"Dynamic Traffic Light Monitoring System"

Project report submitted in partial fulfillment of the requirement for the

degree of Bachelor of Technology

in

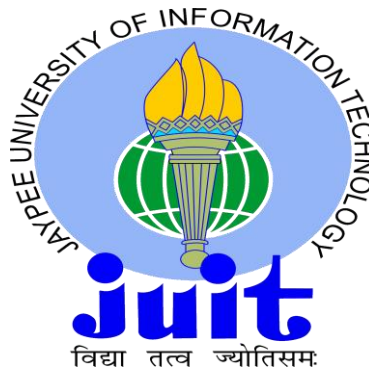**Computer Science and Engineering/Information Technology**

By

Ayush Gupta (151237)

Under the supervision of

Dr. Ruchi Verma

to

Department of Computer Science & Engineering and Information

Technology

Jaypee University of Information Technology Waknaghat, Solan-

173234, Himachal Pradesh

Candidate's Declaration

I hereby declare that the work presented in this report entitled **"Dynamic Traffic Light Monitoring System"** in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering/Information Technology** submitted in the department of Computer Science & Engineering and Information Technology**,** Jaypee University of Information Technology ,Waknaghat is an authentic record of my own work carried out over a period from August 2018 to December 2018 under the supervision of **Dr. Ruchi Verma** (Assistant Professor(Senior Grade), Computer science and Engineering).The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Ayush Gupta (151237) ………………..

This is to certify that the above statement made by the candidate is true to the best of my knowledge.

Dr. Ruchi Verma
Associate Professor(Senior Grade)
Computer Science & Engineering
Dated:

ACKNOWLEDGEMENT

I would like to express our special thanks of gratitude to my project guide Dr. Ruchi Verma who helped me in conceptualizing the project and actual building of procedures used to complete the project. I would also like to thank our Head of department for providing us this golden opportunity to work on a project like this, which helped me in doing a lot of research and we came to know about so many things.

Secondly I would like to thank our family and friends who guided us throughout the project so as to complete our project on time.

Thanking you,

Ayush Gupta (151237)

CONTENTS

ABSTRACT

The growing population trend has always been an alarming issue as it results in a constant need to modify our systems and the working orders need to be changed drastically to meet the common demands. One of the major problem faced by the citizens is of Congestion. The present implementations of ITS in the country, in several cities, are focused primarily on the traffic volume calculation rather than informing the public. The proposed idea will significantly reduce human involvement as the data uploaded to cloud will be computed without any human inputs. The connected network will be using neural networks that significantly reduce the risk of network failure, keeping the system updated at all instances. The fault tolerance will be improved by re-routing the network through additional subsidiary nodes present to channel the data in case of a failure. Updation of data and manipulations to the server will be dynamic, data flowing through algorithms and the public only able to see the simplified computed data. Our proposition uses technologies that are used currently in traffic systems but takes them a step further as they use both software (through codes) and hardware (through sensors) components to provide an almost error free management system.

Chapter 1: INTRODUCTION

1.1 INTRODUCTION

 The growing population trend has always been an alarming issue as it results in a constant need to modify our systems and the working orders need to be changed drastically to meet the common demands. One of the major problem faced by the citizens is of Congestion.

"Every day the world is getting smaller" can be aptly related here as due to a surge in the number of people, the space is getting limited.

Traffic congestion has emerged in recent years majorly due to an increased ability of people to buy vehicles to suit their needs. The improved qualities of roads and transporting network has further contributed to the cause. Above all, there comes an added pressure by the tourists as their movement is highly uncertain and their needs need to be fulfilled in order to generate revenue from tourism industry. Problems that cannot be targeted at this stage can at least be monitored.

Thus, the issue of traffic congestion needs to monitored at present as the situation is not going to get any better in the near future.

1.2 Present Methods of Traffic Monitoring

The present methods of monitoring traffic are mostly surveillance based and a large part needs human interaction. Humans are prone to errors and also a lot of human labor is required in the current system.

The proposed Idea will reduce the human involvement to minimum possible and also will be a highly efficient way of monitoring and, to a large extent, addressing the problem of traffic congestion.

1.3 Internet of Things

The Internet of Things (IoT) is an arrangement of articles or "things" implanted with devices, programs, sensors and system availability, that enables all the items to collect and exchange the required data. The Internet of Things grants the identification of all the objects and also allows them to be controlled remotely crosswise over existing framework of systems, creating open doors for direct understanding between PC based frameworks and our physical world, prompting a boost in proficiency, precision along with additional financial advantages. Every thing that is recognizable extraordinarily from its implanted processing framework anyway has the ability to work within the present Internet foundation. Various uses and applications of IoT are:

- Monitoring the environment

- Automating homes and structures

- Managing the framework

- Medical and in addition medicinal services frameworks

- Manufacturing process

- Management of vitality assets

1.4 Objective

• To develop a prototype for a dynamic traffic light monitoring system using arduino as well as IR sensors.

• The aim is to reduce traffic congestion in the area.

• To provide services such as e-challan for traffic rules violation.

• To come up with the prototype to survey user geographical area, which intends to help the user to save his time during congestion in the region.

• To make available a real time survey of the intended region.

• To give continuous, updated and current information regarding traffic in the region using web app as the notification source.

• Updation to Cloud Servers.

• Fault Immune Network for data flow.

• Using tag sensors to check permits.

1.5 Methodology

The Idea is based on an entry-exit model and real time surveillance procedure wherein the entry and exit of vehicles will be monitored. The primary objective of the model is to provide a system to maintain traffic in a complete area including maintenance and violation check and control.

The checkpoints for monitoring will be located at various points within a city, starting from the boundary of the city following through to all possible road diversions and also including the major hubs of traffic congestions. At these checkpoints, the number of vehicles in and out will be checked in real time environment and hence we will be able to calculate, through previously calibrated software, the amount of traffic inside a particular area. The real time data will be uploaded to the cloud servers, from where they will be available to the Apps designed specifically for the purpose.

