DYNAMIC ROAD DIVIDER FOR ENHANCED VEHICULAR TRAFFIC MANAGEMENT

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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.

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I. INTRODUCTION

RoadDividerisgenericallyusedfordividingtheRoad forongoingandincomingtraffic.Thishelps keeping the flow of traffic; generally there is equal number of lanes for both ongoing andincoming traffic. The problem with Static Road Dividers is that the number of lanes on eithersideoftheroadisfixed.Sincetheresourcesare limitedandpopulationaswellasnumberofcarsper family is increasing, there is significant increase in number of cars on roads. This calls forbetterutilization ofexisting resources likenumber of lanes available.

For example, in any city, there is industrial area or shopping area where the trafficgenerally flows in one direction in the morning or evening. The other side of Road divider is mostly eithe r empty or very underutilized. This is true for peak morning and eveninghours.Thisresults in loss of time for the car owners, traffic jams as well as under utilization of availableresources.

Our aim is to formulate a mechanism of automated road divider that can shift lanes, sothatwecanhavenumber oflanesinthedirectionofthe rush.Thecumulativeimpactofthetimeand fuel that can be saved by adding even one extra lane to the direction of the rush will besignificant. With the smarter planet application proposed below, we will also eliminate thedependencyonmanualinterventionandmanua ltrafficcoordinationsothatwecanhaveasmartertra fficall over thecity.

Objectiveofthe project

Amovableroaddividerisatrafficcontroldeviceused toseparatelanesof vehiculartraffic.It istypically 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 orevents,or to adjust the numberof lanes based ontraffic

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 ofcollisionsand improvingoverall road safety.

Traffic Guidance: Movable Road dividers are often equipped with reflective materials orsignage, enhancing their visibility and providing directional guidance to drivers. They canindicate lane closures, detours, or specific traffic patterns, helping drivers navigate throughcomplexroad layouts.

Flexibility:Themovablenatureofthesedividersallo wsforflexibilityintrafficmanagement.Theycanbee asilyreconfiguredorrelocatedtoadapttochangingt rafficconditions,accommodatetemporaryroadwo rk, or facilitatespecial events.

EmergencyResponse:Inemergencysituations,mo vableroaddividerscanbeusedtoquicklyestablish traffic diversions or create temporary lanes for emergency vehicles. They assist inmaintainingorder and facilitating efficient emergency response.BlockDiagram

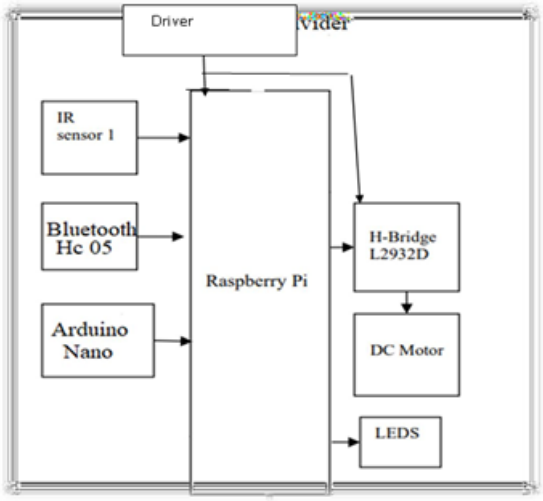


Fig1.Block Diagramof Movableroad divider

II. LITERATURESURVEY

AstudywasconductedonWesternexpressroadclos etoGoregaon,Mumbai,ina10-laneroad was chosen once noting the congestion points. The western express highway was so selected tounderstandthe current trafficscenariofor longdistances.Asurveywascarried outfor aspanof 7.00 am to 9.00 pm, data collected from the survey was no. of vehicle passing a point, speed ofvehicleandconcludedbysayingspeedofthevehicl ereducessignificantlyduringthepeakhours. suggestsanapproachtoreducetrafficdensitybyma kinguseoftwodividersnamelynormalandextende d. The author has shown the results through one way of traffic using ultrasonic sensors,butin real timetrafficcongestion can bein morethan onedirection.

A survey was conducted consisting of the traffic volume of Wag Holichowk in Pune-Nagarhighwayand shows themajortrafficproblem ofthat area.

