DESIGN OF A DENSITY BASED TRAFFIC SIGNAL CONTROL

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Electronics and Telecommunication Engineering

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APPROVAL

This Project titled "DENSITY BASED TRAFFIC SIGNAL CONTROL", submitted by Kazi Asif Rahib and Kazi Saifur Rahman to the Department of ICE, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Electronics and Telecommunication Engineering and approved as to its style and contents. The presentation was held on November, 2018.

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We hereby declare that, this project has been done by us under the supervision of Md. Taslim Arefin, Associate Professor and Head, Department of ICE, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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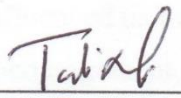

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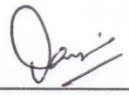

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ABSTRACT

This project is on “Density Based Traffic Signal Control”. Traffic blockage is a severe problem in most of the cities across the world and it has become a nightmare for the citizens. For optimizing traffic control, there is an increasing demand in systematic quick automatic system. This paper is designed to develop a density based dynamic traffic signal control. For traffic blockage, a huge amount of time is being wasted by the citizen of metropolitan area. In this project an intelligent traffic control system has been developed to minimize the blockage of traffic system. Here the traffic signal will be automatically controlled by the system. The signal timing changes automatically on sensing the traffic density at the junction. The ARDUINO UNO used in this project as microcontroller. The system contains IR sensors. System gets activated and receives the signal as the vehicles passes close by it. This project is a cost-efficient and user-friendly system which could ensure the less blockage and time saving way of worldwide.

CHAPTER 1

INTRODUCTION

1.1 Traffic Blockage

Traffic administration has the goal to constantly improve traffic system and regulation. As the figure of vehicle users constantly rises and possessing shifted by running infrastructures are restricted, rational monitoring of traffic will turn a point of focus in the posterior. Fudge traffic congestions is beneficial to both ambience and economics. In our research we focus and maximization of traffic light administrator in a capital applying IR sensor and manifested using Arduino. An wise transportation process (WTP) estimates the traffic parameters and optimizes traffic sign to reduce vehicle delays and stop. Fixed control on traffic is basically not control following to the volume, but in the way of programming which is meanwhile stable in the scheme.

Congestions in traffic system occur when there are more vehicles than the road can handle. This situation makes the trip longer than it should be as it increases the queuing of vehicles. This phenomenon is also known as traffic jam. Congestions in traffic can be a result of accident, going through wrong way, for VIP passing, unauthorized parking etc. it can be happened due to bad road layout, misunderstanding traffic rules also.

FIGURE 1.1: Traffic Blockage in Bangladesh

1.2 Historical Background

The current drills for traffic signal monitoring are given below:

a) Soft Traffic Administration Plan:
The traffic is monitor by one individual only. If there are four streets from where vehicles are arrival then the man should have monitor in traffic. He has to relief the vehicles one by one street. In this intention there is very usage of gut and its not simple to manage when much traffic is there.

b) Self-acting Traffic Administration Plan:
The maximum extensively used self-acting method. Uses easy time based method which works on time interim basis which is currently inept for indiscriminately and non-identical traffic. But time depth basis is very time killing its not a quick method.

c) Intellectual Traffic Administration Plan Using Wireless Technologies:
This is used to affecting appearance of traffic close any round and joint and then capable to way the traffic based on the solidity in wished for way.

Presently the availability of might origins like cinder, biomass, and hydro electrical plants is narrow thus the acquaintance to conduct enough ability from the alluded origins has turn usual. Attenuation of force from road lights is one of the noticeable force fall, attempts to conduct optimum force using automation conduct to much modern processes of force and money defense. With the ample accessibility of fair lighting novelty like light launching diode (LED) lights and totally approachable distant web organization, fast respondent, reliable cause and force wielding road lighting frameworks turn to be fact.

[1] Vishakha S. Thakre et.al has proposed the design of a smart traffic light controller using embedded system that could provide dynamic time interval for traffic lights according to the length of vehicles present at each lane. It also handles the occurrence of emergency vehicles by making the all the signals red other than the one from where the emergency vehicle is

approaching. Also, the proposed system also facilitates user with the GSM technology by sending the information of traffic congestion as an SMS on the mobile phone network.

[2] Faruk Bin Poyen et.al has designed a density based dynamic traffic signal system where the timing of signal will change automatically on sensing the traffic density at any junction. Traffic congestion is a severe problem in most cities across the world and therefore it is time to shift more manual mode or fixed timer mode to an automated system with decision making capabilities. Present day traffic signaling system is fixed time based which may render inefficient if one lane is operational than the others. To optimize this problem, a framework for an intelligent traffic control system has been proposed. This is achieved by using proximity Infrared (PIR) sensors. Once the density is calculated, the glowing time of green light is assigned by the help of the Arduino microcontroller. The sensors which are present on sides of the road will detect the presence of the vehicles and sends the information to the microcontroller where it will decide how long a flank will be open or when to change over the signal lights.

[3] Bilal Ghazal et.al has designed a traffic light control system to realize smooth motion of the cars on the roads. The proposed system evaluates the traffic density and calculates the appropriate time slots for each traffic lights in order to overcome the problems of the mutual interference between adjacent traffic light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system.

[4] C. Bhuvaneshwari et al have analyzed the street light with auto tracking system by which one can increase the conversion efficiency of the solar power generation. Here, the sun tracking sensor is the sensing device which senses the position of the sun time to time and gives the output to the amplifier based on light density of the sun.

[5] & [6] S. Suganya et al and W. Yue have proposed about Street Light Glow on detecting vehicle movement using sensor is a system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the light intensity.

[7] M. Abhishek et al have implemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting.

[8] K. Santha et al have surveyed on Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness.

[9] Srikanth et al proposed a ZigBee based Remote Control Automatic Street Light System. The system is designed with the help of ZigBee modules that helps in detecting the faulty lights and control the light.

[10] Steve Chadwick reports on the two installation case studied in Scotland and Wales and explain the details and benefits of the technology. The system was called as MINOS that had a track record of over 100,000 units installed and working successfully.

[11] Radhi Priyasree explains a system to reduce the power consumption of street lights by avoiding inefficient lighting which wastes significant financial resources each year. This is done by dimming the lights during less traffic hours.

From this composition metering, the systems everyone has carry through and applied is soft and simple to realize. These papers are focused to further redact a numerous skilled method and commit things automated.

1.3 Impacts Of Traffic Blockage

Traffic blockage has a number of minus outcome.

a) Ruining of costly time.
b) Delay, that may sequel in slow coming for job, office, school.
c) Inability to guess accurate travelling time.
d) Increased wasting of fuel and air pollution also.
e) Blockage of traffic may block the passage of emergency vehicles travelling.
f) Top possibility of blockage due to tight pause and certain giving up and active.

1.4 Purpose Of This Project

Various studies and surveys have allot that, on a routine basis most of the traffic blockage or traffic jams occur because of traffic light system. Traffic congestion is nothing but an additional waste of time from one's daily routine. It is noticed that most of the traffic congestion is occur during the morning and late afternoon. Basically during that time the students and employers go to school, college, University or office so they also be late for their office or institutions at the traffic light spot. By decreasing the congestion of cities we can also decrease the extra waste of energy like CNG, Petroleum for special case electricity also. As a deeply populated developing country like Bangladesh whose GDP is on an average 6% and whose greater of the external currency from stock are spent on score petroleum and electricity, can't pay to loss such an significant resource.

The fixed stroll of people from rustic to rural limit in find of fresher assembly has produced in rural demography blow up and over-skimmed infrastructures. One of such over-skimmed infrastructure is the street, a circumstance which has culminated to grown traffic. Though traffic lights have ever been used for directing the activity of traffic, traffic assessing in chief capitals around the earth has unflinching to be a topic of worry.

Also, the consecutive traffic square signals fall off in time legislation, because it locates same time intervals to every road it is governing. This raise unnecessarily anticipation for the drivers, which could not be bearable in whole case, as being in time, is significant to each. Nowadays one of the grave cruxs faced in any capital is traffic blockage. Find stuck within bulky traffic is a problem for every and each person driving the vehicles and also to the traffic police dwelling the traffic. In case of high traffic, generally traffic is controlled by a traffic policeman standing in the middle of the road and such traffic police is deployed in all the junctions along the road and controls the flow of traffic through hand signals.

1.5 Our "Intelligent Traffic Control" Method

Under current continuity, traffic monitoring is gain by the use of a method of hand symbols by traffic police personnel, traffic signs, and locating. A match able and fit education process is wanted, through driver-licensing masterities, to ensure that those who lead motor vehicles fathom the laws of the road and the rituals that they are necessary or instructed to receive when a certain control machine is arrived. Every traffic control machine is ruled by criterions of model and usance; for case, stall symbol always have a red backdrop and are octangular in structure. Plan values grant the motorist to rapidly and balancedly catch the symbol in the observable area along the street. Criterion use of colors and structure aids in this identification and in composing on the adequate path of act. Under present situations, traffic lights are set on in the various channels with stable time balk, imitating a certain hoop while changing from one signal to other forming ineligible and unnecessary blockage on one lane while the other lanes remain void.

We propound a modern intelligent traffic monitoring method that is able to monitor the traffic system through traffic symbols on the base of recent traffic density. The recent traffic control method of Bangladesh is controlled by the traffic police manually. Some streets of Dhaka city have a self-acting method for regulating the traffic light. It has stable time depth for crossing the traffic from either parts of the street that occurs congestion problem. Ours intelligent traffic monitoring method will solve this matter on tangible time base. This process will look on the current traffic situation then it will take verdict that which street will remain bare and which street will be remain choked. This paper proposes an intelligent system using Arduino for implementing it in the city. We also added a modification of traffic signal light in this system.

1.6 Aim Of This Project

a) To scheme a intelligent traffic monitoring method
b) To build a intelligent traffic regulator circuit in the breadboard
c) Attempt for its performance

d) Output commercialization
e) To scheme the monitoring method with less value material's

The principle motive of this project is to scheme an smart self traffic symbol monitoring method. Traffic blockage is one of the principal issues to be calculated. Commonly vehicular traffic splits at the joints of the street and are stricted by the traffic symbol. Traffic symbols necessity a favorable adjustment and monitor to assure the sleek and immune gush of the vehicular traffic. During the crowd moments, the traffic on the streets is at its top. Also, there is a chance for the emergency vehicles to gore in the traffic jam. Therefore; there is a necessity for the progressive monitor of the traffic during crowd moments. Hence we mention a intelligent traffic signal moderator. The raised method attempts to reduce the possible of traffic jams, containing by the traffic lights, to whatever limit by wiping the street with over density of vehicles. The process is based on the ARDUINO UNO and IR sensors technology.

