TRAFFICLIGHTCONTROLSYSTEM USINGARDUINOMEGA2560

THE REPORT OF PROJECT SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENTFORTHEDEGREEOF

BACHELOR OF TECHNOLOGY In
ELECTRICALENGINEERING

By

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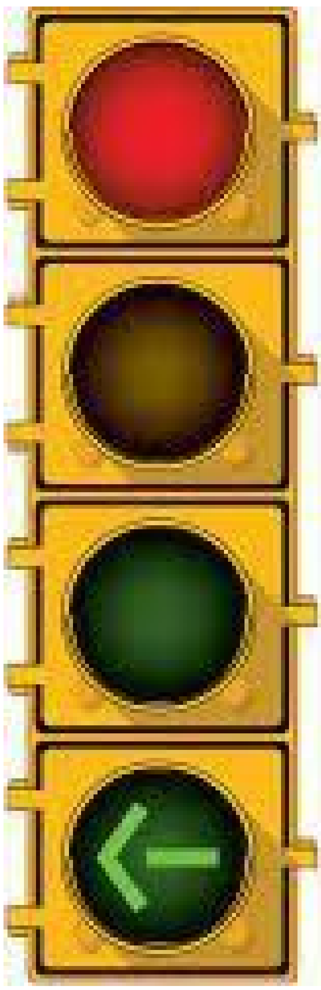

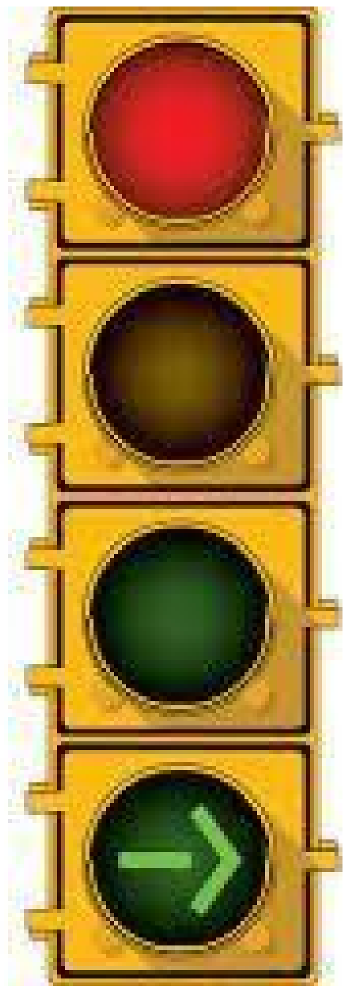

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CERTIFICATE

ThereportoftheProjecttitledDesignanddevelopmentof4waytrafficlightcontroller using arduino mega2560submittedby………………

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ABSTRACT

Traffic congestion is one of the major problems in India. In our daily life we are spending toomanytimesunderthetrafficsignal.Itiscreatedanunnecessarythinginpeople'sdaytodaylife. Sometimestrafficsignalsaredon'tproperlycheck theroadandthesignalsareworkingwithsometimeconstrains.To reduce these problems, we are implementing the automatic density-based traffic lightcontrol using ARDUINO and IR sensors with spike protection. ARDUINO is one of themicrocontrollers which is used to check the traffic lanesand activate the traffic signals.IR sensorswhich are placed in the side of the roads are sense the density of vehicles and send the data to thesignals then Arduino will make decisions on the signals. From that we will reduce the waitingtime inthe signals. Bluetooth Module is used for allowing the emergency vehicles in the first priority byusing the mobile application controlled by the ambulance driver. The spike protection willautomatically enable when the traffic lights are goes into the red signal. It helps to unwanted trafficcongestion.

In our country, many peoples are using roadway transportation. In morning and evening timeeveryofficeworkers,studentsandpeoplesarestuckinheavytrafficandtheyhavelotsofstressduringth etraffic.Fromourproject,we reducethetrafficcongestion,savetimeandreducethestresslevel.
Now we are living in advanced scientific world and we are having lots of work and need more timesto do that works. By wasting time in traffic signals we are unable to finish our works on time.definitely our project will be very helpful forthose peoples who are have many works in their dailylife.HereweareusingtheArduinomega2560fortheoverallcontrolsystem.Fromthatwecanmakema nydevelopments in this project. By proceeding the Arduino program, we make differentoperationsinourproject.WhenIRsensorssensesthevehiclesdensityoneachlane thencalculate andcompare the density of the lanes. At the end of this process, the automatic traffic light signal canautomaticallyworkon theheavytraffic lane.

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Keywords: ***Trafficlight,Arduinomega 2560.***

1. INTRODUCTION

In today's high-speed life, traffic congestion becomes a significant issue inour day-to-day activities. Itbrings down the productivity of individual and thereby the society as voluminous work hour iswasted inside the signals. Highvolume of vehicles, the inadequate infrastructure and so the irrationaldistribution of the signalling system unit main reasons for these congestions.we have togetherpresented our idea by designing the density-based traffic light control using Arduino mega 2560, IR.Sensors for traffic light control and emergency, RF transmitter and receiver for automobile detectionand servo motor for spike protection. Our project aims reducing traffic congestion and unwantedterribly while waiting in the signals. it's designed to be enforced in places nearing the junctionswherever the traffic signals area unit placed, so asto scale back the congestion in these junctions. Itkeepsatrackofthevehiclesineveryroadand consequentlyadjuststhetimeforeverylightsignals.

2. LITERATURESURVEY

Gustav Nilsson _ Giacomo Como focused on a class of dynamic feedback traffic signal control policiesthat are based on a generalized proportional allocation rule. There results in a differential inclusionforwhichthereproveexistenceand,inthespecialcaseoforthogonalphases,uniquenessofcontinu ous solutionsvia ageneralization ofthe reflectionprinciple. Stabilityis thenprovedbyinterpretingthe generalized proportional allocation controllers as minimizes of a certain entropy-likefunction thatis thenusedasa Lyapunovfunction fortheclosed-loop system.