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┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│  Signal Generation  │      │                     │      │                     │
│  Through Sensors &  │ ───> │   Signal Analysers  │ ───> │        Cloud        │
│      Cameras        │      │                     │      │                     │
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│                     │      │ Generation Of Relevant│     │                     │
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│  Through App/Webapp │      │Congestion, Average Delay│   │                     │
│                     │      │      Time etc.       │      │                     │
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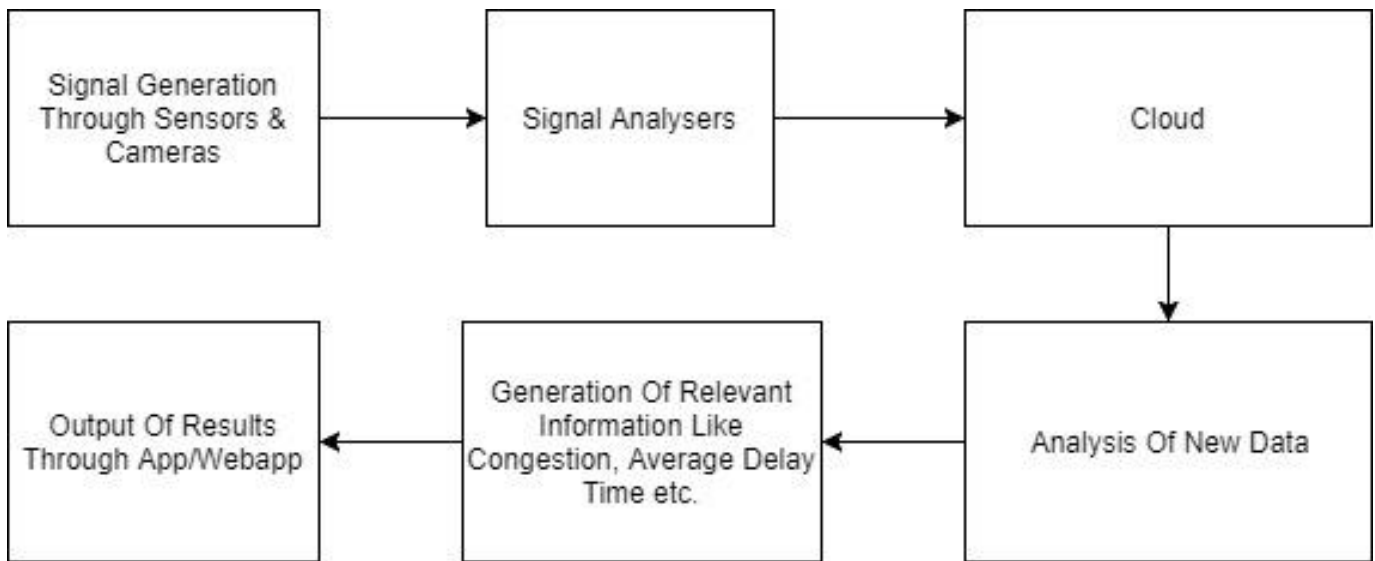
1.5.1 Usage of the Proposed Model at different Levels

- From Government and Police point of view:

With such a model in place in a city, the local police department will be able to keep a complete check on all of the vehicle movement in the city.

The violation control will be efficient as any such activity will be reported directly to the department along with required proof.

The department will be able to monitor the complete city transport system with minimum human manpower.

Advantage points over current system:

1. Keeping record of vehicles incoming and outgoing.

2. Getting proof for traffic violation.

3. Minimum Police Officers required.

4. Complete record of all movement over cloud server.

5. Real time live feed of roads.

6. Alert of present traffic jams.

- From Citizens and Tourists' point of view:

The public will be able to know the present traffic situation of an area by the provided Apps. Tourists will be able to analyze the traffic congestion and hence plan accordingly.

Chapter 2: LITERATURE REVIEW

2.1 **An Approach to Intelligent Traffic Management System Using a Multi-agent System: Hodjat Hamidi ,Ali Kamankesh**

Lately, two issues were appointed in the examination of movement security and activity administration in the state of crisis, being overcasting process and multi-specialist frameworks. As per an article written by Ducasse, 2010, a refreshed portable framework has been recommended that kept up the wellbeing by electronic information, made capacity to peruse data utilizing overcasting process. In this article, a connected portable programming application empower to get wellbeing data and think about dependent on drivers, Android and also help specialists in surveying pictures that are related to one another, even remotely. According to an article written by Roulym, a remote sensor arrange was utilized for the computerization of a process to collect information, and then the gathered Data had to be exchanged using the overcasting procedure ensure the facility (wellbeing). Coming to the other technique, that Kofi proposed in the year 2009, which supposedly has abilities in area of information connection and administrations for acquiring critical information from a circulated working framework. Multiple operator frameworks were utilized an innovation bolster observing, treatment and get street data. As of late, analysts have been shown more enthusiasm for the utilization of procedures and techniques for man-made reasoning to ready to explain complex issues identified with movement frameworks . A framework has been conveyed dependent on tackling procedures that isolated the issue of basic leadership according to sole and sub-issues by trying to utilize free associations as per the called operator. Every specialist could have utilized these diverse strategies, learning in addition to assets to handle information errands. A specialist is indicated an autonomous association which takes certain exhibitions for completion of an arrangement of objectives and could contend as well as coordinate different operators when searched through individual objectives. Operator can be performed using a progression for highlights along the capacity for abusing extensive measure for space information, defeating wrong passage, gaining basic leadership condition progressively and having spoken with others in common dialect. Multi –

operator techniques, shaped during mid-90s have capacity for demonstrating perplexing frameworks are known for giving answers for various free units. In these frameworks (multi-operator frameworks) that they are performed dependent on the presence specialists in the taking care of issue framework apportioned to each sub-issues and in this methodology, utilized totally autonomous specialists and factors and isolated issues dependent on the working qualities. A significant part of the work has been centered around the reproduction and displaying, however some of them introduced in genuine examples. A couple of works that utilized reproduction strategies for multiple operator techniques to reenact and that later created a multiple specialist engineering technique. Swarm insight was utilized profitably to demonstrate complexities of activites in addition to transportation forms. Ants settlement streamlining (ACO) have been utilized well in the taking care of transportation issues specifically ventures, for example, the voyaging businessperson issue (TSP) and utilized vehicle directing issue. Moreover, amid the two previous years, working along with moving parameters were utilized dependending on insect conduct because of relative connect to one another to adjust the dynamic conditions. The fundamental confinement of this examination is that it isn't think about the ongoing unique data and endeavors to settle the insect conduct with multi-operator frameworks and additionally multi-specialist recreation model to connect with activity administration.