1.7 The Advantage Over Traditional Method

The project is purposed at scheming a density based progressive traffic symbol method where the traffic symbol light will switch automatically on realizing the traffic density at any joint. Currently, out country traffic control system is manual but we proposed here a advanced intelligent traffic control system. Traffic blockage is a intense matter in maximum capitals over the earth and therefore it is time to change over manual style or stable timer style to an automated method with verdict making capabilities. Current day traffic signaling method is stable time based which may render unskilled if one lane is operational than the others. To maximize this matter we have made a framework for an rational traffic monitoring method. At times over traffic density at one flank of the junction needs longest green time as comparable to value estimated time. We, therefore bring in here a mechanism in which the time period of green light and red light is imposed on the foundation of the density of the traffic rife at that time. This is earned by using PIR (Proximity Infrared sensors). Once the density is predicted, the ardent time of green light is imputed by the aid of the microcontroller (Arduino Uno). The sensors which are impending on flanks of the road will detect the appearance of the vehicles

and transmits the fact to the microcontroller where it will discern how long a side will be shard or when to switch upon the signal lights. In following chapters, we have enlarged the order of this framework. The purpose of the method is to prosper skill of subsist automatically traffic signaling method. The method will be ideal processing based adaptive signal monitoring. The timing will be reckoned every time switching automatic build upon the traffic clog. Submitted method will operating founded on consecutive method toward with automated signaling.

We also added a red laser light in front our street for which to give signal or massage from far way to the vehicles rider that the lane was stopped for traffic signal. Those who are not notice the traffic signal somehow, they will sure be see that red laser light and stop their vehicle. Thus our road safety and vehicle safety should be secured. This system fudges dissipation of time due to the traffic. Completely automatic. Lower force costs. It shift the simple entry in the traffic light. Less price to scheme the circuit, protection of the circuit is excellent. By applying Arduino UNO, we can raise much farther monitoring to the apparatus.

1.8 Motivation

The rising problem of traffic congestion on the roads due to increasing number of vehicles have led to a chaos condition on roads especially at the peak hours of working days. This problem also creates a headache in the mind of the people driving the automobiles who are stuck in a traffic jam due to high density traffic on roads and lesser outflow of the vehicles. This problem has been raised due to conventional fixed time slots between various traffic lights.

It is highly required that today's traffic system needs to be smart enough to tackle these problems and ensure a smooth flow of traffic on the roads with even lesser congestion at the peak hours. This could be achieved only by implemented more flexible and smart controllers with the traffic lights and a fast and accurate means of determining the traffic. Also, most of the presented traffic light control systems in the literature review are complex and based on sensors. They usually miss the amount of traffic present or give a wrong reading due to

limitations of the range of operation and low accuracy.

Further, highly accurate and long range sensors are generally very costly and difficult to implement on all the roads. So, this proposed design of manually switching the control system to manual or automatic mode by means of a traffic policeman seems more economical and easy to implement. It also does not removes the requirement of traffic police at most of the junctions thereby not effecting the employment of traffic policeman that was otherwise not required in sensor based designs.

Thus, it is required to come up with the design that is socially and economically viable to implement in a nation like Bangladesh.

1.9 Problem Formulation And Objectives

The problem was to scheme and implement a intelligent traffic light monitoring method to overcome the problems of traffic contestation due to high traffic density on one side and remove the situations generating traffic jams.

Some of the principal motives of the scheme are as follows:

a) To produce the design simple and easy to implement in real time.

b) To improve the flexibility of working and easy adaptability to the present situation of traffic.

c) To make the controller robust and more accurate.

d) To make the design portable and field deployable.

e) Finally, to reduce the overall cost of the design.

1.10 Report Formation

Chapter 1 is entitled "Introduction". It introduces historical background, an overview of the technology used in the project, the purpose & aim of this project, the objectives of the project, the motivation of the project and the advantage over traditional method of this project are also described in this chapter.

Chapter 2 is entitled "An Overview Of ARDUINO". This chapter focused on the history behind the ARDUINO, used in the project.

Chapter 3 is entitled "Background Study". This chapter focused on the components used in the project and also summarizes the technology used in the project work.

Chapter 4 is entitled "Implementation And Design Analysis". It describes the implementation process, the theoretical block diagram, Schematic diagram and working process of the project. The design of the project work is also analyzed in this chapter.

Chapter 5 is entitled "Project Analysis". It describes the output of our project. The benefits of the project over the existing traffic monitoring method are discussed in that chapter. The accuracy of our project, the limitations of the project over the existing traffic monitoring method are also discussed in that chapter.

Chapter 6 is entitled "Conclusion". In this chapter, the suggestion for future work and challenges are described. It also describes appropriate conclusion.

Appendix is entitled "Programming Codes". It describes the available programming languages for this project.

CHAPTER 2

AN OVERVIEW OF ARDUINO

2.1 Arduino

Arduino is the most popular programmable board that help to complete any communications and electronics based projects. Basically Arduino is an tile origin position which has “one click compile or upload” characteristics. It is an bare paternity electronics prototyping position that simple to conduct and limber both for the software and hardware. Arduino is capable to observe its surroundings by the light, controlling motor and other activators. It is very easy to scribe and upload cryptogram to the I/O plank to run any programs due to its open source platform features. Arduino planks are gainable commercially in preassembled structure, or as do-it-thyself sets. The hardware scheme specifications are flat-out obtainable, approving the Arduino planks to be propagated by anybody.

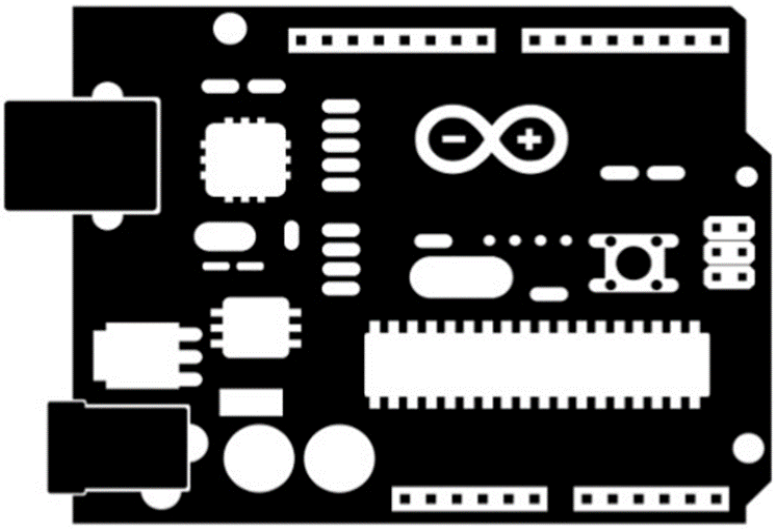

FIGURE 2.1: A Arduino Board

2.2 History

In 2005, Arduino was exempted by learner's from the Interaction Design Institute Ivrea(IDII). They developed it for their class project as a modest tool for windows and Mac OSX. From the starting time, the attractive features of Arduino was developed to attract artist and designers. The tile origin microcontroller hardware has been schemed in a mode that it afford effortlessly coherence of the external components like motors, speakers and LED (reply to the user inputs). Hernando Barragan, who was created the wiring microcontroller that parsing datum to the electronics devices to contribute Arduino project. Mainly, he wanted it to be used as the prototyping tool. Later, his assistance (Hernando Barragan) created the visual programming language for the prototyping tool.

2.3 Raising

Whereas talking the improvement of Arduino, it is merit together with about microcontroller. In the 1960, a revolutionary development was observed in the computer industry after the improvement of solid state computers (like as IBM 1402), that usually used transistors to procedure its operation and its magnetic interior retention for its storage (on behalf of void pipes) that enable to increment the solidity of the computer. In 1959, Jack kil-be invented integrated circuits, which enable transistors and circuits to be focused among teeny chips of semiconducting equipment (kind of silicon), which allowed also miniaturization of the compute material. The several most important in the very same decennary was the lofty inches computer programming dialects, written in allusive dialect which made computer codes something easy to learn and read than the former machine dialects. FORTREN (uses at scientific calculator) and COBOL (uses in business application) were the main languages brought in that time.

The microprocessor was one of the best novelty in the generation of the recent computer in the 1970's. In the beginning, the microprocessor miniaturized all the hardware materials of CPU to suitable into one, teeny, mobilized circuit acquainted as the microchip. The microchip turn out

the main leading material of the microcontrollers (like Arduino), what consists of a microchip, memory storage hardware and input/output hardware caused by sensors. After that in 1970's and 1980's more languages were also developed (such as C, C++, Java) caused by appeals in business and science.

2.4 Evolution

Earlier on the creation of Arduino, the PIC microcontroller plank was brought in by common apparatuses in 1985 was one of the maximum applied apparatus for the electronic enthusiasts. The PIC microcontroller board was preferred because of it's the agility and comfort of its programming care of soft dialects together with PBASIC. Another cause was that it was capable to depot programs on a flurry retention chip which enable the indications on the plank to be programmed by an limitless figure of chances. It further support output device like LED and motors as well as sensors. Various exoteric planks for hobbyists thrust into the INITIAL Mark (Parallax Inc. 1990), and wiring both of what partition the advantages of ingenuousness of programming, and a turn out pleasure of rapid-prototyping. Materially, the early pioneer to the Arduino was a mores shaped wiring microcontroller built by the designer/ artist Hernando Barragan in 2005.

It was in 2006 when the Arduino wing was timbered in Italy and it grown of Barragan Massimo, David Cuartilles, Nicholas Zambetti and Dave Mellis. Principal target of this wing was to exhibit an electronic prototyping stage that would facilitate the wiring stage and rehash it get-at-able to the non-technological users particularly in the originative moors. The Arduino, hence organized the following characteristic, a programming ambience based on processing dialect (a programming language suppose by Ben Fry and Casey Reas, further suppose for designers / artist), the efficiency to program the plank via a norm USB link and a lower cost drop.

2.5 Summary

In this chapter, we discuss about the background of mighty open source tool ARDUINO plank.

CHAPTER 3

BACKGROUND STUDY

3.1 Introduction

In present livelihood we have to turn with much matters, one of which is traffic blockage becoming much solemn day afterward day. It is spoken of that the lofty size of vehicles, the insufficient infrastructure and the absurd allocation of the improvement are prime causes for accretive traffic jam. This project is included with Arduino Uno broad, (Light Dependent Resistor), Infrared sensor, LED. We want to develop a density detection sensor and connect it to an Arduino. And that will be used to provide a pulse.

3.2 Existing Traffic Monitoring Method

The traffic management system are Dhaka city is Rajdhani Unnayan Kartipakkha (Rajuk), Dhaka metropolitan police (DMP), Bangladesh road transport authority (BRTA). They plan and monitoring the traffic management system. Dhaka metropolitan police gave important strategy and they already setup close circuit television, setup electric display board in city road and monitoring all the components easily. Traffic police indicates parking, lan, footpath, crossing, manpower etc. Public transportation will be found that stop according to the stoppage. Traffic Engineering Department will be responsible for the control of all traffic signals within the city boundaries, their proper functioning and the optimization of their timing. But still now out traffic management system is very poor and the method what we use for controlling our traffic blockage is turned as an older version.

