain traffic scenarios, such as rush hour congestion or events with one-way traffic flow, movable road dividers can be used to create temporary reversible lanes, optimizing traffic capacity.

These are just a few examples of the applications of movable road dividers in vehicular traffic control. Their versatility and adaptability make them valuable tools for traffic management in various situations.

VI. CONCLUSION & FUTURE SCOPE
CONCLUSION

In conclusion, movable road dividers are valuable tools for vehicular traffic control. They serve multiple objectives, including lane management, traffic safety, traffic guidance, flexibility, and emergency response. By creating a physical barrier between lanes, they help prevent collisions and provide clear separation for traffic flow. Movable road dividers can be easily reconfigured and relocated, making them adaptable to changing traffic conditions or temporary roadwork. They can also be equipped with reflective materials or signage for enhanced visibility and guidance to drivers. However, it is important to follow local

regulations and guidelines for theirappropriate use and maintenance. Overall, movable road dividers play a significant role in improving traffic control and safety on the roads.

FUTURE SCOPE

Future Scope Points for Movable Road Dividers in Vehicular Traffic Control:

Intelligent and Adaptive Dividers: Develop movable road dividers equipped with sensors and smart technology to gather real-time data on traffic conditions. These dividers can automatically adjust their position and configuration based on traffic flow, optimizing traffic control and minimizing human intervention.

Communication and Integration: Explore the integration of movable road dividers with traffic management systems and smart city infrastructure. This would allow for better coordination and communication between dividers, traffic lights, and other traffic control devices, enabling dynamic traffic control based on real-time data.

Energy Efficiency: Investigate the use of sustainable and energy-efficient materials in the construction of movable road dividers. This can include lightweight materials, solar-powered lighting for enhanced visibility, and environmentally friendly manufacturing processes.

Automated Deployment and Retrieval: Develop automated systems for deploying and retrieving movable road dividers. This could involve robotic or mechanical devices that can quickly and efficiently position and remove the dividers, reducing the need for manual labor andincreasing operational efficiency.

Enhanced Safety Features: Continuously improve the safety features of movable road dividers. This may include incorporating crash-absorbing materials, implementing active warning systems, or integrating advanced vehicle detection technology to alert drivers ofapproaching dividers.

Advanced Data Analysis: Utilize advanced data analytics techniques to analyze the data collected from movable road dividers. This can provide valuable insights into traffic patterns, congestion hotspots, and potential areas for improvement in traffic control strategies.

Modular and Customizable Designs: Design movable road dividers with modular components that can be easily reconfigured and customized for different traffic scenarios. This would provide flexibility in adapting to various road layouts and traffic conditions.

Autonomous Vehicle Integration: Consider the impact of autonomous vehicles on traffic control and how movable road dividers can interact with these vehicles. Research and develop dividers that can communicate with autonomous vehicles to optimize traffic flow and ensure safenavigation.

User-Friendly Interfaces: Improve the user interface and controls for movable road dividers, making them more intuitive and user-friendly for traffic control personnel. This can include touchscreens, mobile applications, or remote control capabilities.

Collaborative Traffic Control: Explore the potential for cooperative traffic control systems that involve collaboration between multiple movable road dividers. This can enable coordinated actions, such as synchronized lane changes or adaptive lane widths, to improve overall traffic flow efficiency.

These future scope points aim to enhance the functionality, efficiency, and safety of movable road dividers in vehicular traffic control. As technology and transportation systems continue to advance, these developments can contribute to more effective traffic management and improvedoverall road infrastructure.

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