Areviewwasgivenofcostefficiencyinimplementing movabledividers.Thecostofcongestionwas marked based on fuel burned productive loss by including working hours of a person, theopportunity 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 TrafficDensity but the drawback here was traffic density information was not secured while transmitting theinformationforcontrolling 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-basedapproach. The model was implemented using this approach uses raspberry pi and servo motorshoweverthepracticalityofthisapproachisa seriousconcernduetothecostofitsimplementatio n.

suggested using a smart temporary divider which will curl in and out of the road. This approachusesRFIDbasedambulancedetectionand afterbeingidentifiedclearsthelanesforanemergen cyvehicle.Thisapproachseemstobemoreappealin gduetoitspracticalapplications.Butimplementingt his is verydifficult.

III. DESIGN OF HARDWARE

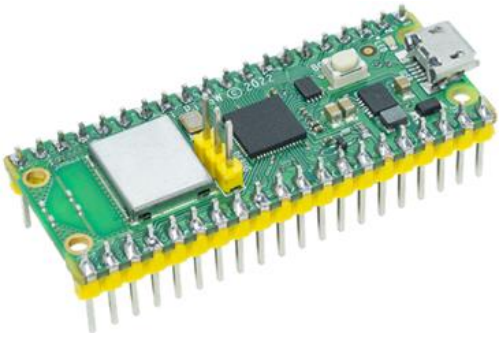
This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

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”.

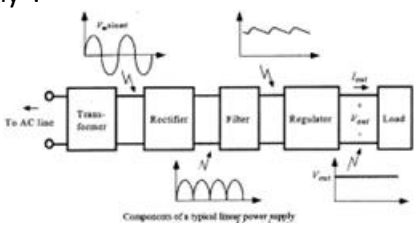


Fig: 2.Block Diagram of Power Supply

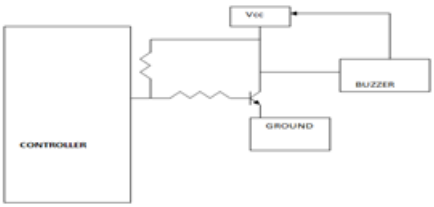
LCD DISPLAY

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.

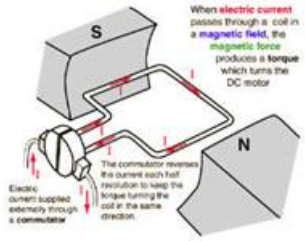
LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are used in applications as diverse as aviation lighting, automotive headlamps, advertising, general 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 phoneand the Arduino BTboard (Bluetoothmodule) .The android mobile phone consistsofseveralBluetoothappswhichenablesthe usertoaccessthepetrolbunkpumpingmotor. In this project we are targeting Android platform since it has huge marketand open source. Android is a software stack for mobile devices that includes anoperating system, middleware and key applications. The Android OS is based onLinux.AndroidApplicationsaremadeinaJava-likelanguagerunningonavirtualmachine called 'Dalvik' created by Google. The Android SDK provides the toolsand APIs necessary to begin developing applications on the Android platformusingtheJavaprogramminglanguage.AccessorymodeisafeatureofAndroidOSsinceversion 2.3.4 Gingerbreadand 3.1Honeycomb and above.

The application consists of main function of drawing fuel from the petrol bunk by activating the pumping motor through the Bluetooth interface.

Inadditionafeedbackmessageisalsoreceivedbythe androidmobileaboutthebalanceofthefuelpresent intheuseraccount.Thisisjustlikeaprepaidphenomenon.Thesameinformationisalso displayedin theLCD thatis interfacedwith the controller.