2.2 Intelligent Traffic Monitoring System: Satya Priya Biswas, Paromita Roy, Nivedita Patra , Amartya Mukherjee and Nilanjan Dey

Movement clog of urban areas has been considered a noteworthy issue for the most part in creating nations; to experience this, numerous models of movement framework that were brought into light by diverse researchers. Diverse methods were proposed for making the movement framework more quick witted, dependable, and strong. This paper exhibits the different methodologies made toupgrade the movement framework over the globe. A similar report was made of the distinctive

potential inquires about the insightful activity framework rises. Key purposes for each examination were featured, making a decision based on executing them in creating nationsn for example, India.

The proposed model chiefly focuses on the accompanying variables:

(i) The unnecessary utilization of time cut in specific path, when less vehicles are being driven through.

(ii) A path where a crisis vehicle is present, for example, rescue vehicle, it likewise needs to sit tight in case of an urgent requirement.

(iii) Path with varied movement needs to wait for a similar time range.

Regularly, green flag during rush hour gridlock indicator stays on for settled interim for every street. In the current framework, blockage of vehicles may occur if bunches of vehicles are holding up in a specific path and the other path which has less quantities of vehicles is made free. The work introduces a survey of the current research done in field and attempts to create a framework appropriate for creating nations. The venture has two destinations, which are, first, figuring the length of the vehicles out and about for the stream of the movement easily without clog and, second, creating need based flagging which will give the need to the crisis vehicles, for example, rescue vehicle. The microcontroller can be programed effectively which gives scope for organization better calculations in future. The sensors are to be fitted in favor of the streets and associated with the controller at the crossing point. These are some furious employments which are to be managed before executing the framework, yet once actualized, it will make our movement framework more helpful and urban areas more intelligent.

2.3 Traffic congestion monitoring system: **David K. Martell** , **Ian R. Williams**

As indicated by a first part of the present development there is given a movement clog observing framework, involving identifying implies arranged at an area and serving to distinguish stationary or moderate moving activity units at said area, transmitting implies speaking with said recognizing intends to get from said distinguishing implies signals speaking to data as to blockage at said area and orchestrated to transmit signals speaking to said data, and accepting means conveyed by activity units and masterminded to get the transmitted signs and to display said data at the activity units

conveying said getting implies. As indicated by a second part of the present development there is given an activity blockage observing framework, involving a majority of recognizing implies arranged at individual areas remote from one another and serving to distinguish stationary or moderate moving movement units at their separate areas, and to emanate signals speaking to data as to clog at said areas, transmitting implies organized to transmit signals speaking to said data, and getting implies conveyed by activity units and masterminded to get the transmitted signs and to exhibit said data at the activity units conveying said accepting means, the accepting means at every unit being orchestrated to show the data as to blockage at said particular areas all the while. As indicated by a third part of the present development there is given a movement blockage observing framework, involving recognizing implies arranged at an area and serving to identify stationary or moderate moving activity units at said area and to produce signals speaking to data as to clog at said area, transmitting implies masterminded to transmit signals speaking to said data, and getting implies conveyed by movement units and organized to get the transmitted signs and to display said data at the movement units conveying said accepting means, said getting implies serving to exhibit said data as previously mentioned consistently for whatever length of time that said data is pertinent. As per a fourth part of the present development there is given a movement clog checking framework, including recognizing implies arranged at an area and serving to distinguish stationary or moderate moving activity units at said area and to produce signals speaking to data as to blockage at said area, transmitting implies organized to transmit signals speaking to said data promptly after the discharge of that data by said identifying implies, and getting implies conveyed by movement units and masterminded to get instantly the transmitted signs and quickly to show said data at the activity units conveying said accepting means. As indicated by a fifth part of the present creation, there is given an activity clog observing framework, including identifying implies arranged at an area and serving to recognize stationary or moderate moving movement units at said area, and to emanate signals speaking to data as to blockage as to said area, transmitting implies organized to transmit signals speaking to said data, and getting implies conveyed by activity units and masterminded to get the transmitted signs and to show said data outwardly at the activity units conveying said accepting means.

As indicated by a 6th part of the present innovation, there is given a movement clog observing framework, including identifying implies arranged at an area and organized to recognize infra-red

radiation produced by stationary or moderate moving activity units at said area, timing implies masterminded to decide when the recurrence of beats of infra-red radiation from said activity units at said area falls underneath a limit an incentive for a foreordained day and age, and flag emanating implies orchestrated to discharge a flag upon said recurrence falling beneath said edge an incentive for said day and age. Inferable from the above parts of the innovation, it is conceivable instantly, outwardly and amid all the day and age of pertinence, to instruct drivers with respect to blockage at a majority of areas all the while. Also, faculty are not expected to watch the area constantly. The units of activity might be people on foot, cyclists, or engine vehicles, for instance. As indicated by a seventh part of the present innovation, there is given a vehicle conveying getting implies masterminded to get data as to movement clog at an area and to get messages, inconsequential to the activity blockage, for a man at said vehicle, and visual presentation implies associated with said accepting means and serving to show said data and said messages. Attributable to this part of the creation, a driver can get outwardly activity clog data as well as close to home messages, for instance. As per an eighth part of the present innovation, there is given a vehicle conveying accepting means masterminded to get data as to activity blockage at an area in one zone of a majority of zones of a vehicular course organize, and visual showcase implies associated with said getting means and serving to show, specifically, a graph of said arrange or a chart of said one zone with said data.