Junchen Jin and Xiaoliang Ma proposed a group-based signal control approach capable of makingdecisionsbasedonitsunderstandingoftrafficconditionsattheintersectionlevel.Thecontrolproble m is formulated using a framework of stochastic optimal control for multi-agent system inwhich each signal group is modeled as an intelligent agent. The proposed system is designated to becompatiblewiththeprevailingsignalsystem.Theparameterswereoff-lineoptimizedusingageneticalgorithm.Simulationresultsshownthattheproposedadaptivegroup-basedcontrolsystemoutperformstheoptimizedGBVAcontrolsystemmainlybecauseofthat'sreal-timeadaptivelearningcapacityin responsetothe changesin traffic demand.

Nasser R. Sabar et al controlled the movement of traffic on urban streets by determined theappropriate signal timing settings. Proposed algorithm was based on the so-called memeticalgorithm that combines the strengths of the genetic algorithm and local search in an adaptivemanner. Inthatusedtwo importanttechniquesfor improvingthe performanceoftraditionalmemeticalgorithms.First, asystematic neighborhood based simple descent algorithm wasemployed as a local search to effectively exploit the search space. Second, an indicator scheme wasproposed to control the local search application based on the quality and diversity of the searchprocess. The proposed algorithm was coded inthe commercial microscopictraffic simulator,AIMSUN, andtested ontwo difference realworldcase studies inBrisbane,Australia,and Plock,Poland. Theresults demonstratedthat theproposed algorithmwas betterthangeneticalgorithmsandfixed-time settings, indicated that the proposed algorithm was an effective solutionmethodfortraffic signaloptimization problems.

Huajun Chai et alcaptured the interaction between travellers' route choice and traffic signal controlin a coherent framework. They tested their algorithmand controlstrategy by simulationinOmNet++(Anetworkcommunicationsimulator)andSUMO(Simulation ofUrban Mobility) under several scenarios. The simulation results shown that with the proposed dynamicrouting, the overall travel cost significantly decreases.Itwas alsoshownthattheproposedadaptivesignalcontrol reducedtheaverage delayeffectively,as wellas reducedthefluctuationof theaveragespeedwithin the wholenetwork.

EkinhanEriskinetal[3]suggestedanewmethodfordesigningtrafficsignaltimingat oversaturatedintersectionswasexpressed"theeliminationpairingsystem".Anobjectfunctionwithvehicl edelayandstop-startnumbershas beengenerated.Totalcostvalue hasbeencalculated according to the object function. Obtained results were compared with Webster as atraditional traffic signal timing design method and Transyt 14 signal timing software. While Webstergivesexaggeratedresults, Transyt14andEliminationPairingSystemsprovidedbetterresults.

3. ProblemAnalysis

In this section, we classify the ITSCP according to its various characteristics. Due to thehighly stochastic nature of the ITSCP, problem complexity is a crucial consideration. Thecomplexity of the ITSCP depends on various factors such as the number and shapes of theintersections and the types of vehicles in the network, as well as the real-time strategiesused(ifany).:

1. **Network type: isolated intersection, arterial network, or general network :-** AsdiscussedinSection 2, weclassifiedthe networktypes evaluatedin ITSCPresearchintoisolated intersections, arterial networks, and general networks. Computational complexityincreases dramaticallyasthenumberoflanes and intersectionsincrease, oras theintersections are connected in more complex structures. Earlier research therefore coveredonlyITSCPsat anisolated intersection.For example,DunneandPottssolvedtheITSCPfor anisolatedintersectionwitha maximumoftwolanes oneachleg.Afterwards,thenetwork scopeexpandedtoincludeisolatedintersectionswithmultiplelanesineachdirection and various shapes such as T-junctions . Similarly, arterial networks with multiplelanes were studied in detail after Gazis first discussed a 1 × 2 arterial network consisting oftwosequential intersections.Finally,Wongexploredageneralnetwork

   As computer hardware and software simulation tools have developed, the computationallyaffordable network size has increased. Recently, some papers have succeeded in applyingalgorithms toreal-worldnetworks suchas a9 × 7gridofintersections inOttawa,Canadaandageneralnetworkcontaining50intersectionsinTehrancity.Nonetheless,theITSCPis still being actively researched for isolated intersections or small arterial networks. Jin andMaandLietal.solvedtheITSCP foranisolatedintersection and1 × 3arterialnetworkmodel, respectively.Thenetworksevaluated inbothpapersconsideredcontainedintersections withonlyone or twolanesoneachleg.Suchsmall networksare still beingactively researchedbecause ofthedevelopment ofconnectedvehiclesandnewsolutionmethods. For example, Christofa et al. proposed a person-based optimization approach onarterial network by considering passenger occupancy of vehicles explicitly in a connectedvehicleenvironment.Whenthe passenger occupanciesofvehicles are consideredasdecision variables,thenumberofconstraintsandvariablesincreases with thenumber ofvehicles in the system, necessitating a small network. Additionally, as new solution methodsaredeveloped,

2. **Type ofroadusersandpriorityconsideration:-**Inthisreview,weassumedthatthetraffic on theroadsconsistsofpassengercars,pedestrians,transitvehicles andtheirpassengers, emergency vehicles, motorcycles, HGVs, LGVs, and bicycles for the ITSCP.Becauseitisdifficultto takealltraffic typesintoconsideration, mostresearchershavelimitedthetypeoftrafficmodes tospecific categories.Alargenumber ofpapershaveconsidered only one type of passenger car without pedestrians. Improta and Cantarellafirstexpanded thetypeofroadusers consideredto includepedestrians inadditionto asingletype ofpassenger car.Pedestrians areaccountedforintheITSCPinterms ofthe minimumgreenlighttimerequired for themtocross theroad. Somepapers dealing withphysicalqueuelengthsorthe occupancyofthenetworkhaveaccounted forvarious typesofpassengercars,andChandanetal.consideredvarious types ofpassenger carsas well asHGVs to more precisely estimate emissions. Recently, studies considering bicycles havebeen conductedas thenumberofintersections withdedicatedbicycle lanes increases to

accommodate the growing number of cyclists . Portilla et al. proposed separate vehicle andbicycle models for the ITSCP to reflect the ability of bicycles to be accommodated in smallerspacesaswellasthesimplerdescription ofthedynamicbehaviorofbicycles.