Fig4.BluetoothmoduleBC417

IV. RESULTS CIRCUITDIAGRAM

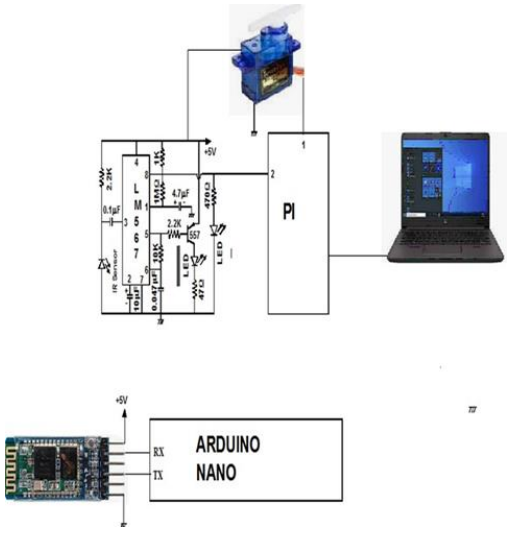


Fig5.CircuitDiagram

V. RESULTS

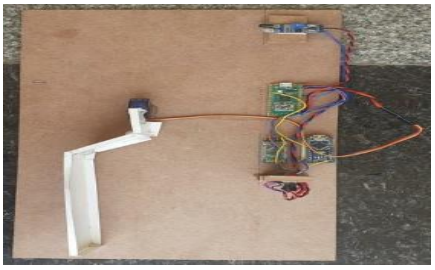


Fig6.WithoutPowerSupply

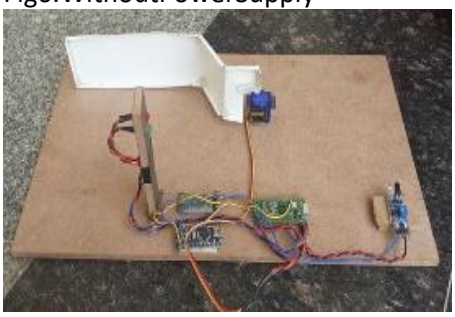


Fig7.WithoutPowerSupply

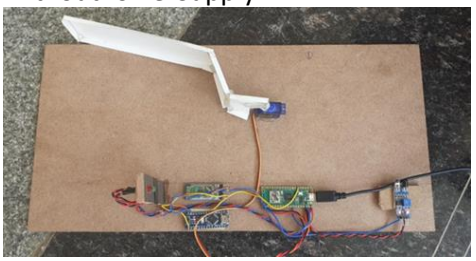


Fig8.WithPowerSupply

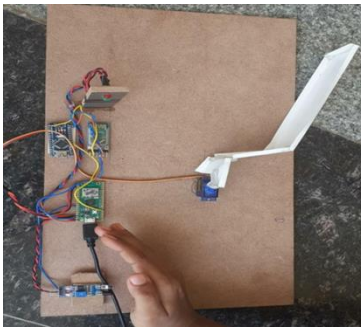


Fig9WithPowerSupply

ADVANTAGES

Movableroaddividersforvehiculartrafficcontrolofferseveraladvantages.Herearesomeofthekey benefits:

Flexibility:Movableroaddividerscanbeeasilyrepositionedorrelocatedtoadapttochangingtraffic conditions. This flexibility allows for efficient traffic management during construction,events,oremergencies.Lanescanbecreated,adjusted,orclosedasneeded,providingmaximumcontrolover trafficflow.

EnhancedSafety:Thesedividersactasphysicalbarriers,creatingaclearseparationbetweenlanes.Thishelpspreventvehiclesfrommergingorcrossingintoadjacentlanes,reducingtheriskof collisions. By improving lane discipline, they contribute to overall road safety and reduce thelikelihoodofaccidents.

Quick Deployment: Movable road dividers can be deployed relatively quickly compared topermanent infrastructure. This makes them particularly useful in situations requiring temporarytraffic control, such as road maintenance, work zones, or special events. They allow for rapidadjustmentstotraffic patternswithouttheneedforextensiveconstructionorroad closures.

Improved Traffic Flow: By effectively managing lane assignments, movable road dividersoptimize traffic flow. They help reduce congestion and improve traffic efficiency by creatingdesignatedlanes,accommodatingdifferenttrafficvolumes,andguidingdriversthroughcomplexroadlayouts. Thiscan result insmoothertravel experiencesand reduced traveltimes.

Cost-Effectiveness: Compared to permanent infrastructure, movable road dividers offer acost-effectivesolutionfortrafficcontrol.Theycanbeeasilytransported,installed,andremoved,eliminatingthe needfor extensiveconstructionorcostlymodificationstotheroad.Theirversatilityandreusabilitymakethemamoreeconomicalchoicefortemporarytrafficmanagementneeds.