2.4 Adaptive Traffic Light Control with Wireless Sensor Networks: Malik Tubaishat, Yi Shang and Hongchi Shi

We imagine a savvy street framework were the aggregate outing time is least because of limiting the normal holding up time on activity lights. Notwithstanding limiting the normal movement holding up time, we might want to see a street framework which can streamline the activity stream by using the free streets. Huge measure of power and time is squandered because of green movement light without any vehicles following the same path. Numerous arrangements had been brought into light to unravel road turned into parking lot. Most customary activity reconnaissance frameworks utilize meddlesome sensors, including inductive circle locators, small scale circle tests, and pneumatic street tubes. Notwithstanding, these sensors disturb activity amid establishment and fix, which prompts a staggering expense establishment and support. The frameworks could be likewise mind-

boggling expense and their exactness relies upon condition .This paper introduces an ongoing versatile framework dependent on remote sensors that can possibly build up another period of acquired from standard inductive circles. The analyses in demonstrates that conveying remote sensor organize for movement observing gives %99 of recognition rate continuously. Utilizing remote sensor organize for transportation applications furnishes estimations with high spatial thickness and precision. A system of remote attractive sensors offers a lot more noteworthy adaptability, lowers establishment and support cost as compared to circle, radar or video indicator frameworks. Chen et al. proposed a model for Remote sensing organization of the Canny Transportations Framework (Minds). Minds framework is utilized for the data social occasion and information exchanging. In this framework three kinds of Minds hubs are utilized; the unit of vehicle as a singular unit, roadside unit with the two side of street, with crossing point unit on the convergence. The unit of the vehicle estimates its parameters, exchanges them with units. The unit assembles data of vehicles, and exchanges with convergence unit. Crossing point unit collects, then examines data coming from different units, passing them to the technique sub framework, that thusly ascertains a proper plan as per the preset advancement target, (for example, most extreme throughput, least holding up time, and so forth.) Chiefly, the convergence unit needs to know what number of vehicles in each path will achieve the convergence before the flag stage closes. In any case, there is no enough exchange about how this data helps the convergence unit. Body planned a portable dispersed sensor processing framework called Cartel. Cartel hub's a portable installed PC coupled with an arrangement of sensors. Every hub assembles, then processes readings of sensors, before conveying them to a focal entryway, where data is put away for further examination in a database. When all is said in done, it's made simple to gather, convey, picture heterogenous information received from irregularly associated versatile hubs. It is conveyed six vehicles for almost more than a year for breaking down drive times anddmetropolitan Wi-Fi arrangements, along with certain automative diagnostics. In spite of the fact that this framework has possibilities for smoother drive time by gathering data about the movement, yet it doesn't take care of the activity issue. That is, just vehicles with CarTel hub can profit by this framework.

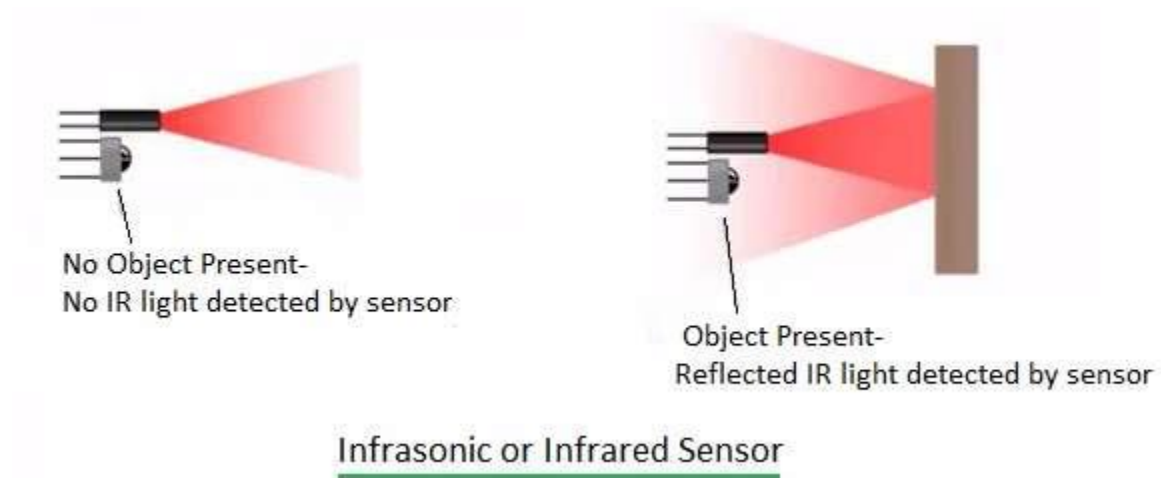# Chapter 3:System Development

3.1   Tools and Technologies used

3.1.1 Hardware Used

1.IR Sensors
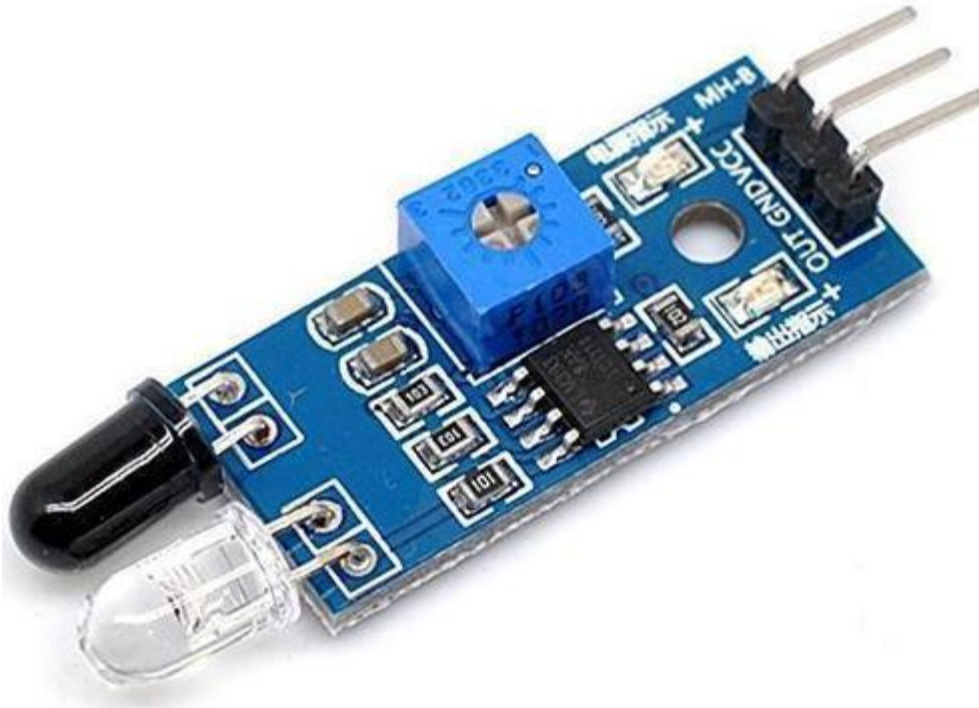
Infrared sensor can be defined as an electronic gadget which detects some parts of the environment. It is capable of recognizing movement. Sensors like these estimate infrared radiation, in opposition to producing the IR radiations and hence, is also known as a detached IR sensor. All the articles transmit some kind of radiations that provide warmth, according to a rule of the infrared range. Certain kinds of radiations can't be seen by our eyes, but can be identified

using this sensor. When photons of the IR light fall on the photodiode, they yield voltages with changse according to the amount of IR light received.