Transitvehiclehavebeenconsideredimportantroadusers inthe ITSCPsinceSalterandShahidemonstratedthatgiving priorityto buses reducedbusdelayatthe costofincreasingpassenger car delay.Subsequentresearcheffortshavebeen dedicatedtofindingmoreadvanced transit signal priority logic considering the performance indices of the vehicles inthenetwork. Ekeila etal.proposedanalgorithm tominimizethedelayoftransitvehicleswhile preventing negative impacts on street traffic. Christofa et al.approached the problemfromthe perspectiveoftheindividual,especiallythedriversofpassengercars andpassengers oftransit vehicles. Heetal. gavepriority notonlytotransit vehicles, butalsotoemergencyvehicles.Withthe adventofconnectedvehicles,it isnowpossibletoobtainadditional informationaboutthenetworkstateandvehicleoperations.Usingvehicle-to-infrastructure communication systems, the traffic signal control system can receive requestsfromappropriatelyequippedvehiclesandpedestrianstogenerateanoptimizedsignaltiming planthataccommodatesall oftheactiverequests. As communicationtechnologycontinues torapidlydevelop,moreresearchintosolvingtheITSCP withpriorityconsiderationisexpected.

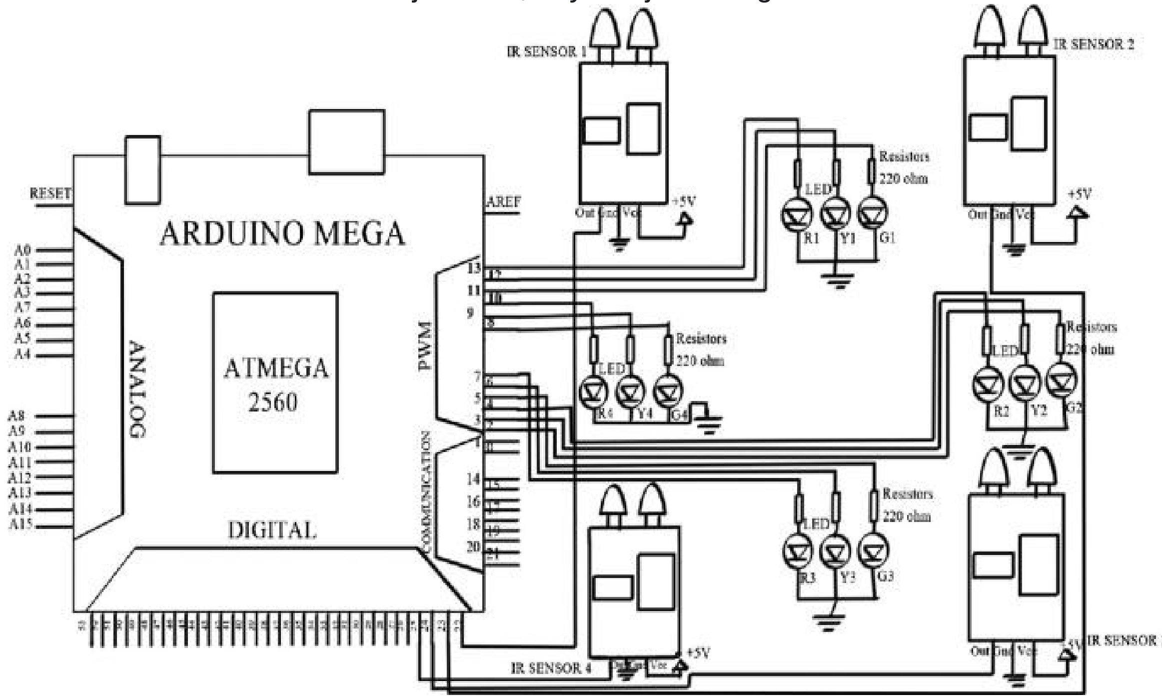
3. **Real-time strategies: fixed-time, actuated, or adaptive :-**Three major traffic controlstrategiescan be used whensolvinganITSCP: fixed-time, actuated, and adaptive. Thefixed-time strategy establishes optimal signal plans for fixed signal phase sequences with afixedtime durationforeachphase. Adopting thefixed-timedstrategy assumesthat trafficdemand remains similar at all times to calculate the optimal signal plans based on historicaltraffic information. Gazis and Smith used the fixed-time strategy for a 1 × 2 arterial networkand anisolatedintersection,respectively.

Theactuatedstrategycollectsreal-timedatafrominfrastructure-basedsensorsandappliesasimplelogiccriterionsuchasgreenlightextension,gapout,ormaxout. Greenlightextensionprolongsthegreenphase basedontrafficflowrate.Gap out terminatesaphasewhenthetimeintervalbetweenconsecutiveactivationsofavehicledetectorexceedsanestablishedthreshold.Maxoutterminatesthegreenphasewhenitexceedsthe established maximum green phase duration. Since Dunne and Potts first adopted theactuated strategy of green light extension assuming a constant arrival rate per experiment,actuated strategieshavebeenconsistently appliedinresearch

4. FORMULATION/ALGORITHM

Theory/BlockDiagram/CircuitDiagrams,Model/Figures&ImagesofPrototypes

traffic lightcontrolsystemswork by**adaptingtheirtimingtocurrenttraffic conditions**.Theyusea detector,whichcan communicate withthetraffic light control systemtoletthemknowabout current traffic.Whenanintersectionisjammed,they'll adjusttiming tolettrafficflow better.



(a) Blockdiagramofoverallsystem

5. PROBLEMDISCUSSION

In this section, we classify the ITSCP according to its various characteristics. Due to thehighly stochastic nature of the ITSCP, problem complexity is a crucial consideration. Thecomplexity of the ITSCP depends on various factors such as the number and shapes of theintersections and the types of vehicles in the network, as well as the real-time strategiesused(ifany).