As the traffic demand increases, it becomes vital to manage the overall movement within the limited resources without affecting the rate of traffic queue discharge through an approach and

also to ensure safety at an intersection in an urban area. So the necessity of an effective traffic signal system is beyond question in a capital city like Dhaka. Although there are some installations, traffic signal system is approaching lots of difficulties in controlling vehicular movements Dhaka.

This project is, therefore, focused to build up a intelligent traffic monitoring method for out country.

3.3 Components Used In The System

Components that need for this project is given below:

Serial No:	Name Of Components:	Amounts:
1	Arduino UNO	1
2	LED	12
3	Infrared Sensor	2
4	Male to Male Jumper Wire	As much as required
5	Power Supply (9-volt battery or USB-type)	1

TABLE 1.1: Required Components

3.4 IR Sensor

IR Transmitter:

IR transmitter looks like an LED. This IR transmitter constantly effuse IR bridles from it. The leading voltage of this IR transmitter is 2 to 3V. These IR (Infra Red) bridles are perdue to the

human eye. But we can scene these IR bridles through camera. Infrared is an perdue radiant force, electromagnetic diffusion with longest wavelengths than those of visible light, pervaded from the titular red border of the visible band spectrum at 700 nanometers (frequency 430 THz) to 1000000 nm (300 GHz) (though community can view infrared upon to leastwise 1050 nm in tests). Maximum of the thermal radiation ejected by objects close chamber temperature is infrared. Infrared diffusion is used in medical, industrial and scientific solicitations.

Night-vision instruments treating effective close infrared enlightenment approve folk or brutes to be noticed except the watcher being track out. Infrared astrology uses sensor-arrayed telescopes to enter dusty territory of place similar as atomic clouds, track out objects for example planets, and to scene extremely red-transferred objects from the promptly days of the cosmos. Infrared thermal imaging cameras are used to find out morbidity fall in insulated processes, to obey switching blood stream in the skin, and to detect overheating of electrical machinery.

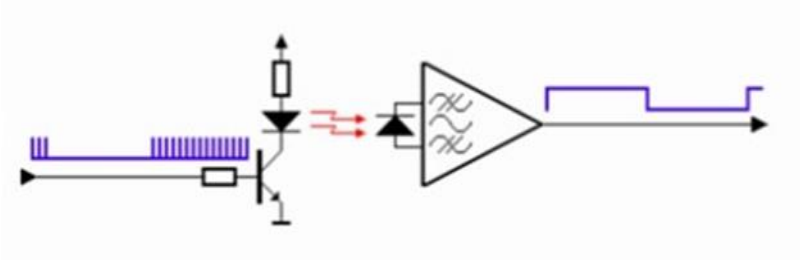

FIGURE 3.1: IR Transmitter

IR Receiver (Photodiode):

A photodiode is a semi-conductor instrument that changes light into current. The current is produced when photons are sunk in the photodiode. A short volume of current is further created when no light is impending. Photodiodes may take on optical filters, built-in lenses, and may have massive or pony surface areas. Photodiodes generally have a slower reaction time as their surface area rises.

The general, consecutive solar cell used to produce electric solar force is a massive area

photodiode. Photodiodes are resembling to constant semiconductor diodes without that they may be either manifested (to track out vacuum UV or X-rays) or packaged with a optical fiber or window cohesion to approve light to come at the sensorial portion of the machine. Multiplex diodes schematic for use particularly as a photodiode use a PIN junction more than a p–n junction, to increment the agility of reaction. A photodiode is planned to handle in reverse bias. The older chips were devoted to sole one of the multiple protocols that were invented. At present immensely less force microcontrollers are used in IR transmitters for the soft cause that they are much ductile in their use. When no button is squeezed they are in a immensely less force rest genre, in which hardly any current is eroded. The processor when arise up to transmit the adequate IR command only a key is squeezed.

FIGURE 3.2: IR Sensor

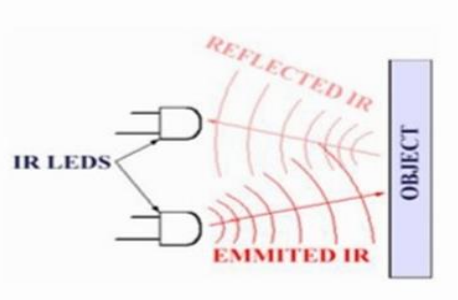

FIGURE 3.3: Workings of IR sensor

3.5 Arduino Uno

Arduino Uno is a microcontroller plank based on the ATmega328P. It has 14 digital input/ output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB cohesion, a force jack, an ICSP header and a remit button as shown in fig 3.5. It contains everything needed to clinch the microcontroller; merely join it to a computer with a USB cable or force it with a AC-to-DC adapter or battery to be aware of undertaken.

The support package for Arduino Uno microcontroller is installed in the MATLAB software from the internet. It involves two parts:

a) Arduino hardware support package.
b) Arduino input and output support package.

These support packages establishes communication between the MATLAB and the Arduino Uno microcontroller. It makes writing or reading of pins from or to Arduino in the MATLAB possible. It is required for the controlling of traffic lights based on the density of traffic, which is the timing variation based on the density of the traffic and priority for the lane where emergency vehicle is present.

FIGURE 3.4: MATLAB Support Package for Arduino

3.6 Architecture And Specification Of Arduino Uno Board

There are various types of Arduino planks that can be used for various motives. The Arduino UNO materials are:

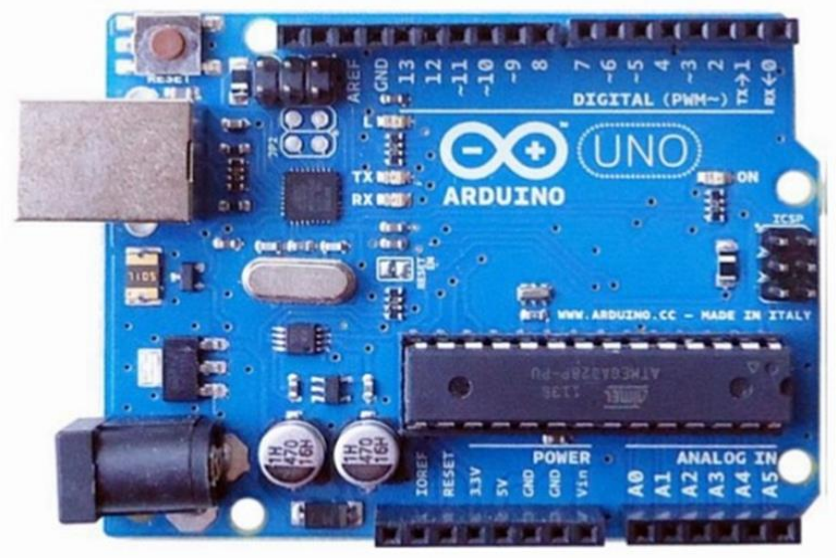

FIGURE 3.5: Arduino UNO R3 Board

FIGURE 3.6: Atmega328 Chip

The ARDUINO UNO specification table is given below:

Feature	Specification
Microcontroller	ATmega328
Operating Vtg	5v
Input Vtg(recommended)	7-12v
Input Vtg(limit)	6-20v
Digital I/O(pins)	14(in which 6 is pwm)
Analog input pins	6
DC Current per I/O PIN	4omA
DC Current for 3.3v pin	50mA
Flash memory	32KB in which 0.5 KB for boot loader
SRAM	2KB(ATmega328)
EEPROM	1KB(ATmega328)
clock speed	16Mhz

TABLE 1.2: Arduino UNO Specification

3.7 LED's

A light-emitting diode (LED) is a two-lead semiconductor light origin. It is a p–n junction diode, which ejects light when enlivens. When a compatible voltage is applied to the leads, electrons are capable to recombine with electron holes within the machine, discharging energy in the form of photons. This outcome is named electroluminescence, and the hue of the light (similar to the force of the photon) is destined by the energy band hiatus of the semiconductor. An LED is oft short in area (under than 1 mm2) and mobilized optical materials may be used to form its diffusion model. Blooming as applied electronic materials in 1962, the earliest LEDs ejected less-strength infrared light. Infrared LEDs are still often used as transmitting elements in distant-monitoring circuits, such as those in remote monitoring for a ample diversity of consumer electronics. The premier visible light LEDs were also of less strength, and narrow to red. Modern LEDs are obtainable across the visible, infrared and ultraviolet wavelengths, with immensely aerial glint. Shortly LEDs were oft used as indicator lamps for electrically instruments, replacing short lucent bulbs. They were soon packaged into numeric readouts in the form of seven segment displays, and were generally seen in digital clocks. Current improvements in LEDs consent them to be used in environmental and task lighting. LEDs have much benefit upon radiant light origins simultaneously with coarse force costs, longest living state, exalted physical toughness, lesser volume, and faster squeezing. Light casting diodes are currently used in solicitations as mosaic as aviation lighting, automotive headlamps, usual lighting, advertising traffic gestures, camera flashes and lighted wallpaper. As of 2015, LEDs capable ample for axil lighting stand any more expensive and claim much strict current and temperature regulation, than dense fluorescent lamp origins of match able output. They are, howsoever, significantly more force skilled and litigious, have low environmental worries attached to their adjustment.

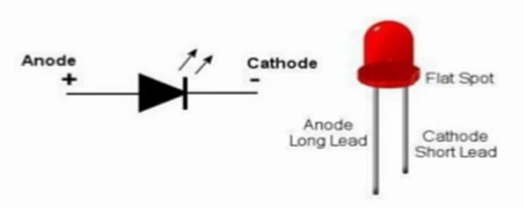

FIGURE 3.7: Symbol of LED

Three LEDs i.e. Red, Yellow and Green are used as a traffic light indicator which are connected in series with 1k resistor in the PCB board. All the LEDs are polarized and all its ground wire are connected together.

FIGURE 3.8: Red, Yellow and Green LED's

3.8 Power Supply

Arduino plank needs a pathway to be attached to a force origin. The Arduino UNO can be powered from a USB cable next to your computer or a parapet force issue that is concluded in a cask jack. In the photo over the USB merger is labeled and the cask jack is labeled. The USB merger is further how you will weight code onto your Arduino plank.

As per the force need of the hardware of the density based traffic light monitoring method, issue of +5V with respect to GND is exhibited. The full circuitry is sliced with TTL logic level of 0V to 5V. It construct of 0V to 9V transformer to step down the 220V AC supply to 9V AC. Also a bridge rectifier alter the 9V within 9V√2 DC. It is also filtered by a 1000uF capacitor and then systematic using 7805 to get +5V. To separate the output voltage of +5V since noise also filtering 220uF capacitor is used.

3.9 Summary

In this chapter, we discussed about the exact components needs for our whole project. We also discuss the existing traffic monitoring condition in our country and focusing our proposed plan.

CHAPTER 4

DESIGN & IMPLEMENTATION

4.1 Introduction

The implementation of the project is done after simulating the schematic circuit properly. In this chapter, the function of every section in the circuit is investigated with coding and also with physical outlook. To give a proper and clear concept about the operation the entire system is separated into different parts. In this chapter also discusses the working process of the circuits used in various parts with following chart, block diagram and corresponding designed diagram.