No Object Present-
No IR light detected by sensor

Object Present-
Reflected IR light detected by sensor

Infrasonic or Infrared Sensor

2.Digital Speed Sensor

TYPICAL SPEED SENSOR

A computerized sensor of speed is a kind of tachometer. It's a gadget that is utilized for measuring a vehicle's wheel revolution speed. For most of the part comprises of a pickup and toothed ring. Wheel speed sensor was at first used to supplant the mechanical linkage from the street wheels to the speedometer, disposing of link breakage and improving the measure development (end every single moving part with the exception of the needle/spring gathering). With the approach of mechanized driving guides, for example, electronic ABS, the sensor likewise given wheel speed information to the controllers to help the administrator in keeping up control of the vehicle. The vehicle Speed sensor is likewise utilized for the correct changing up of gears for the vehicle support.

Raptor II

Speed Sensor

Spoke Magnet

Bracket

USB Charger Cable

Hex Key

Cable Ties

**Crank Arm Magnet**
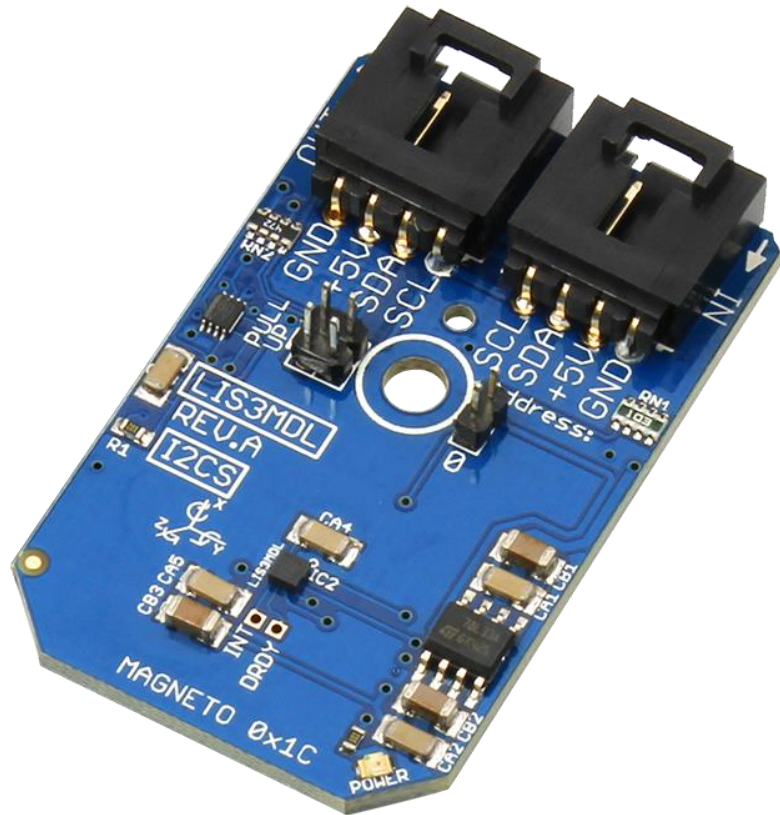
3.Magnetometers

A magnetometer or attractive sensor is an instrument that estimates attraction—either the charge present in an attractive material or course, quality, relative difference in the attractive field present at any specified area. Compasses could be called a basic kind of magnetometer which estimates the direction of any attractive field present around. The primary magnetometer equipped for estimating unquestionably the attractive power was imagined by Carl Friedrich Gauss in the year 1833 after which eminent advancements during the nineteenth century came through with the Corridor impact. Magnetometers, generally are used for estimating the field throughout the world and according to geophysical overviews, in order to identify inconsistencies of various kinds. Another use is in the military for the identification of submarines. Therefore, some nations like the US, Australia and Canada, control the circulation of these magnetometers by tagging them as military innovation. These devices could be used as metal indicators: they can only identify ferrous metals but at a bigger profundity than the regular locators; equipped to recognize extensive items like, vehicles, at a large distance, while the range of a metal finder rarely exceeds 2 meter. Nowadays magnetometers had to be scaled down so that they could be fused with incorporated circuits, with ease.

How does a Magnetometer work?

Construction & working!

gyroscope
dsPIC
USB interface
magnetic field sensor
accelerometer
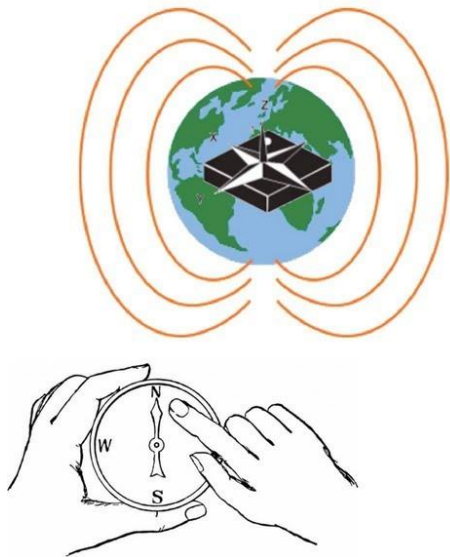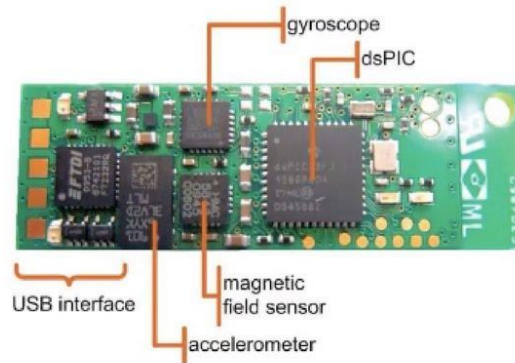
4.CCTV/Camera