1. **Networktype:isolatedintersection,articlenetwork,orgeneralnetwork:**Asdiscussed in Section 2, we classified the network types evaluated in ITSCP research intoisolatedintersections,arterialnetworks,andgeneralnetworks.Computationalcomplexity increases dramatically as the number of lanes and intersections increase, orastheintersectionsareconnectedinmorecomplexstructures.Earlierresearchtherefore covered only ITSCPs at an isolated intersection. For example, Dunne and Pottssolved the ITSCP for an isolated intersection with a maximum of two lanes on each leg.Afterwards, the network scope expanded to include isolated intersections with multiplelanesineachdirectionandvariousshapessuchasT-junctions.Similarly,arterialnetworks with multiple lanes were studied in detail after Gazisfirst discussed a 1 × 2arterial network consisting of two sequential intersections. Finally, Wongexplored ageneralnetworkcontaining15intersectionswithone ortwolaneson eachleg. Ascomputerhardwareandsoftwaresimulationtoolshavedeveloped,thecomputationallyaffordablenetworksizehasincreased.Recently,somepapershavesucceededinapplyingalgorithms toreal-worldnetworkssuchasa9 × 7gridofintersections in Ottawa, Canada and a general network containing 50 intersections inTehrancity.Nonetheless,theITSCPisstillbeingactivelyresearchedforisolatedintersections or small arterial networks. Jin and Maand Li et al.solved the ITSCP for anisolatedintersectionand 1 × 3arterialnetworkmodel,respectively.Thenetworksevaluated in both papers considered contained intersections with only one or two lanesoneach leg.Suchsmallnetworksarestill beingactively researched becauseof thedevelopment of connected vehicles and new solution methods. For example, Christofa etal.proposed a person-based optimization approach on arterial network by consideringpassenger occupancy of vehiclesexplicitly ina connected vehicleenvironment.Whenthe passenger occupancies of vehicles are considered as decision variables, the numberofconstraintsandvariablesincreaseswiththenumberofvehiclesinthesystem,necessitating a small network. Additionally, as new solution methods are developed,theyare typicallyfirstvalidatedusingasmall network.
2. **Types of road users and priority consideration :**In this review, we assumed that thetraffic on the roads consists of passenger cars, pedestrians, transit vehicles and theirpassengers, emergency vehicles, motorcycles, HGVs, LGVs, and bicycles for the ITSCP.Because it is difficult to take all traffic types into consideration, most researchers havelimited the type of traffic modes to specific categories. A large number of papers haveconsidered only one type of passenger car without pedestrians. Improta and Cantarellafirst expanded the type of road users considered to include pedestrians in addition to asingle type of passenger car. Pedestrians are accounted for in the ITSCP in terms of theminimumgreenlighttimerequiredforthemtocrosstheroad.Somepapersdealingwith physical queue lengths or the occupancy of the network have accounted for varioustypes of passenger cars , and Chandan et al.considered various types of passenger carsas well as HGVs to more precisely estimate emissions. Recently, studies

consideringbicycles have been conducted as the number of intersections with dedicated bicyclelanes increases to accommodate the growing number of cyclists . Portilla et al.proposedseparatevehicleandbicyclemodelsfortheITSCPtoreflecttheabilityofbicyclesto be accommodatedinsmallerspacesaswellas thesimplerdescriptionofthedynamic behaviorofbicycles.

Transit vehicle have been considered important road users in the ITSCP since Salter andShahidemonstratedthatgivingprioritytobusesreducedbusdelayatthecostofincreasing passenger car delay. Subsequent research efforts have been dedicated tofinding more advanced transit signal priority logic considering the performance indicesof the vehicles in the network. Ekeila et al. proposed an algorithm to minimize the delayof transit vehicles while preventing negative impacts on street traffic. Christofa et al.approached the problem from the perspective of the individual, especially the drivers ofpassenger cars and passengers of transit vehicles. He et al.gave priority not only totransit vehicles, but also to emergency vehicles. With the advent of connected vehicles, itis now possible to obtain additional information about the network state and vehicleoperations . Using vehicle-to-infrastructure communication systems, the traffic signalcontrolsystemcanreceiverequestsfromappropriatelyequippedvehiclesandpedestri ans to generate an optimized signal timing plan that accommodates all of theactiverequests.Ascommunicationtechnologycontinuestorapidlydevelop,moreresearc hinto solvingthe ITSCPwithpriorityconsiderationis expected.

3. **Real-timestrategies:fixed-time,actuated,oradaptive:**Threemajortrafficcontrol strategies can be used when solving an ITSCP: fixed-time, actuated, and adaptive . Thefixed-time strategy establishes optimalsignal plansfor fixed signal phasesequenceswith a fixed time duration for each phase. Adopting the fixed-timed strategy assumesthat traffic demand remains similar at all times to calculate the optimal signal plansbased on historical traffic information. Gazisand Smithused the fixed-time strategy fora 1×2 arterial networkandan isolatedintersection,respectively.

Theactuatedstrategycollectsreal-timedatafrominfrastructure-basedsensorsandapplies a simple logic criterion such as green light extension, gap out, or max out. Greenlight extension prolongs the green phase based on traffic flow rate. Gap out terminates aphasewhenthetime intervalbetweenconsecutiveactivationsof a vehicledetectorexceeds an established threshold. Max out terminates the green phase when it exceedsthe established maximum green phase duration. Since Dunne and Potts first adopted theactuatedstrategyofgreenlightextensionassumingaconstantarrivalrateperexperiment, actuatedstrategies havebeenconsistentlyappliedin research.

6. IMPLEMENTATIONDETAILS

TECHNOLOGIESANDMETHODOLOGIESUSEDINTRAFFICLIGHTCONTROLSYSTEM

Traffic signal controllers are electronic devices located at intersections that control the sequence ofthe lights. Along with computers, communications equipment, and detectors to count and measuretraffic, the controllers are frequently grouped together to control large numbers of traffic signals,either at intersections in a city or on ramps approaching expressways and motorways. While thedetailed brand and type of equipment vary greatly, the functions performed by the systems aregenerallyconsistent.

There are four basic elements in a computerized traffic control system: computer(s),communicationsdevices,trafficsignals andassociatedequipment,anddetectorsfor sensingvehicles. Traffic flow information is picked up by the detectors from the roadway and transmitted tothe computer system for processing. The detectors are normally embedded in or suspended abovethe roadway. Vehicle counts and speeds are typically measured; vehicle type (*e.g.,* auto or truck) alsomay be obtained. The computer processes the traffic flow data to determine the proper sequence forthe lights at the intersections or ramps. The sequencing information is transmitted from thecomputer through communications equipment to the signals. In order to assure safe and properoperation,informationisalso transmittedfromthe trafficsignals to the computer,confirmingproper operation. Humans can interact with the system by accessing the computer system in someway.