IncreasedVisibilityandGuidance:Movableroaddividersareoftenequippedwithreflectivematerialsorsignage,enhancingtheirvisibilityandprovidingclearguidancetodrivers.Thishelpsensure drivers are aware of lane closures, detours, or specific traffic patterns, promoting saferandmoreefficient navigation.

EmergencyResponseSupport:Inemergencysituations,movableroaddividersplayacrucialroleinestablishingtrafficdiversionsandcreatingtemporarylanesforemergencyvehicles.Theyassist in maintaining order and facilitating efficient emergency response, allowing emergencypersonnelto reach theirdestinations moreeffectively.

It's important to note that while movable road dividers offer numerous advantages, their properusageandadherencetolocalregulationsare essentialformaximizingtheirbenefitsandensuring safetrafficcontrol.

DISADVANTAGES

Whilemovableroaddividershaveseveraladvantagesinvehiculartrafficcontrol,theyalsohavesomedisadvantages to consider:

Limited Physical Barrier: Movable road dividers, compared to permanent barriers such asconcrete barriers, may provide a lesser degree of physical separation. This can potentially leadto a higher risk of vehicles crossing over or breaching the divider, especially in high-speed orheavy-trafficsituations.

VulnerabilitytoImpact:Movableroaddividersaretypicallydesignedtoabsorbsomeimpactforceintheeventofacollision.However,theymaystillbesusceptibletodamageordisplacementifstruckbyavehicle, particularlyiftheimpactissignificant.Thiscanresultintheneedforrepairsorreplacement,causingpotentialdisruptionsandadditionalmaintenancecosts.

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

unintended movement orcollapse.

MaintenanceandInspection:Movableroaddividersrequireregularmaintenanceandinspection to ensure their effectiveness and safety. This includes checking for any damage,ensuringproperalignment,andreplacinganyworn-outormalfunctioningparts.Regularmaintenance efforts canbetime-consuming andresource-intensive.

Limited Durability: Depending on the type of movable road divider used, their durabilitymay 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 ofthedividers and requiring morefrequent replacements.

Reliance on Human Intervention: Proper deployment and positioning of movable roaddividers rely on human intervention. Errors in placement or inadequate training of personnelinvolved in their setup can lead to incorrect configuration, potentially compromising trafficcontrolobjectives and safety.

Cost Considerations: Movable road dividers, especially those with advanced features likeretractable barriersor electronic signage,canbe more expensivetoprocure andmaintaincomparedtotraditionalpermanentbarriers.Thecostsassociatedwiththeirdeployment, maintenance, andrepairshouldbeconsideredintheoverallbudget fortrafficcontrolmeasures.

It'simportanttoassessthesedisadvantagesalongwiththeadvantageswhendecidingwhethertouse movable road dividers for vehicular traffic control. The specific context, traffic conditions,and available resources should be considered to determine the most appropriate traffic controlmeasuresfor agiven situation.

APPLICATIONS

Movableroaddividershavevariousapplicationsinvehiculartrafficcontrol.Someofthecommonapplications include:

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

TemporaryLaneSeparation:Thesedividersareusefulfortemporarilycreatingoradjustinglanes during road repairs, maintenance, or special events. They can establish temporary lanes ordiverttrafficto accommodate theongoing work or event.

TrafficCalmingMeasures:Movableroaddividerscanbeemployedaspartoftrafficcalmingmeasures in areas where speed reduction or lane narrowing is necessary. They help in slowingdowntrafficand improving safety forpedestrians and cyclists.

Emergency Traffic Control: During emergencies or accidents, movable road dividers aredeployedtocreatetemporarylanesordetoursforemergencyvehicles.Theyassistinmaintainingorderandensuring efficient movement ofemergency response teams.

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

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

School Zones and Pedestrian Safety: Dividers are employed in school zones and areas withhighpedestrianactivitytocreatesaferpathwaysforpedestriansandseparatethemfromvehiculartraffic.