Closed circuit TV (CCTV), also known as video surveillance, is use of camcorders for transmitting a flag to some particular place the too, on a restricted arrangement of screens. It differs from communicated TV since the flag is not straightforwardly transmitted and instead it makes use of point to multipoint (P2MP), point to point (P2P) and work wired remote connections. In spite of the fact that all camcorders fit this definition, the term is regularly connected to those utilized for reconnaissance in zones that may require checking, for example, banks, stores, and different territories where security is required. Despite the fact that Video telephony is now only called 'CCTV' from time to time, one exception is the using of the video in separate instructions, where is the critical tool. Observation of the general society used the CCTV regularly in various regions all around the world. The usage of body worn camcorders has presented another type of observation, regularly used in law implementation. Video reconnaissance led to the creation of a critical discussion regarding the offsetting of its usage

with the people's right to protection not becoming a problem in public. In mechanical plants, the CCTV hardware is also used for watching the bits of the procedure from a centralised control room. The CCTV frameworks can also work persistently or as necesaary for the screening of any specificied occasion. Another kind of CCTV, with advanced video recorders (DVRs), gives the recordings to conceivably numerous years, along with an assortment of value, execution of the choices and additional highlights like, the movement discovery and email alarms. Recently, decentralized IP cameras, and certain outfitted with megapixel sensors, bolster recording specifically for organizing joined capacity of gadgets, and inward glimmer for the remain solitary task.

5.Raspberry Pi
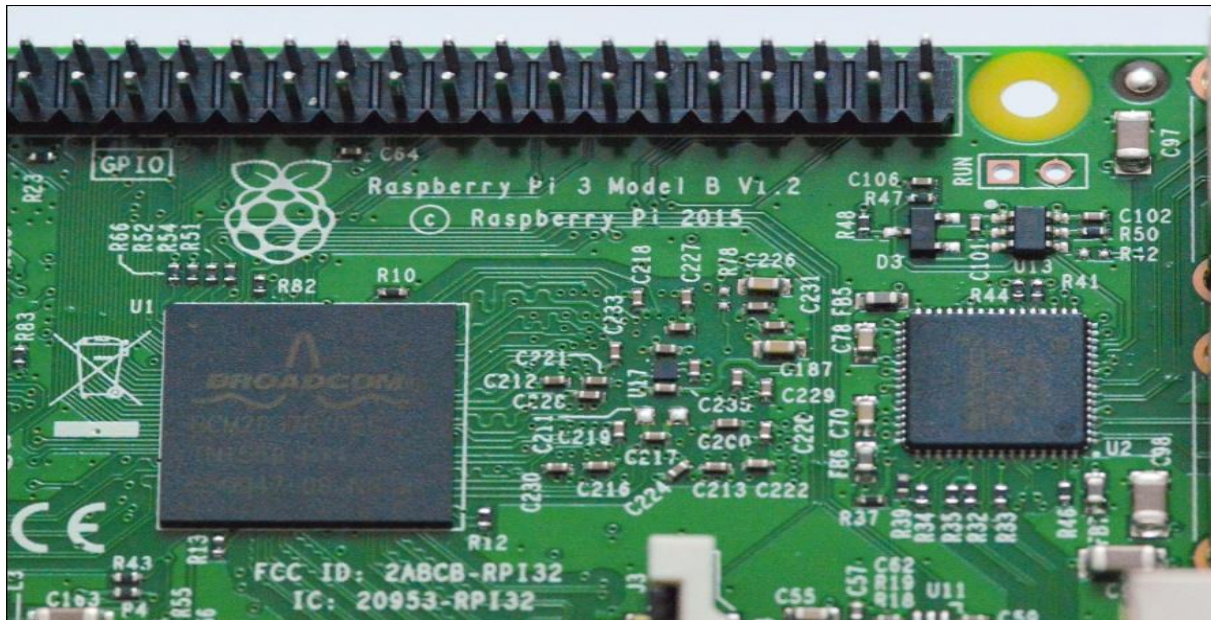
Processor that is used by Raspberry Pi system is a BroadcomBCM2835 system-on- chip (SoC) multimedia processors. This implies that large number of the components, which includes its central processing unit and graphics processing units along with various audio components, video components and other communications infrastructure, are provided on a single set. It's the SoC design that is the main point of difference between Broadcom processors and those found in personal computers. In addition, pi employs a divergent instruction set architecture (ISA), which we call ARM.

Raspberry Pi has the advantage of running on just 5V 1A power supply that is supplied by the micro-USB port present on the chip itself. The Raspberry Pi is primarily designed to work on OS named as GNU/Linux.

|	**Arduino Uno**	**Raspberry Pi Model B+**	**Intel Edison**
Price	$30	$35	$50 (board not included)
Size	7.6 x 1.9 x 6.4 cm	8.5 x 5.6 x 1.7 cm	3.55 x 2.5 x .39 cm
Memory	0.002MB	512MB	1 GB
GPIO	14	40	40
Clock Speed	16 MHz	700 MHz	500 MHz, 100 MHz
On Board Network	None	10/100 BaseT Ethernet socket	Dual-band (2.4 and 5 GHz) Wifi, Bluetooth 4.0
Multitasking	No	Yes	Yes
Input voltage	7 to 12 V	5 V	3.3 to 4.5 V
Flash memory	32KB	Micro SD card	4 GB eMMC
USB	One, input only	Four, peripherals OK	One, peripherals OK
Operating System	None	Linux distributions	Yocto Linux v1.6
Integrated Development Environment	Arduino IDE	Scratch, IDLE, anything with Linux support	Arduino IDE, Eclipse, Intel XDK