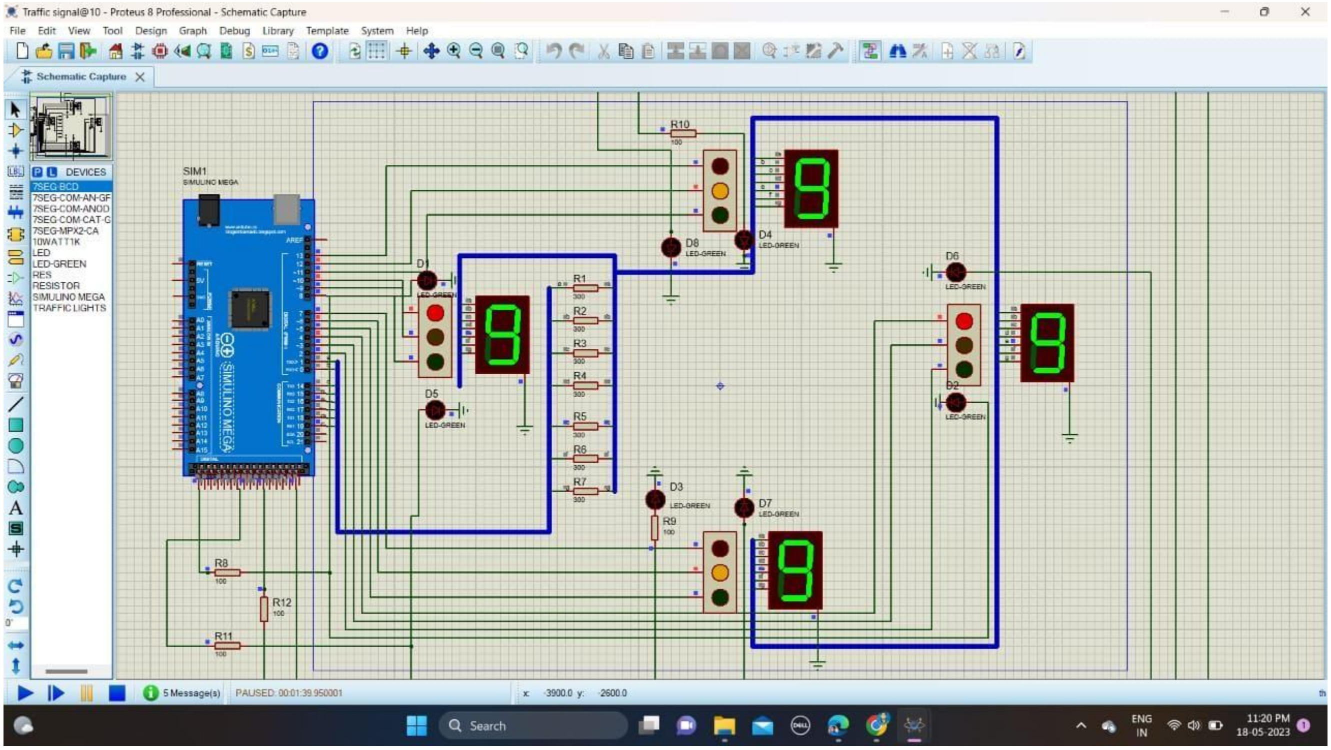
While these are the general principles, important variations are possible. First, it is common tofind some form of computer as part of the traffic signal at the intersection or ramp to be controlled.This allows the local computer to process traffic flow data directly, reducing communications needsand costs. Another variation is that selected vehicles themselves may transmit traffic data directly tothe computer system. This is frequently combined with the ability to receive information in thevehicle regarding points of congestion, so the driver can choose to avoid them. If the two-waycommunication exists between the vehicles and computer system, it may not be necessary to haveseparatephysical detectors.

Another area of application for traffic control devices is their use in traffic restraint (often calledtraffic “calming”). Rather than use traffic control to increase efficiency of movement, controls areused to create impediments that restrain traffic from sensitive areas. Most commonly applied inolder cities whose road network does not match current needs, traffic restraint seeks to funneltraffic onto particular routes by creating impediments to movement on others. These other routestypically have some special value—a historic site or a residential character—that requiresprotection. Devices typically used include speed bumps, barricades to block streets, turnprohibitions, stop signs,andraisedpavement markers.

Traffic restraint also includes programs to foster bicycle and pedestrian travel. Wider sidewalks,sometimes including tables and benches, and bicycle lanes frequently accompany restraint actions.These programs recognize that what is good for vehicular travel may not necessarily be positive forother road users, the environment, or the neighbourhood. An unfortunate aspect of these programsis that their benefits and costs are highly localized. Those living on the “right” side of the restraintdevice generally experience slow speed and lower traffic volume. Those living along the routes ontowhichthetrafficis funneledmust endureincreasedvehiclevolumes andspeeds.

Traffic control also can be used to give priority to high-occupancy passenger modes. The objective ofsuchactionsistoemphasizepeopleratherthanvehiclemovement.Avarietyoftechniquesare available and are employed in priority treatment approaches. The most common is the dedication ofspecial lanes to the use of priority, or high-occupancy, vehicles. Buses and car pools can use the lanesto move at high speeds along congested expressways and motorways, bypass queues at expresswayramps, and move along congested arterial streets. Because these special lanes are designed tooperate uncongested, they provide an incentive, through reduced travel times, for travelers to leaveprivate single-passenger automobiles and travel by multipassenger modes. Buses also may be givenpriority by allowing only them to turn at intersections and to be provided with extra green time at atraffic signal. The undesirable feature of such systems is that they provide improved service to high-occupancy modes while sustaining or increasing congestion for others. The residual congestion forother road users may result in continued wasteful fuel consumption and high vehicle pollutantemission.

7. SAMPLEOUTPUT



Benefitsoftrafficlight

Signals offer maximum control at intersections. They relay messages of both what to do and whatnot to do. The primary function of any traffic signal is to assign right-of-way to conflictingmovements of traffic at an intersection. This is done by permitting conflicting streams of traffic toshare the same intersection by means of time separation. By alternately assigning right of way tovarious traffic movements, signals provide for the orderly movement of conflicting flows. They mayinterrupt extremely heavy flows to permit the crossing of minor movements that could nototherwisemove safelythrough anintersection.