4.2 Idea And Methodology

As we all know that traffic congestion is a major problem from a long time and traffic administration is also trying overcome this serious from a long time. So as a result one solution has been deducted which is controlling the traffic on time delay. The basic idea of this paper has been taken from the foresaid concept. According to that idea the traffic signal switches after a certain interval of time. The time interval is controlled by any microcontroller.

This system build on the detection of vehicle activity using IR sensors. The IR sensor is a proximity sensor which consists of an emitter LED and a receiver LED embedded in it. IR diffusion is always eject by the emitter LED. When this diffusion is inhibit by whatever mettle or ruminant object at a space, the IR diffusion gets reflex by the object can be detected by auditing the grantee LED. This morals can be used to detect vehicles on wayfarers or the on street and according to switch on the gradual streetlights, as deep as the vehicle blocks the IR sensor diffusion, stable to the road light close to the land.

This was a very basic step towards the optimization of traffic on road but this was not up to the mark. So to control the traffic in more smarter and efficient way this project has been made by modifying the previous idea. The new idea is doing its job good as it has been seen that traffic jams are reduced and also the crucial time of the citizens are saved.

Methodology:

a) The method is based on microcontroller.
b) The method contains IR transmitters and IR receivers what are placed on the left flank of street.
c) This IR method gets enliven when any vehicle go beyond on street among IR transmitter & IR receiver.
d) The microcontroller rules the IR method and gets enliven when vehicles are go beyond in among the sensors.
e) Based on various densities of vehicles, the microcontroller fix the aglow time of the traffic lights.

4.3 Block Diagram

The block diagram of the project contains a power unit and density detect unit. In this project, the power units are used to power the entire circuit used in the project. A sensor unit is used to detect the density of a lane, monitoring vehicle and give the accurate symbol.

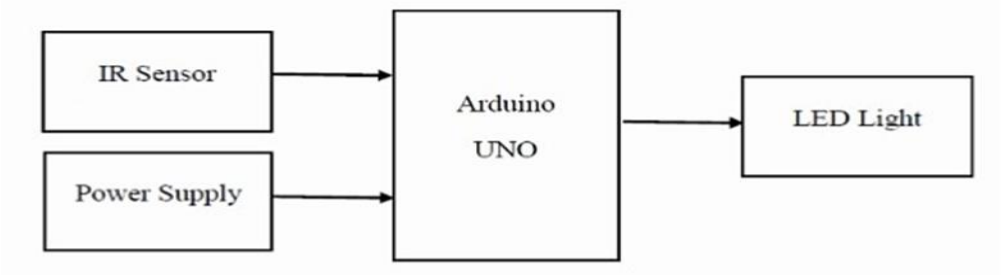

FIGURE 4.1: Block Diagram of Density Based Traffic Signal Control System (a)

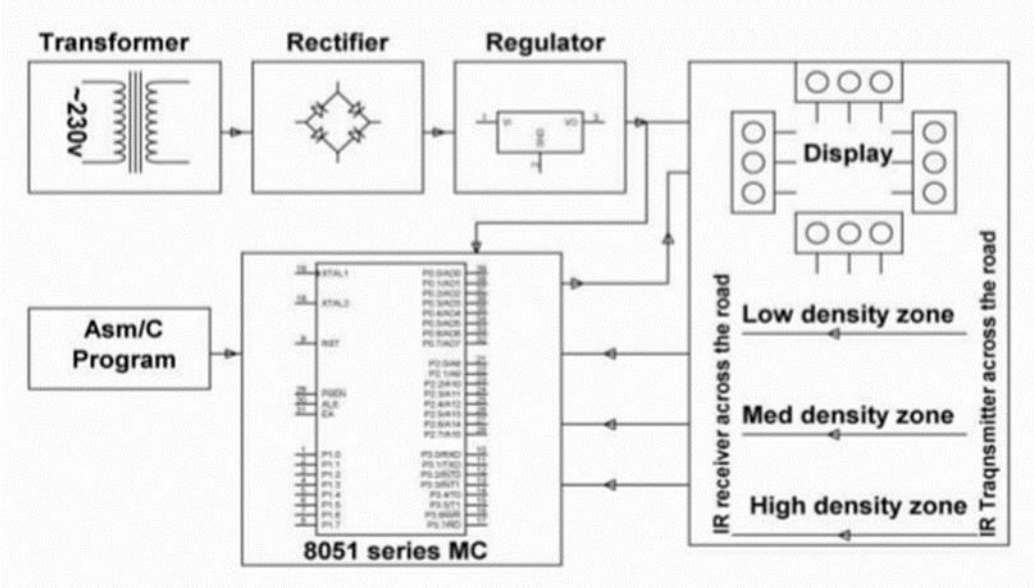

FIGURE 4.2: Block Diagram of Density Based Traffic Signal Control System (b)

4.4 Hardware Design

The project will help peoples who want to do something or make something with the help of Arduino. The project is designed in two parts, these are the software part and another one is the hardware designing. In this project we have used some basic components like IR (Inferred Ray) sensor as a density detector, LED and Microcontroller.

As a microcontroller we have used Arduino UNO Board here, which is perfect for building a new project or doing anything in the field of robotics or something that is smart to use. To use an Arduino we have to use the Arduino Software which free for all users and can be downloaded from http://www.arduino.cc. The Arduino program is based on C/C++ Programming language. And a huge collection of example is provided in their websites which are also free for all. And the software is one of the easiest software to use.

The hardware design of this project is very simple and efficient also. First of all we have designed the IR sensor. The IR sensor generally works as counter. And counter passes a signal after a significant number of gesture or movement is detected. Then we have designed the

whole circuit in the breadboard by the aid of microcontroller. Arduino UNO plank is the perfect choice to make the project more efficient and easy also.

In this control system we have used some basic components to design this circuit. These components are found easily at any electronics shops or markets. For counting we have made a light sensor with some basic components. The output of this circuit is connected to the Yellow, Green and Red lights of Traffic Signal.

The system was designed to be simple and the experimental setup included the prototype model of traffic lights showing lights from the four sides of a junction. The model included traffic lights each on the four sides; depicting red, yellow and green colors. These are designed using colored bulbs of red, yellow and green color. The input signal was given through four different switches to control the timings of four directions.

4.5 Full Circuit Design

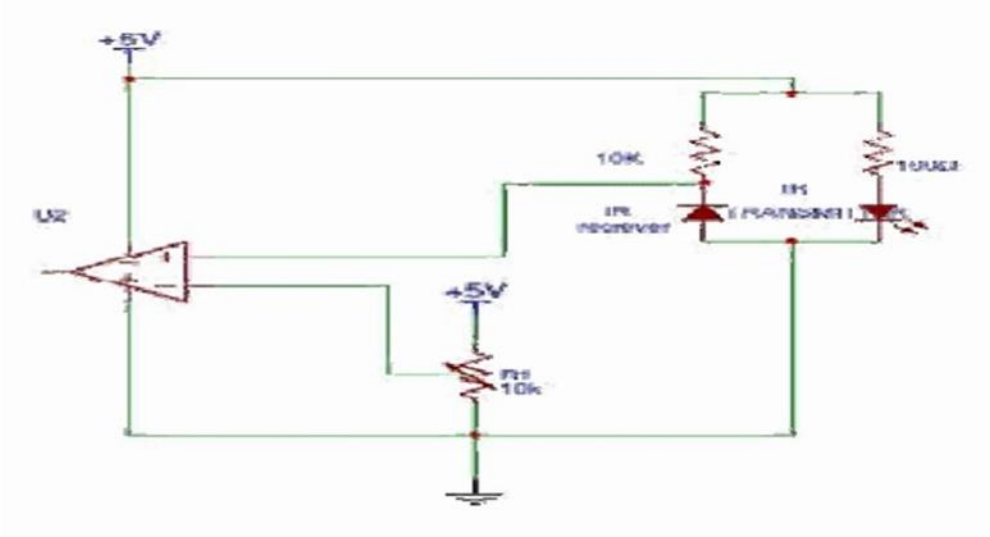

FIGURE 4.3: Circuit Diagram of Sensor Module

The circuit given shown in the circuit diagram tab complete logical circuit of traffic light control system. The main components are 2 input quad OR Gate IC 74LS32, NOT gate IC 74LS04, current driver IC ULN2003A and last timer IC 555.

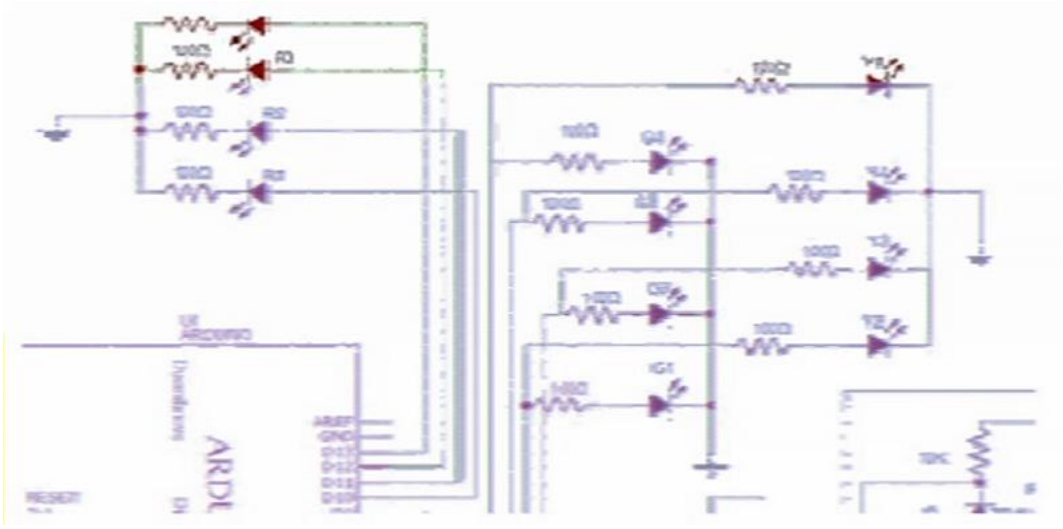

FIGURE 4.4: Circuit Diagram of Density Based Traffic Light Control System (a)

Both the inputs of all four OR gates are connected to all eight data pins D0-D7 of 25 pin D-type female connector. Four green LEDs are connected with all even pins D0-D2-D4-D6 and yellow LEDs are connected with all odd pins D1-D3-D5-D7. The output of all OR gates are given to all four RED LEDs through NOT gates. Further the even pins also drives relays (RELAY1A-2A-3A-4A) through current driver chip. The relay gives supply to IC555 that is connected in single shot mode. LDR is used to detect laser beam.