6.Arduino
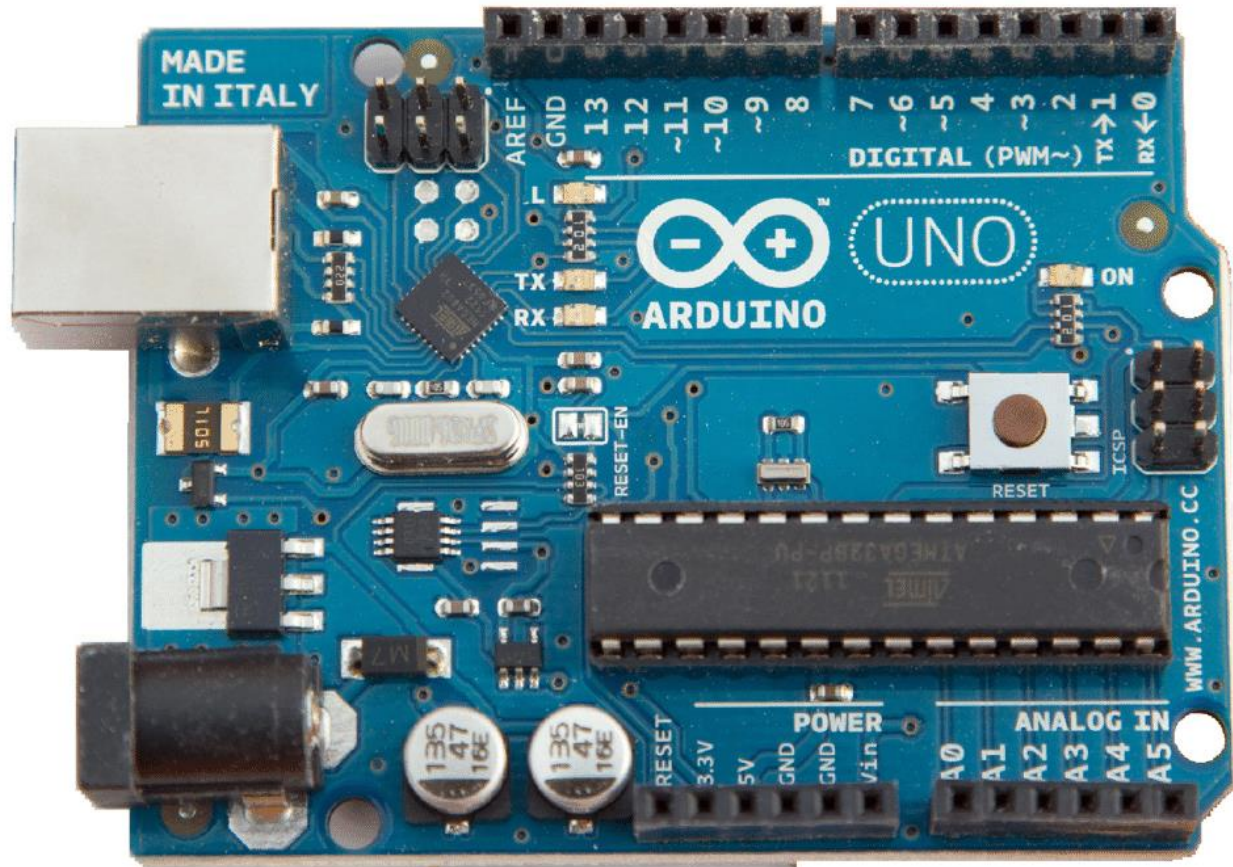
Arduino is an equipment that consists of controllers and chips and are to designed in an efficient way to make the complex tasks easier.It is used to coordinate various sensors and its working. It has an authorisation regarding its making and then it can be programmed by any of the client. Arduino sheets are available in preassembled frame and are in ready to use form. This board structure consists of microchips and controllers. Boards are embedded with the sets of programmed input output sticks that are interfaced to other boards for cross functioning. These boards also contain USB port which are programmed for its usage. The working of these micro

controllers is modified by coding in c/c++. Beside using the normal compilers available, it has own IDE.
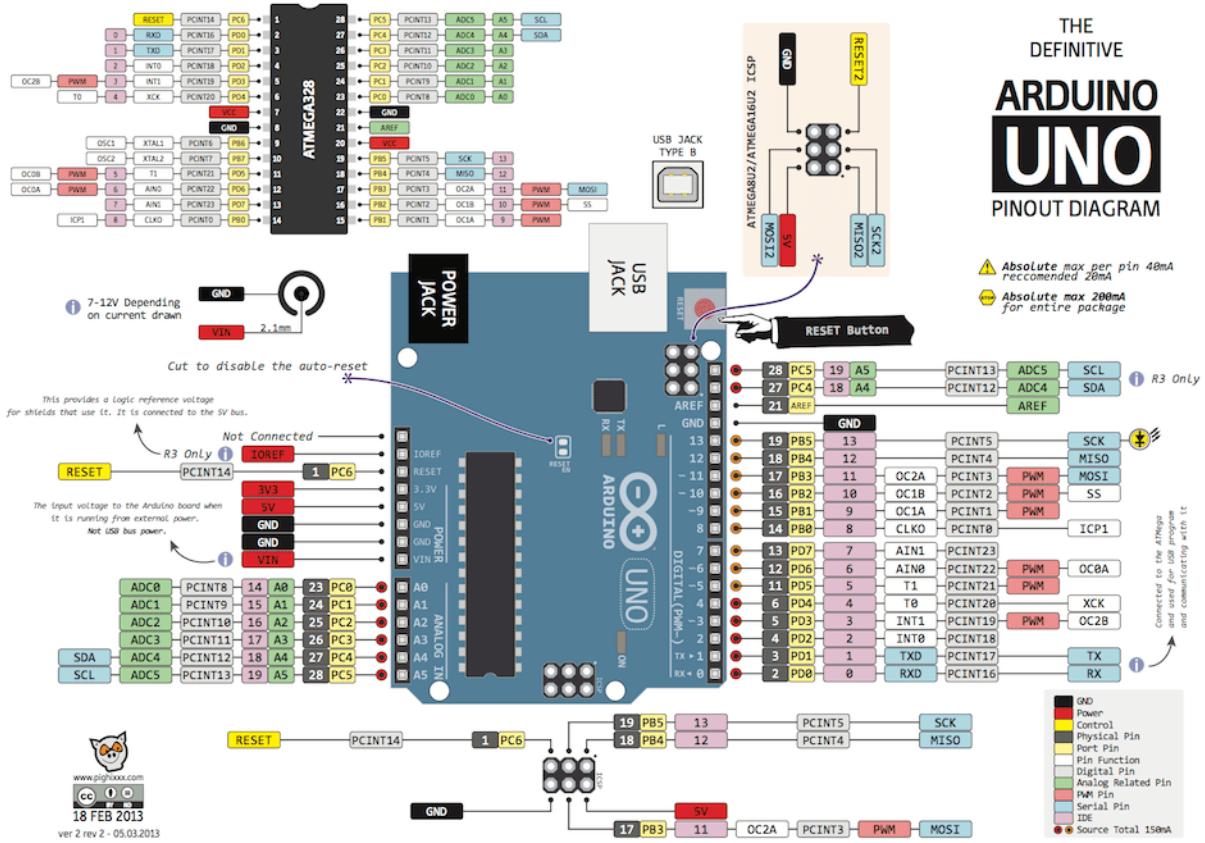
3.1.2 Software Used