When properly timed, a traffic signal increases the traffic handling capacity of an intersection, andwhen installed under conditions that justify its use, a signal is a valuable device for improving thesafety and efficiency of both pedestrian and vehicular traffic. In particular, signals may reducecertaintypesofaccidents, most notably,right-angle (broadside)collisions.

While many people realize that traffic signals can reduce the number of right-angle collisions at anintersection,fewrealizethatsignalscanalsocauseasignificantincreaseinrear-endcollisions. Normally, traffic engineers are willing to accept an increase in rear-end collisions for a decrease inthe more severe right-angle accidents. However, when there is no right-angle accident problem at anintersection, and a signal is not needed for traffic control, the installation of traffic signals canactually cause deterioration in the overall safety at an intersection. Traffic signals are not a "cure-all"for traffic problems. The primary goal of the traffic engineer is to attain the safest and most efficientoverall traffic flow possible. In addition to an increase in rear-end accident frequency, unjustifiedtraffic signals can also cause excessive delay, disobedience of signals, and diversion of traffic toresidentialstreets.

Advantagesoftrafficsignalsareasfollows:

1. Trafficsignalshelpformovementoftrafficsecurelywithoutanycollision.

2. They can reduce the number of accidents on roads like pedestrian accident and right-anglecollisionoftwocars.

3. Signalscanincreasethecapacityoftraffichandlingattheintersection.

4. The traffic signals help for the safe movement of slow-moving traffic by interrupting heavy trafficatregularintervals.

5. The indications of the signals can be seen easily in foggy weather or at night time. Withoutsignalling system, it is very difficult to control traffic by the traffic policeman at night or in foggyweatheroron a rainyday.

DisadvantagesofTrafficSignals

Disadvantagesoftraffic signalsareasfollows:

1. Theydelaythetraffic bystoppingthevehiclesattheintersectionduringpeakhours.

2. During signals breakdown, there are serious and wide-spread traffic difficulties during peakhours.

8. CONCLUSION/FUTURESCOPE

The traffic congestion of the road is one of the main causes in the low productivity and decreasing ofthestandardsofamoderncity.Inthissense,somerecenttrendsinartificialintelligencesuggestthatin a close future, some vehicles and control systems will be operated by intelligent agents improvingsome challenges on the road. Based on the paradigm of ubiquitous computing, the control of the trafficbased on intelligent agents offers an ideal path to operate the vitalities using internet or other ad-hocinterconnectionsbasedoninformationonrealworldtime.Inthiscase,theflexibilityoftheautonomous agents allows making decisions in similar ways as a human being does. In this sense, thepaper introduces a novel methodology to manage traditional traffic control using intelligent agents.Specifically, agents are in-charge of assesses the conditions and requirements of the lanes in order toevaluate if the assigned length of green light offers a service with at least the 80% of dispatchedvehicles.Todothis,theagentsuseanadaptationbasedontheCBRfilter,whichisalsosimilartothat of a policeman handling the traffic flow at a typical junction. This cognitive process allows agents to becapable of evaluating past decision from a data base built over the time. In this light, an integratedsimulatorforthedesignandevaluationofintersectionhasbeenfirstdeveloped.Thesimulatorper mits users to configure different aspects of a determined intersection in order to provide resultsthat disclose the behavior of the traffic flow and other relevant information such as the emission andfuel consumption. The simulator also reports the changes of the length in each traffic light throughoutthe experiments. Finally, the studies performed in the integrated simulator were used to evaluate notonly the likely mobility advantages but also the environmental benefits of the new strategy to controltraffic lights based on intelligent agents. To do this, the results compared the volume of attendedvehicles, the level of the service at the junction, the fuel consumption and emissions, under the trafficlights control based on intelligent agents, to those under traditional signal control methods. Differentconfigurations have been considered in both experiments, with one involving an isolated intersectionand a three-way intersection. The obtained results have clearly demonstrated the significant mobilitybenefits of the proposed approach in terms of the level of congestion after a green light by increasingtrafficcapacityinaparticularlaneaswellasthesignificantreductionofstopping-time,fuelconsumption and the emissions generated because of longlength of red lights. However, several futureinvestigation aspects are suggested by the current research, including the following: Issues such asacceleration and des-acceleration, collision avoidance and vehicles with different velocities, must beincludedinthesimulatorbyofferingasetofmorerealisticsituationinthevirtualinstrumentproposed here. In this paper, the focus has been basically on vehicular traffic and on assessing themobility and environmental benefits using intelligent agents to control the length of the lights. Futureresearch should attemptto evaluatethe likely safety benefits of the approach and how pedestrianscan be accommodated at such junctions. Intelligent traffic lights using sophisticated computationalalgorithms represent a novel futuristic approach to autonomous controlling the intersections. As such,futureresearchshouldfocusonassessingthereliability,robustnessandsafetyoftheapproachunderaw ide range ofexpectedoperatingconditions andlikelyfailure modes.

In short, intelligent and communicative agents employed to control traditional pre-programmingtrafficlightsarecapabletoensureautonomywithoutlosingsecurityandeffectivenessintheop timization of the vehicular flow at any particular junctions using the CBR methodology. Therefore,thepaper promotestwo maincontributions for thestate-of-the-art intheareas of theintelligentagentsandinthefieldofcomputationaltoolstosimulateandevaluatethebehaviorofvehiculart raffic

9. REFERENCE

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AppendixA(Hardwar eDescription)

ArduinoMega2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It is one of the mostpowerful and versatile boards in theArduino line-up. The Mega 2560 offers an extensive range ofinput/output pins,memory capacity, and computational capabilities, making it suitable for a widerangeof applications, fromsimpleprojectstocomplexsystems.