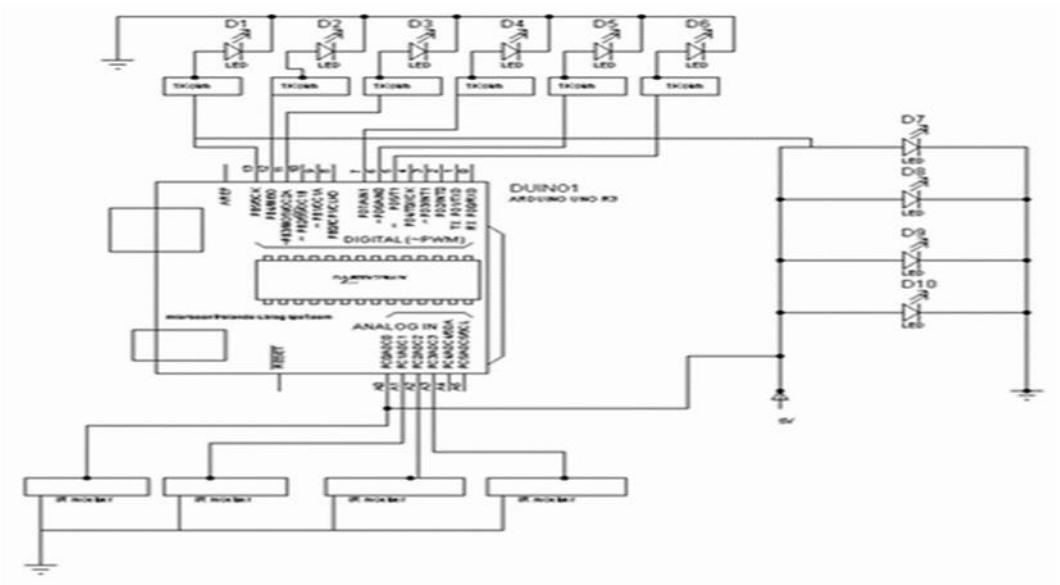

FIGURE 4.5: Circuit Diagram of Density Based Traffic Light Control System (b)

4.6 Schematic Diagram

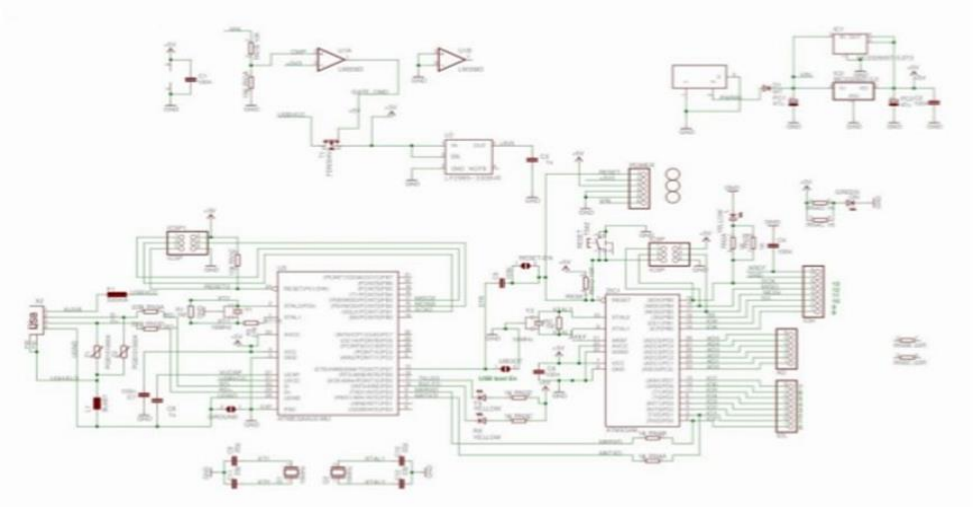

FIGURE 4.6: Schematic Diagram for Arduino Uno Board

Since it first debuted, the Arduino Uno has been a huge hit with electronics enthusiasts from beginner hobbyists to professional programmers. The Uno is a single-board microcontroller and its open-source platform allows us to extend the environment by using libraries to share your developments with the vast, growing Arduino community.

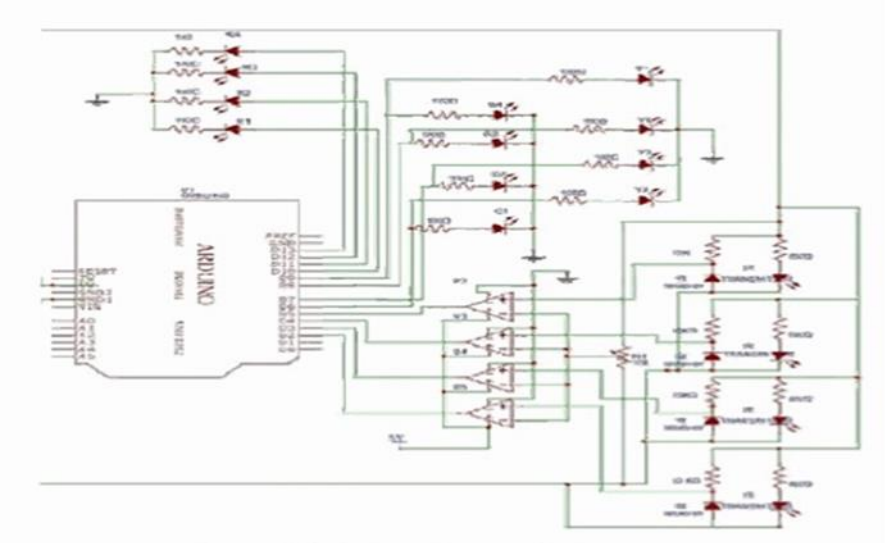

FIGURE 4.7: Circuit Schematic Diagram

The circuit diagram consists of signaling lights, ATMEGA 328 micro controller, Infrared transmitter, Infrared receiver, power supply.

4.7 Pin Diagram

The pin diagram of ATMEGA 328 microcontroller is given below:

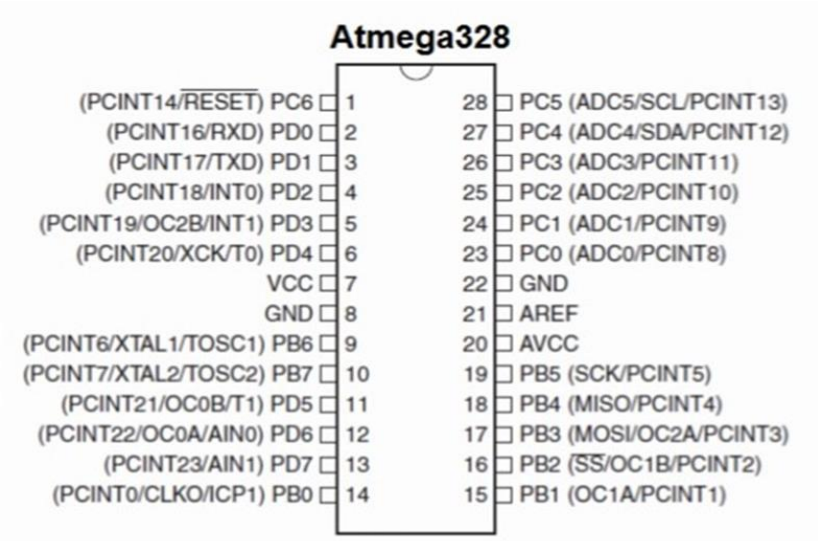

FIGURE 4.8: Pin Diagram of Arduino UNO Chip (ATMEGA 328)

ATMEGA328 is a highly exoteric microcontroller chip made by Atmel. It is an 8-bit microcontroller with 32K Flash Memory, EEPROM 1K and 2K Internal SRAM. The ATMEGA328 is one of the microcontroller chips used with exoteric Arduino Due-Milano' Ve cards. Arduino Due-Milano' Ve appears by any 1 to 2 microcontroller chips, or ATMEGA168, ATMEGA328. Of these 2, the ATMEGA328 chip is improved, much commencing. Dissimilar ATMEGA168 having 16K program memory and 512 bytes of SRAM internal flash, the ATMEGA328 has 32K program memory and 2K internal flash SRAM. ATMEGA328 has 28 on the map. It has 14 pin digital / S, 6 of which can be used while PWM and six analog input pins. These I / O 20 pins are on the map.

4.8 Software Development

To design the software we have to write the program inside the Arduino software. After writing the program we need to verify the program that the program has any error or not. After verification the software is uploaded to Arduino UNO board from the software by the aid of

USB cable of Arduino UNO plank.

The Arduino mobilized improvement environment (IDE), which is a cross-platform petition written in the programming dialect. It born from the IDE for the dialects Processing and Wiring. It was built for folk with no dense wisdom of electronics.

Arduino IDE software can be used in Windows, Mac or Linux conducting system. The software can be found at their own website. We have downloaded the software by the pursuant link http://arduino.cc/en/Main/Software. From that link you can found the latest version of the Arduino IDE software.

After installing the Arduino IDE now it's time to check the hardware is in proper condition or not. To check this first of all we have to join the Arduino UNO Plank to the computer by the aid of USB cable of Arduino UNO Plank. After connecting the hardware it's time to check the hardware with some small programs. In this case we have gone through the built in Blinking LED program. The program ran perfectly both in the IDE and Arduino UNO Board. And we got the confirmation that all the components are working properly and perfectly.

The Arduino IDE basically based on the C and C++ programming language. It's follows the Wiring library function of C/C++. When we write a program or Arduino design, we are round molding the use of Wiring library that is ancillary in the Arduino IDE. This Wiring library is helping us doing program simply and easily. The wiring library is helping use writing program or Sketch of Arduino by manage only two deeds like the "setup()" and the "loop()" function. Basically the wiring dialect is stimulated by the processing dialect. And the programming dialect of Arduino IDE is hereditary by the processing dialect. In this programming language the equivalent functions are known as "setup()". For programming any program with Arduino IDE those two functions "setup()" and "loop()" is must to use. It is mandatory for all programs. Whenever there is no necessity of using one of those functions, the also we have keep those functions in the program to run the program successfully.