TrafficDiversionsandDetours:Insituationswherearegularrouteisclosedorunderrepair,movable road dividers are utilized to establish temporary diversions or detour routes, ensuring asmoothflow oftraffic.

WorkZoneSafety:Movableroaddividersplayavitalroleinimprovingworkzonesafetybyproviding physical separation between traffic and workers. They help minimize the risk ofaccidentsand injuries.

LaneReversals:Incertaintrafficscenarios,suchasrushhourcongestionoreventswithone-way traffic flow, movable road dividers can be used to create temporary reversible lanes,optimizingtraffic capacity.

These are just a few examples of the

applications of movable road dividers in vehicular trafficcontrol. Their versatility and adaptability make them valuable tools for traffic management invarious situations.

VI. CONCLUSION&FUTURESCOPE

CONCLUSION

In conclusion, movable road dividers are valuable tools for vehicular traffic control. They servemultiple objectives, including lane management, traffic safety, traffic guidance, flexibility, andemergency response. By creating a physical barrier between lanes, they help prevent collisionsand provide clear separation for traffic flow. Movable road dividers can be easily reconfiguredand relocated, making them adaptable to changing traffic conditions or temporary roadwork.They can also be equipped with reflective materials or signage for enhanced visibility andguidance 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 inimprovingtraffic controland safetyon the roads.

FUTURESCOPE

FutureScopePoints forMovable RoadDividers inVehicular TrafficControl:

Intelligent and Adaptive Dividers: Develop movable road dividers equipped with sensorsandsmarttechnologytogatherreal-timedataontrafficconditions.Thesedividerscanautomatically adjust their position and configuration based on traffic flow, optimizing trafficcontrolandminimizing human intervention.

Communication and Integration: Explore the integration of movable road dividers withtrafficmanagementsystemsandsmartcityinfrastructure.Thiswouldallowforbettercoordination andcommunicationbetweendividers,trafficlights, andothertrafficcontroldevices,enabling dynamictrafficcontrol basedonreal-time data.

Energy Efficiency: Investigate the use of sustainable and energy-efficient materials in theconstruction of movable road dividers. This can include lightweight materials, solar-poweredlightingfor enhancedvisibility, andenvironmentally friendlymanufacturing processes.

Automated Deployment and Retrieval: Develop automated systems for deploying andretrieving movable road dividers. This could involve robotic or mechanical devices that canquicklyandefficientlypositionandremovethedividers,reducingtheneedformanuallaborandincreasingoperational efficiency.

Enhanced Safety Features: Continuously improve the safety features of movable roaddividers.Thismayincludeincorporatingcrash-absorbingmaterials,implementingactivewarningsystems,orintegratingadvancedvehicledetectiontechnologytoalertdriversofapproachingdividers.

Advanced Data Analysis: Utilize advanced data analytics techniques to analyze the datacollected from movable road dividers. This can provide valuable insights into traffic patterns,congestionhotspots,and potentialareasforimprovement intrafficcontrolstrategies.

ModularandCustomizableDesigns:Designmovableroaddividerswithmodularcomponents that can be easily reconfigured and customized for different traffic scenarios. Thiswouldprovide flexibility in adaptingto various road layouts andtrafficconditions.

Autonomous Vehicle Integration: Consider the impact of autonomous vehicles on trafficcontrol and how movable road dividers can interact with these vehicles. Research and developdividersthatcancommunicatewithautonomousvehiclestooptimizetrafficflowandensuresafenavigation.

User-FriendlyInterfaces:Improvetheuserinterfaceandcontrolsformovableroaddividers,making them more intuitive and user-friendly for traffic control personnel. This can includetouchscreens,mobileapplications, or remotecontrolcapabilities.

CollaborativeTrafficControl:Explorethepotentialforcooperativetrafficcontrolsystemsthatinvolvecollaborationbetweenmultiplemovableroaddividers. Thiscanenable coordinated actions, such as synchronized lane changes or adaptive lane widths, to improve overall trafficflowefficiency.

These future scope points aim to enhance the functionality, efficiency, and safety of movableroad dividers in vehicular traffic control. As technology and transportation systems continue

toadvance,thesedevelopmentscancontributetomoreeffectivetrafficmanagementandimprovedoverall road infrastructure.

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