KeyFeatures:

a) **Microcontroller:** The Arduino Mega 2560 is powered by the ATmega2560 microcontroller,which operates at 16MHz and has 256 KBof flash memory for program storage.It alsofeatures 8 KB of SRAM and 4 KB of EEPROM, providing ample memory for data storage andmanipulation.

b) **DigitalandAnalogI/OPins:**TheMega2560offersagenerousnumberof 54digitalinput/output pins, with 15 of them capable of providing PWM(Pulse Width Modulation)output. Additionally, it includes 16 analog inputs, enabling the board to interface with a widerangeof sensors,actuators,andotherdevices.

c) **MultipleCommunicationInterfaces:**TheMega2560includesseveralcommunicationinterfaces, including four hardware UART (Universal Asynchronous Receiver/Transmitter)serialports,aUSBconnectionforserialcommunication and programming,a SPI(SerialPeripheral Interface)port, and an I2C (Inter-Integrated Circuit) bus. These interfaces facilitateconnectivitywithotherdevices,suchascomputers,sensors,anddisplays.

d) **External Interrupts:** The board features six external interrupt pins, allowing it to respondquicklytoexternaleventsorsignals.Theseinterruptscanbeusedtotriggerspecificactions orinterruptthenormalprogramflowwhencertainconditionsaremet.

e) **Power Supply Options**: The Mega 2560 can be powered via a USB connection, an externalpower supply, or a 7-12V DC power jack. The board incorporates a voltage regulator thatensuresastablepowersupplytothemicrocontrollerandconnectedperipherals.

Specifications:

- Microcontroller:ATmega2560
- OperatingVoltage:5V
- InputVoltage:7-12V
- DigitalI/OPins:54(ofwhich15providePWMoutput)
- AnalogInputPins:16
- DCCurrentperI/OPin:20mA
- DCCurrentfor3.3VPin:50mA
- FlashMemory:256KB(8KBusedbybootloader)
- SRAM:8KB
- EEPROM:4KB
- ClockSpeed:16MHz

Resistors(1kohm)

Resistors are passive electronic components commonly used in electrical and electroniccircuits to restrict the flow of electric current. A 1k-ohm resistor, also known as a 1 kilo-ohmresistor, is a specific type of resistor that has a resistance value of 1000 ohms. This note provides anoverviewof 1k-ohmresistors,includingtheirconstruction, characteristics, andapplications.

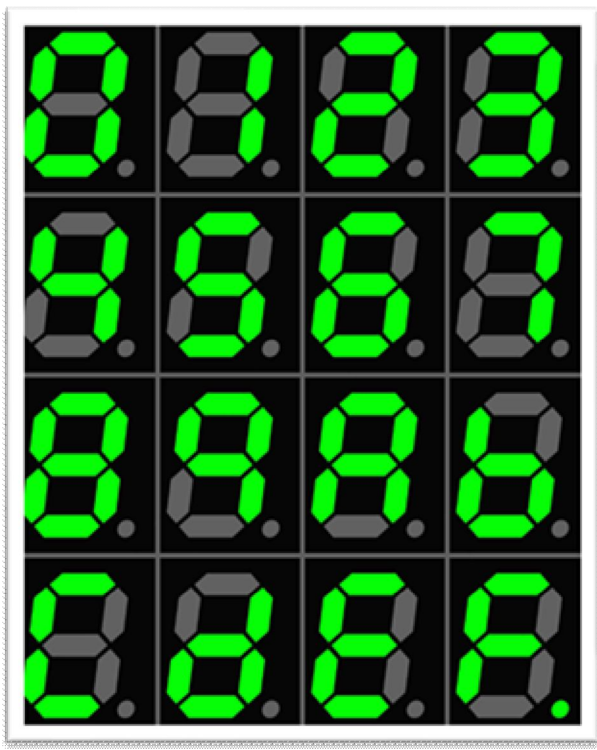
Construction and Characteristics: 1k-ohm resistors are typically made ofa cylindricalceramic or carbon composition material with metal leads extending from each end. The resistancevalue of 1k ohm indicates that when a voltage of 1 volt is applied across the resistor, it will allow acurrentof 1 milliampere toflowthroughit,accordingtoOhm'sLaw(V=IR).

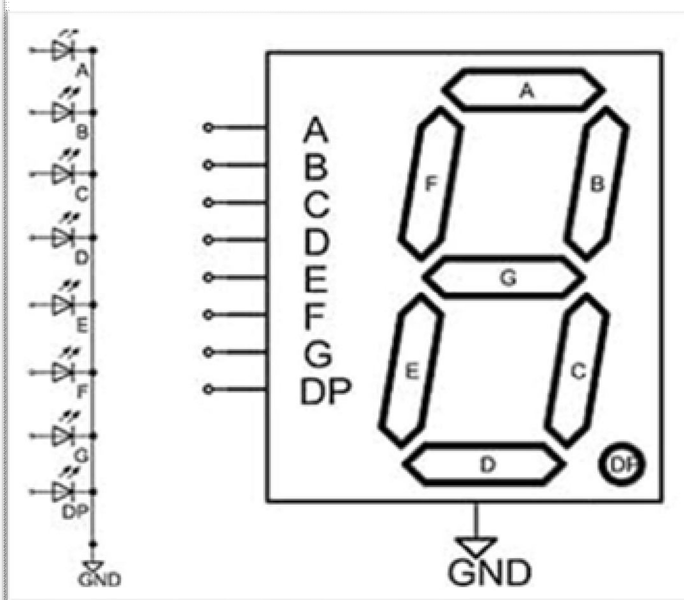
The power rating of a 1k-ohm resistor indicates the amount of power it can safely dissipatewithout getting damaged. The most common power ratingsfor 1k-ohm resistors range from 0.125wattsto0.25watts.

SevenSegmentLight

Introduction: A seven-segment display is a common electronic component used to displaynumerical digits or simple alphanumeric characters.It consists of seven LED (Light Emitting Diode)segments arranged in a specific pattern to form the shape of the numbers 0 to 9 or letters A to F. Thisnote provides an overview of the seven-segment display, including its construction,workingprinciple,and applications.

Construction: A typical seven-segment display consists of seven individualLED segmentsarranged in a specific pattern. These segments are labeled as "a,""b," "c," "d," "e," "f," and "g." Thedisplay also includes a common pin or digit pin, usually labelled as "COM" or "D. " The anodes of theLED segments are connected to the positive supply voltage, while the cathodes are connected tothecommonpin.