4.9 Flowchart

The flowchart of this proposed method is as follows:

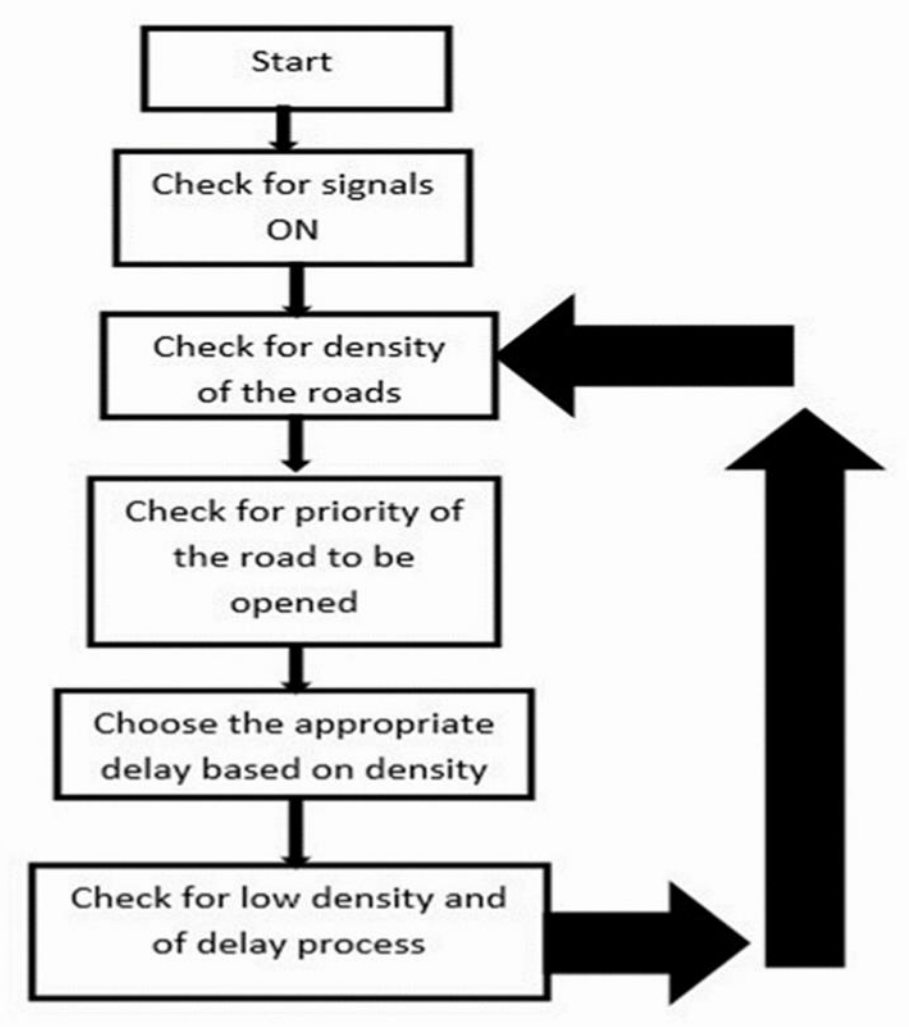

FIGURE 4.9: Flowchart of the Proposed System

4.10 Power Management

The power of the system will be provided by the battery or USB cable from our computer or force origin. We have to connect 12V battery or adaptor to the development board or switch on the supply.

4.11 Working With Arduino Software

First download and install the Arduino IDE for Mac, Linux or Windows to arduino.cc. Windows users also necessity to install a driver. Gather your plank via USB, start the Arduino application and elect Arduino Uno to the tools to plank menu. Bare the design table. Bare Examples: 01. Basics: Blink. Click the toolbar button to upload it to your plank.

The Integrated Development Environment (IDE):

Microcontroller needs software for programming. The Arduino plank has its own integrated development environment (IDE). It is gratis and anybody can download it from its official. That gives Arduino Plank to reach much users and it also helps it to get.

IDE Parts:

a) Compile: Before program "code" can be sent to the board, it needs to be converted into instructions that the board understands. This process is called Compiling.

b) Stop: This stops the compilation process.

c) Create new Sketch: This opens a new window to create news ketch.

d) Open Existing Sketch: This loads a sketch from a file on our computer.

e) Save Sketch: This saves the changes to the sketch.

f) Upload to Board: This compiles and then transmits over the USB cable to our board.

g) Serial Monitor: Until this point when our programs (sketches) didn't work, we just pulled out our hair and tried harder.

h) Tab Button: This lets you create multiple files in your sketch. This is for more advanced programming than we will do in this class.

i) Sketch Editor: This is where write or edit sketches

j) Text Console: This shows you what the IDE is currently doing and is also where error messages display if make a mistake in typing program.

k) Line Number: This shows what line number your cursor is on.

4.12 Working Procedure

Figure (4.10) shows the Automatic Street Light Control Based on Vehicle Detection Using Arduino UNO. The circuit diagram of the IR sensors are connected to the Arduino port pin number 2 to 5 respectively which is the input signal to the Arduino board and connect the ground of all the IR sensors to GND port. All the positive terminals of the LEDs, depicting the streetlights in the model, are given as the outputs of the Arduino signals, are connected to port pin number 6 to 13. Again connect the ground of all the LED's to GND port as per the circuit diagram. It works in accordance with the crossing the vehicle.

Initially the IR sensor is in LOW. When the vehicle moves past an IR sensor becomes HIGH, the positive terminals of the two or three LEDs, as per requirement, are made high through the Arduino output ports and hence they glow. As soon as the vehicle crosses one street light, the LEDs again switch off. And when the vehicle goes by the next IR sensor, the corresponding LEDs glow. This process continues. Since the street lights (LEDs) are not switched on continuously, lot of electricity will be saved.

We also added a red laser light in front of our street for which to give signal or massage from far way to the vehicles rider that the lane was stopped for traffic signal. Those who are not notice the traffic signal somehow, they will sure be see that red laser light and stop their vehicle.

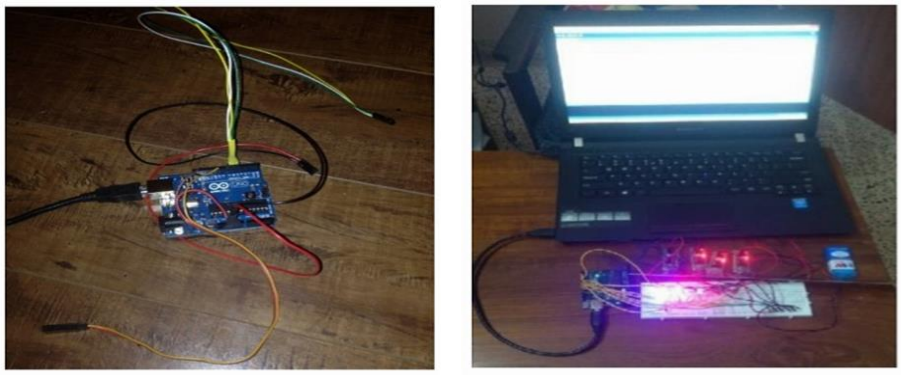

FIGURE 4.10: Density Based Traffic Light Control System & Vehicle Detection Using Arduino

The purpose of the system is to improve efficiency of existing automatic traffic signaling system. The timing will be calculated each time change automatically depending upon the traffic load. Proposed system will functioning based on traditional system along with automated signaling. Estimated traffic load on particular road will be used to calculate the required time duration for controlling of signal lights based on in comparison with the experimental results. System will be intelligent and will calculate the time every time and operate in a cyclic clockwise signal lights control. Maximum and minimum time limit will being maintained. It is to prevent over waiting of vehicle in queue of other lanes which would be found out experimentally. Controls of the signal will be routed through the microcontroller.

Circuit Operation:

It operates in two modes:
a) Normal mode &
b) Density mode.

Normal Mode:

In this mode of operation green, yellow and red lights change after a fixed time period like a typical traffic signal. Here, light from IR transmitter LED reach IR receiver without any interruption. IR sensor senses amount of cars passing through the road. By using Arduino, we can observe the voltage of IR sensor. When light from IR transmitter does not interrupted by vehicles, value of voltage is low (about 800). When voltage value is below 800, this mode is operated.

Density Mode:

When amount of cars increases, light of IR transmitter intersect by cars to reach the receiver. Then the voltage of IR sensor increases (about above 850). When voltage is below threshold value, normal mode is on; but above threshold values then the red signal becomes automatically green.

4.13 Operational Model

This project is redact by setting IR transmitters, receivers, microcontrollers and leads at a 4-way junction as shown in Fig (4.11).

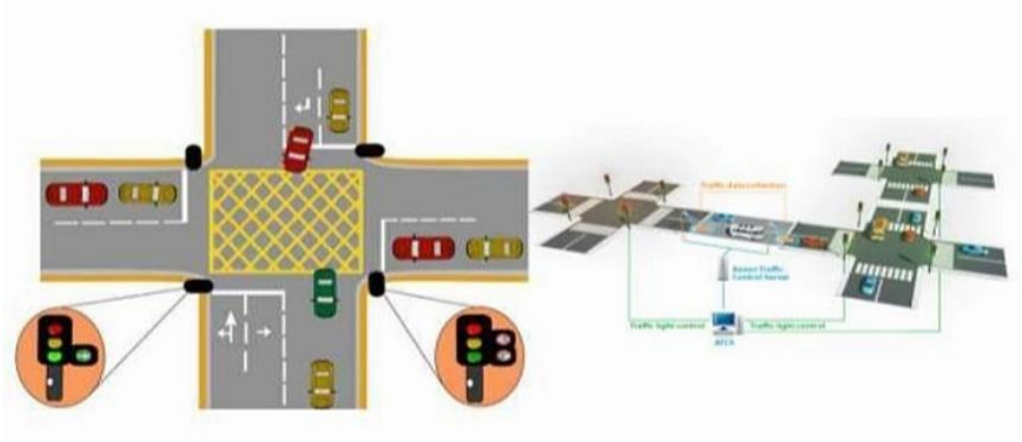

FIGURE 4.11: Basic Layout of the Traffic Control System

FIGURE 4.12: Design & Implementation of a Density Based Traffic Light Control System

Figure 4.12 shows the physical appearance of our whole the project. Most of the circuit and components are placed in a street shape plank. IR sensors monitoring the density of the vehicle in a lane and give the signal to ARDUINO UNO and that process the traffic monitoring lights automatically. Inside that street shape plank, there is one 9V battery connected with ARDUINO UNO by jumper wire. Figure 4.11 shows the basic layout of our proposed method.

4.14 Summary

This chapter mainly focused on implementation and the design of the system with a block diagram. In this chapter simulation is divided into some parts and operation of each part is discussed briefly. The output of our project shown in that chapter. We also discussed about the research and methodology of our whole project.

CHAPTER 5

PROJECT ANALYSIS

5.1 Introduction

In this chapter, we will discuss the outputs and the advantages of our project. There is a variation of coding and variation of using the software in this project. We will also discuss the time delay and efficiency and limitations of this project.

5.2 The Output Of This Project

In the count testing unit we have found that it works properly. Still the counter sometimes provides wrong results because of IR sensors sometimes may absorb normal light. Here first of all we tested the counter only with an LED, after finding that the counter works properly then we added that with the Arduino UNO Board.

After testing all the components we have combined all the components together as like as the circuit design diagram and found that the application works correctly. When a certain number of vehicle passes through the IR sensor one side of the road gets stopped and the other road will be free to move forward.

After knowing about the above said hardware and using appropriate programming for the Arduino UNO microcontroller, the following things have been obtained. The fig:(5.1) shows when there is normal traffic at the junction the traffic light continues as time delay. The fig:(5.2) shows that where there are more vehicle in any lane as compared to the other lane is given priority and the signal is green as soon as the lane is not cleared.