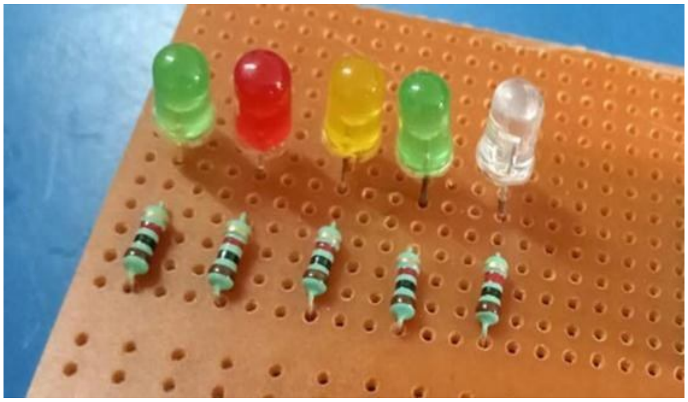




TrafficLightLed

Introduction: Traffic light LEDs are essential components of traffic signal systems used toregulate and control vehicular and pedestrian traffic at intersections. They provide clear and visibleindications to drivers and pedestrians, ensuring orderly and safe traffic flow. This note provides anoverviewoftrafficlight LEDs,includingtheirconstruction,characteristics,andapplications.

Construction: Traffic light LEDs are constructed using Light Emitting Diodes (LEDs) designedspecificallyfortrafficsignalapplications.TheseLEDsaretypicallyhousedindurable,weather-resistantenclosures.Each traffic light unitconsists of multiple LED elements, arranged in a specific pattern toformthe familiarred, yellow,andgreen light signals.



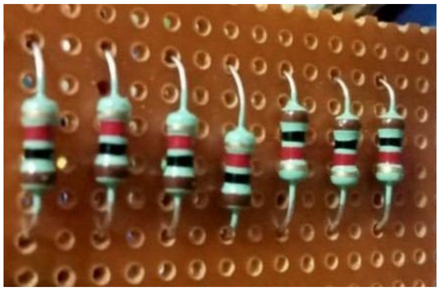
Characteristics: TrafficlightLEDspossessseveralimportantcharacteristics:

1. ***High Brightness:*** Traffic light LEDs are designed to be highly visible even in adverse lightingconditions.They produceintenseand brightlight outputto ensureclear visibilityduringdaytimeandnighttime.
2. ***Longevity:***LEDtechnologyoffersexceptionaldurabilityandlongevitycomparedtotraditional incandescent bulbs. Traffic light LEDs have a significantly longer lifespan, reducingthefrequencyofmaintenanceandreplacement.
3. ***EnergyEfficiency:***LEDtechnologyishighlyenergy-efficient,consuminglesspowercompared to conventional incandescent bulbs. This efficiency contributes to reduced energyconsumptionandlower operatingcosts.
4. ***RapidResponse:***TrafficlightLEDshavefastresponsetimes,enablingquickswitchingbetweendifferentsignalstates.Thisresponsivenessensuresprecisecontrolandsynchronizationoftrafficmovements.

ResistorBank

Introduction: Aresistorbank,alsoknownasaresistornetworkorresistorarray,is acollectionof resistors connected together in a single package. Resistor banks are used in electronic circuits toprovide a combination of different resistance values in a compact and convenient form. This noteprovidesanoverviewofresistorbanks,includingtheirconstruction,types,andapplications.

Construction: Resistor banks are constructed by combining multiple resistors within a singlepackage.Theresistorsaretypicallyconnectedineitheraparallelorseriesconfiguration, allowingthebank to offer a range of resistance values. The package may have multiple terminals or pins toconnecteachresistorindividuallyorin groups.



Applications: Resistorbankshavevariousapplicationsinelectroniccircuits,including:

a) ***Voltage Dividers:*** Resistor banks are often used in voltage divider circuits to scale down ordivide the voltage across a circuit. By selecting specificresistors from the bank, differentvoltageratioscan be achieved.

b) ***Current Limiting:*** Resistor banks can be used to limit the current flowing through a circuit orspecific components. By incorporating appropriate resistors from the bank, the current can becontrolledtoensure safeoperation.

c) ***Signal Conditioning:*** Resistor banks are commonly used in signal conditioning circuits toadjust signal levels or impedance matching. Theyhelp modifytheamplitude or shape ofanalogsignalstomeet the requirementsof subsequentcircuitstages.

d) ***Attenuators:***Resistorbankscanbeusedasvoltageorsignalattenuatorstoreducetheamplitudeofas ignal.Byselectingspecificresistorvalues,theattenuationlevelcanbeadjustedasneeded.

e) ***Calibration:*** Resistor banks are often used in calibration processes and test equipment. Theyprovide a range of known resistance values that canbe used for precise calibration ofmeasurementinstrumentsorcircuitry.

AppendixB(Project Operation)

Operation

The traffic light system we are design its working on arduino programming. When arduino startsimulationthetraffic lightsandcountingsevensegmentsis workingontheprocess.

The signals is working on step by step. In the 1stcase signal-1 is on state where other three signals isonredconditionatatime.InthisprocesswhenSignal-2isworkingonlysignal-2blueisONstateotherthreesignalsareinredcondition.Forthe3rdcaseonlyblueisonsignalthreeatthesametimeall other three signals are in red condition. In the fourth case signal 4 blue is on & all other lights are inredcondition.Aftercompletingone cycleagain itwill working on thecyclingprocess.

It is design based on arduino programming because of in the traffic signal not required any kind ofmanpower.

Overall,thetrafficlightsystemisjustneedmaintenanceotherwiseitsworkonautocontrolledprocess.

Appendix

(Next-GenTrafficLights)

RevolutionizingTrafficLights

The aim of this project is to design and develop a traffic light that is efficient, safe, and cost-effective.The traffic lights incorporate several unique features that make it stand out from the local roads &reducethe traffic problems.

The blinking is dependingonthestatemachinetransition.Asaconclusion,thecontroller cancontrolthetrafficmovementanddetectabusyandnon-busyroad.These trafficlightsuseanelectro-mechanicalsignal controller, which has movable components and a dial timer. This allows the light to switch and hold lightcolors for the predetermined amount of time. Dynamic traffic light control systems work by adapting their timingtocurrenttrafficconditions.

The primary function of any traffic signal is to assign right-of-way to conflicting movements of trafficat an intersection. This is done by permitting conflicting streams of traffic to share the sameintersectionby meansoftimeseparation.

Wemustkeepourvehicleontheleftsideoftheroadtoallowthecomingcarfromanotherdirection to move on the right side. We should not use mobile while driving. If the call is important,stopyourvehicleonthesideoftheroad andthenreceiveit.