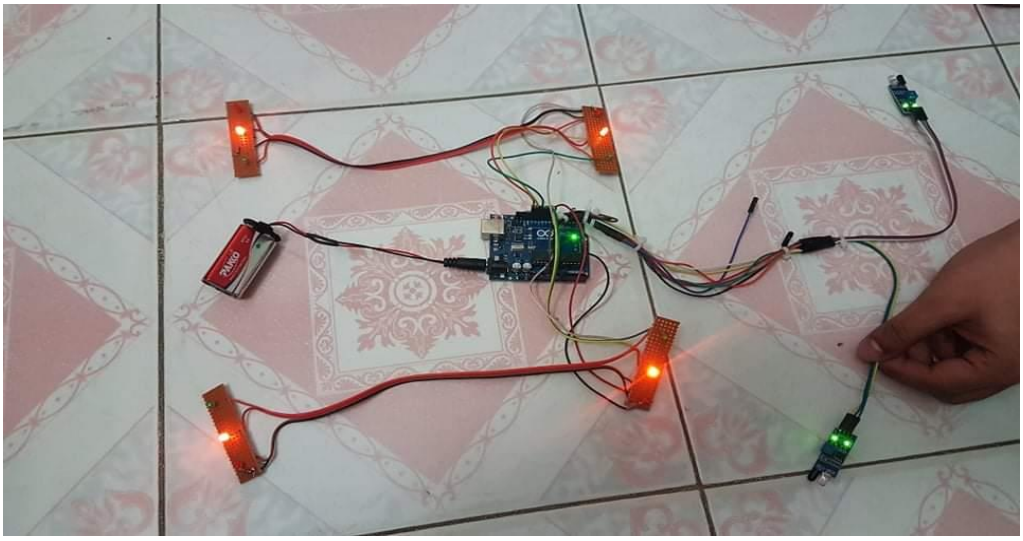

FIGURE 5.1: Normal Operation

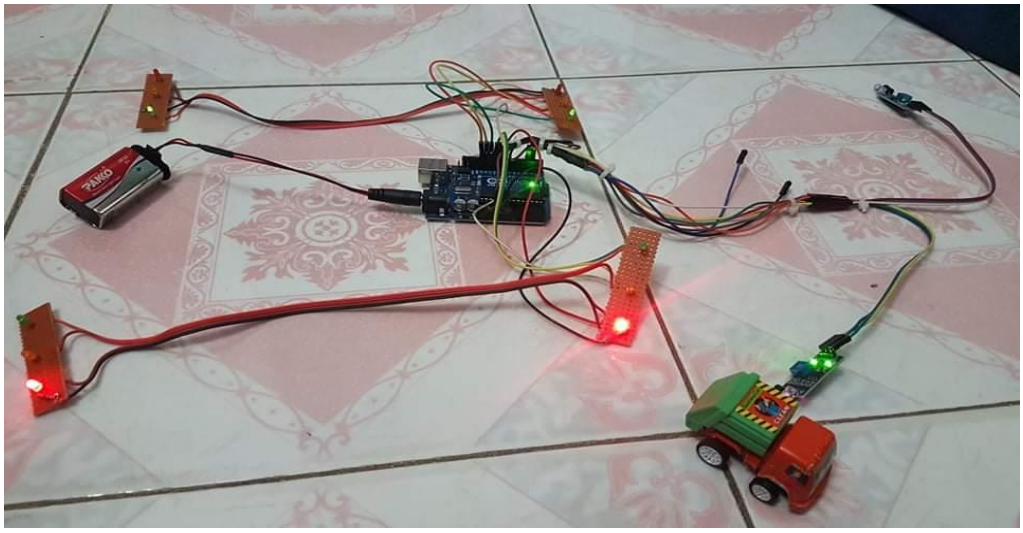

FIGURE 5.2: After Detecting Vehicles

Operation:

During operation, traffic light controller works as conventional traffic lights. First lights on side 1 turn green for 30 seconds and all other sides are red. Vehicle coming from side 1 can either go straight or turn right. After 30 seconds green light on side 1 turns OFF and yellow

lights on side 1 and 2 turn ON respectively. On side 3 and 4 red lights continue to remain ON. After 5 seconds the yellow lights on side 1 and 2 turn OFF. Simultaneously green light on side 2 turns ON and red light on side 1 turns ON. Vehicles coming from side 2 can now either go straight or turn right. Hence this process goes on and on. Vehicle riders also see the proposed red laser light from front of the stop lane road, that's why they get warning before.

FIGURE 5.3: Traffic Light Controlling Operation

Result:

The simplicity of this density based traffic light control system gives us the opportunity for direct implementation.

5.3 Benefits Of The Project Over The Existing Traffic Method

In our project, there are many benefits over existing traffic monitoring method for the vehicle blockage limiting. Our project increases the validity of the traffic monitoring method with proper direction and monitoring of the vehicle density in a cost useful way and makes it much more owner in a friendly way. Our project also give the red laser symbol at stop lane vehicle's rider properly.

5.3.1 Accuracy

It is important to understand that the Arduino board includes a microcontroller, and this microcontroller is what executes the instructions in the program. The ATMEGA328 microcontroller is the MCU used in Arduino UNO R3 as a main controller. ATMEGA328 is an MCU from the AVR family; it is an 8-bit device, which means that its data-bus architecture and internal registers are designed to handle 8 parallel data signals. ATMEGA328 has three types of memory:

a) Flash memory: 32KB nonvolatile memory. This is used for storing application, which explains why you don't need to upload your application every time you unplug Arduino from its power source.

b) SRAM memory: 2KB volatile memory. This is used for storing variables used by the application while it's running.

c) EEPROM memory: 1KB nonvolatile memory. This can be used to store data that must be available even after the board is powered down and then powered up again.

Since the system is a sensor based traffic monitoring method. If the sensor finds any vehicle, it sends a message to ARDUINO UNO plank and then ARDUINO gives the right symbol for traffic monitoring. We can see from the graph (figure 5.4) that the level of accuracy of locating the vehicle's is 100%. We take 5 data and 5 times successfully delivered and every time the detection of vehicle's density is successfully received. So, the accuracy level of the density detection process is 99% approx.

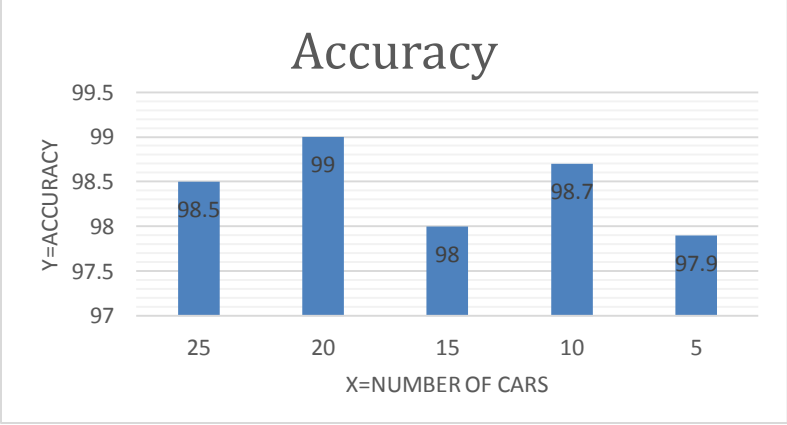

Figure 5.4: Graphical representation of density rate (X axis=sec, Y axis=Number of Data)

For faster traffic transfer at crossroads

a) Reducing travel times

b) Greater efficiency

c) Fuel saving

d) Save people time

e) Reduction of injuries.

The traffic light is controlled based on the instantaneous traffic density as measured which helps to overcome the problems faced in fixed time traffic light signal. The project firstly focuses on the priority marked vehicles which helps to serve humanity in a better way.

In the prospective of Bangladesh, this proposed system is significantly accurate and so much essential for reducing the traffic blockage.

5.3.2 Delay

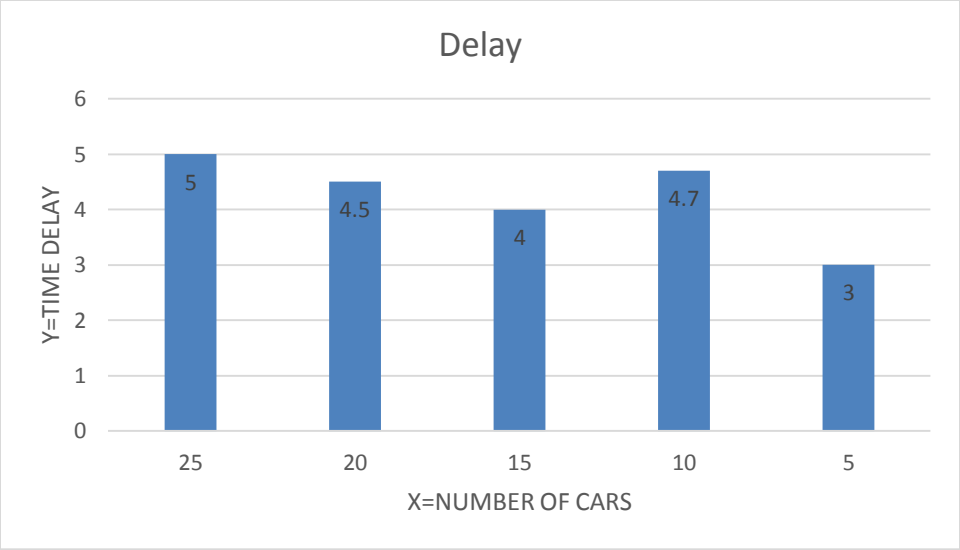

Figure 5.5: Graphical representation of GPS delay (X axis=sec, Y axis=Number of Data)

Figure (5.5) shows the graphical representation of the density detection time delay. We take 5 data. First data takes 5 second to get the density detection and the 2nd data takes 4.5 second

and so on. The average time delay is 5 second to track the density of the vehicles at a lane.

5.3.3 Power Assumption

The MCU accepts supply voltages from 1.8 to 5.5 V. However, there are restrictions on the operating system; for example, if you want to get the maximum output (220uF) of the system, you need a supply voltage of at least 4.5 V.

1. Working voltage: 1.8—5.5V DC
2. Standby current: ≈2.5mA
3. Operating temperature: -20 to +55 degree Celsius
4. Storage temperature: -40 to +85 Degree Celsius
5. Working ambient temperature: -20℃~+70℃
6. Dimensions: 21 (L) × 8 (W) × 4.5(H) mm
7. Coverage: 180 degree (IR sensor)

5.3.4 Cost

SL	Brand & (Model name)	Specifications	Cost (TK/=)
1	ARDUINO UNO	Open-Source Hardware And Software Device Which Contains Programs	6,000
2	IR (Infra Red) Sensor	A Electronic Sensor Which Measures Infrared Light Radiating From Objects In Its Field Or View	500
3	Base Board (Cock-shit) And Color Papers	For Build A Structure	100
4	Toy Cars	For Measuring Density At An Street	100

Table 2.1: Cost Analysis

This system have low cost to design the circuit and the maintenance of the circuit is good; that's why this proposed system is easy convenience to handle. It consume low power and it avoids wastage of time due to the traffic. In the base of our developing country, this is the most appropriate and efficient system. By using this system configuration we tries to reduce the possibilities of traffic jams at our country by minimizing it's cost and we get success in that department.

5.3.5 Longevity

This system is fully automatic. It has low power consumption. It provides the easy access in the traffic light. Low cost to design the circuit, maintenance of the circuit is good. That's why; the longevity of this system is much grater than older traffic control system. But if the system is down, then the maintenance is not so difficult and cost-effective for our traffic control engineer's. But it needs a lot of maintenance especially in developing countries because of the road ground de-formations. By using this microcontroller IC we can create many more control to the appliances and it can be repaired automatically by the proper use of Arduino UNO microcontroller. So, the life age of this system is grater than our traditional traffic control system.

5.4 Limitations Of This Project

a) IR sensors sometimes may absorb normal light also. As a result, traffic system works in improper way.
b) IR sensors work only for fewer distances.
c) We have to arrange IR sensors in accurate manner otherwise they may not detect the traffic density.
d) The infrared sensor may output erroneously, dust particles are recorded at a receiver signal transmitter.

5.5 Summary

In this chapter, we discussed the outputs and the result of our project. We discuss the output part wise. We also discussed the time delay and efficiency. The advantage of the benefits of a project is a very important topic. We also discussed it.

CHAPTER 6

CONCLUSION

6.1 Conclusion

The Density Based Traffic Control System was designed and developed to decrease traffic congestions or traffic jam that is occurred by the traffic control system. We have used 5v and 3.3v from Arduino UNO Board. We have used IR sensor. With the help of IR Sensor we have counted the number of vehicle passed through the sensor.

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC‘s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

In this project we are succeeded to minimize the traffic congestions created by the fixed traffic light system with the help of Arduino and improved algorithm. That is dependent on real time rather than a fixed time. We have noticed that our intelligent traffic control system is much efficient and the cost of production is very low. As a result “Density Based Traffic Control System” is suitable enough to use commercially. This model could be implemented with few modifications as a source of revenue; as charging station for battery operated vehicles. The project may be very well used in where the traffic signals is kept and in many other places where we need to full fill the need of the automation. In the future we implement the project’s idea in the industries. By using this density based traffic signal system in future we can know traffic density in the city and so that remedies can be made according to that.

In this paper we have studied the optimization of traffic light controller in a city using Arduino and IR sensors. A traffic light system has been designed and developed with proper integration

of both the hardware and the software. This interface is synchronized with the whole process of the traffic system. Automatically, this project could be programmed in any way to control the traffic light model and will be useful for planning proper road system.

At the end we have designed and developed a Arduino based Intelligent Traffic Control System, and fixed the problem that we had before. Finally we have reached our goal successfully.

6.2 Challenges & Future Scope

With the help of this project there is an opportunity of doing a big project in future. The applications those are stated above are some demo applications. But there is a huge possibility of developing this project. Because both the number of vehicles will increase and the roads will decrease proportionally with respect to time. Initially for the limitation of funding and time we have developed an intelligent traffic control system for two way road. Here we can see a big future work scope in this sector. We have faith that we will be able to complete all the features needed for the ultimate application in near future.

a) We will implement this system for traffic controlling in a 2 lane junction.
b) We will update this system with when a pedestrian try to cross the road during green signal it will turn on an alarm and warn the pedestrian and traffic police.
c) We will update this system with when a vehicle try to move even during red signal it will turn on an alarm to warn the driver of the vehicle and the traffic.
d) We can use GSM module to track location of car.
e) We can use camera for security purpose.
f) We can use image processing technique.
g) Multiple sensors can be placed beside the road to measure the vehicle speed between the appearances of the two peaks can be calculated. Thus speed can be determined by the dividing the distance between two sensors with the calculated time.

This project can bring Bangladesh's digital revolution. Building an intelligent traffic city with

automatic transmission is possible because vehicles can communicate wirelessly with the traffic system and make decisions on their own, making the autopilot more a reality. This project can replace the current traffic system and open more avenues for a world ready for the future. Moving with the new & renewable energy sources, this system can be upgraded by replacing ordinary LED modules with the solar based LED modules. With utilizing the latest technology and advance sensors, we could serve the same purpose of automatically controlling the street lights much more effectively both by cost and manpower. That's why, we took this proposed system as a challenge for development of our country as a digital Bangladesh.

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SOURCE CODE

Introduction

The programming language is a set of command or instructions which use to create a software program. The programming language is a coded language which used by programmers to write instruction that a computer can understand what a programmer wants. It usually refers to high-level languages. Programming languages are used to create programs to control the behavior of a device. A compiler is a special program that processes representations written in a particular programming language. It can also turn them into machine language. There are many programming languages have been created, mainly in the computer field, and many more still are being created every year. Simulation is an effort to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. This allows the designer to determine the correctness and efficiency of a design before the system is actually constructed in a cost-effective way.

Programming Codes

While the density based traffic signal will be ON or OFF thus kind of matter is written in this code. The count code is:

```
int aa1=14;
int aa2=13;
int aa3=12;
int aa4=11;
int bb1=10;
int cc1=9;
int bb2=8;
```

```
int cc2=7;
int ambb1=6;
int amb=0;
int pp4 val=0;
int pp3 val=0;
int pp2 val=0;
int pp1 val=0;
void setup()
{
pin(bb1,output);
pin(cc1,output);
pin(bb2,output);
pin(cc2,output);

pin(ambb1,input);

pin(aa1,input);
pin(aa2,input);
pin(aa3,input);
pin(aa4,input);
}

void loop()
{
 amb=dr(ambb1);
 if(amb==high)
    {
      dw(cc1,low);
      dw(bb2,low);
      delay(25000);
```

```
        dw(cc1,high);
        dw(bb2,high);
       }
 else
    {
     pp4val=dr(aa4);
     pp3val=dr(aa3);
     pp2val=dr(aa2);
     pp1val=dr(aa1);

if(pp2val==high&&pp1val==low&&pp4val==high&&pp3val==low)//equal to both lane
{
dw(cc2,low);
dw(bb1,low);
delay(15000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
dw(cc1,low);
dw(bb2,low);
delay(20000);
dw(cc1,high);
dw(bb2,high);
```

```
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
}

if(pp2val==high&&pp1val==high&&pp4val==high&&pp3val==high)//equal to both lane
{
dw(cc2,low);
dw(bb1,low);
delay(35000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
dw(cc1,low);
dw(bb2,low);
delay(35000);
dw(cc1,high);
```

```
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
}
if(pp2val==low&&pp1val==low&&pp4val==low&&pp3val==low)//equal to both lane
{
dw(cc2,low);
dw(bb1,low);
delay(5000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
dw(cc1,low);
dw(bb2,low);
delay(5000);
dw(cc1,high);
```

```
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
}

if(pp2val==high&&pp1val==high&&pp4val==low&&pp3val==low)//lane==1
{
dw(cc1,low);
dw(bb2,low);
delay(35000);
dw(cc1,high);
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
       }
}
if(pp2val==high&&pp1val==high&&pp4val==high&&pp3val==low)//lane==1
{
```

```
dw(cc1,low);
dw(bb2,low);
delay(35000);
dw(cc1,high);
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
dw(cc2,low);
dw(bb1,low);
delay(20000);
dw(cc2,high);
dw(bb1,high);
 amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }

}
if(pp2val==high&&pp1val==low&&pp4val==low&&pp3val==low)//lane==1
```

```
{
dw(cc1,low);
dw(bb2,low);
delay(20000);
dw(cc1,high);
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
dw(cc2,low);
dw(bb1,low);
delay(5000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
}
if(pp2val==low&&pp1val==low&&pp4val==high&&pp3val==low)//lane==2
```

```
{
dw(cc2,low);
dw(bb1,low);
delay(20000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
dw(cc1,low);
dw(bb2,low);
delay(5000);
dw(cc1,high);
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }

}
```

```
if(pp2val==low&&pp1val==low&&pp4val==high&&pp3val==high)//lane==2
{
dw(cc2,low);
dw(bb1,low);
delay(35000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
dw(cc1,low);
dw(bb2,low);
delay(5000);
dw(cc1,high);
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
}
```

```
if(pp2val==high&&pp1val==low&&pp4val==high&&pp3val==high)//lane==2
{
dw(cc2,low);
dw(bb1,low);
delay(35000);
dw(cc2,high);
dw(bb1,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
dw(cc1,low);
dw(bb2,low);
delay(20000);
dw(cc1,high);
dw(bb2,high);
  amb=dr(ambb1);
  if(amb==high)
      {
        dw(cc1,low);
        dw(bb2,low);
        delay(20000);
        dw(cc1,high);
        dw(bb2,high);
      }
```

```
    }
      }
}
```

We connected the LED with Arduino and write a program for operates that. Codes are:

```
    #identify westswitch 4
    #identify eastswitch 14
    #identify wr 3
    #identify wy 2
    #identify wg 1
    #identify er 13
    #identify ey 12
    #identify eg 7
    #identify y sparkle time 1000
    boolean traffic west = T; // west = T, east = F
    int keep up time = 15000; // total time for let traffic keep up
    int shiftlag = 15000; // total time inly color shifts
    void setup()
    {
    // setup digital I/O pins
    pin(er, output);
    pin(ey, output);
    pin(eg, output);
    pin(wr, output);
    pin(wy, output);
    pin(wg, output);
    pin(westswitch, input);
    pin(eastswitch, input);
    // set initial state for lights - west side is g first
    dw(wg, high);
```

```
dw(er, high);
dw(ey, low);
dw(eg, low);
dw(wr, low);
dw(wy, low);
}
void loop()
{
if ( dr(westswitch) == high ) // req west>east traffic keep up
{
if ( trafficwest != T )
// only maintain if traffic keep uping in the inverse (east) way
{
trafficwest = T; // shift traffic keep up sign for west>east
delay(keep up time); // pay time for traffic for keep up
dw(eg, low); // shift east-facing lights from g
// for y for r
dw(er, high);
dw(ey, low);
delay(shiftlag);
dw(ey, high);
delay(shiftlag);
for ( int a = 0; a < 10; a++ ) // sparkle y light
{
dw(wy, high);
delay(y sparkle time);
dw(wy, low);
delay(y sparkle time);
}
dw(wg, high);
dw(wy, low);
```

```
    dw(wr, low); // shift west-facing lights from r for g
    }
    }
    if ( dr(eastswitch) == high ) // req east>west traffic keep up
    {
    if ( trafficwest == T )
    // only maintain if traffic keep up is in the inverse (west) way
    {
    trafficwest = F; // shift traffic keep up sign for east>west
    delay(keep up time); // pay time for traffic for keep up
    dw(wg, low);
    // shift west lights from g for y for r
    dw(wy, low);
    dw(wr, high);
    delay(shiftlag);
    dw(wy, high);
    delay(shiftlag);
    for ( int a = 0; a < 10; a++ ) // sparkle y light
    {
    dw(ey, low);
    delay(y sparkle time);
    dw(ey, high);
    delay(y sparkle time);
    }
    dw(eg, high);
    dw(ey, low);
    dw(er, low); // shift east-facing lights from r for g
    }
    }
}
```

Summary

In This Chapter, we focused on programming language which is used for our project. By this programming command, we can easily construct the density based traffic monitoring method by ARDUINO UNO and IR sensor. This code is so much appropriate for creating less blockage of traffic at 4 lane street by worldwide.