1.Jupyter Notebook

Jupyter notebook allows us to code in a web browser. It's a mix of codes , instructions and output and all of this information is displayed in-line in one web page on a web browser. Which is very useful to write a code which tells a story since we can run code on different lines getting different outputs without worrying about whole code running altogether. It runs on a local-host created by the pc. After the work is completed CTRL-C is used to stop all the kernels and terminate the server which is been created. It has a great advantage of working on different lines each line can be used to get its own output while we are using it for developing an application. Code written on this platform is in python language which itself is easy to use which makes our overall programming and development easy.

2.Python

Python is a general purpose high level programming language which can be used to make different type of applications like console application, desktop application, web application, mobile application, machine learning and IOT applications. It uses very simple and straight forward syntax so it's very useful for the beginners to understand the syntax and work upon it. It is case sensitive language and an object oriented language which can be stated as that each and every variable made in pyhton is automatically an object. It is a dynamically typed language which means variables which are used while coding any application there data types are finalized while code is running. In python we use indentation instead of curly braces as we use in different programming platforms so indentation is very helpful since it makes the code more readable , we use a variable without it's declaration that means we need not specify the data type of any variable. It is an interpreted language which means it uses an interpreter instead of compiler.

Features:
- It's main emphasis is on code readability.

- It provides automatic memory management.

- It is dynamically typed.

- It has a very large library which includes large number of predefined functions .

- Multi-paradigm programming language(Object oriented, procedural,etc).

- With python interactive interpreter it is easy to check python commands.

- It is platform independent language.

3.Firebase

It is real-time database that is stored in cloud and provides an API (application programming interface) for storing and sync data in real time. It could act as a single point storer of data from multiple devices and also for multiple use-cases even sync to other clients. Firebase comes with many services apart from providing a cloud hosted database.

Firebase Auth can authenticate users using only client-side code eliminating the demand of code on server side. It supports login providers such social networking sites. Besides, it includes a user management system that allows developers to build systems that can authenticate users with email and password stored in Firebase.

Firebase cloud messaging (FCM): This is a cross platform messaging platform .When user sign in to app firebase will receive credentials form the user which can be either related to social networking sites or stored previously in realtime firebase. This credentials are forwarded for authentication to this module of firebase that will verify this on backend and return the response to client.
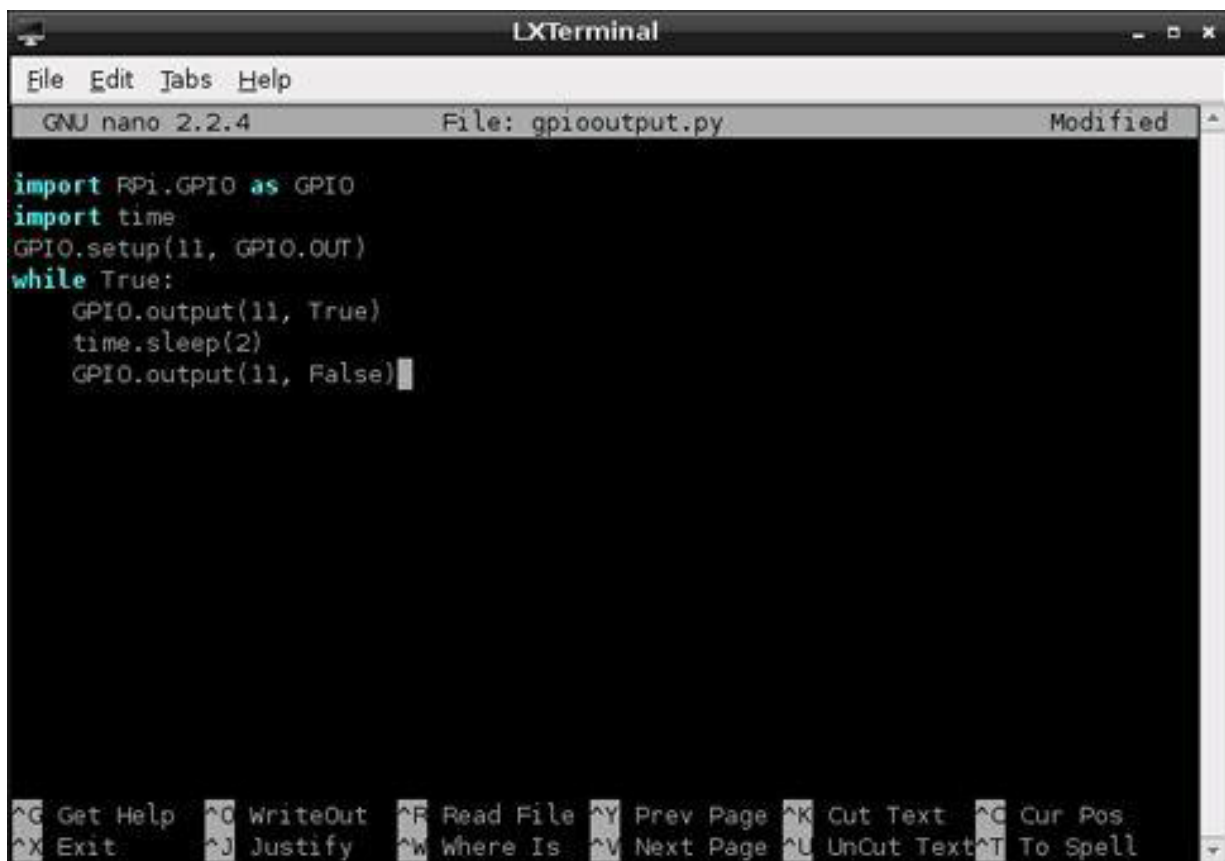
The Firebase Realtime Database is a cloud based database that inherently implies that it is not stored physically. Since data is stored on cloud real time synchronisation of information can happen. It is particularly useful for cross platform applications, when all clients share one Database instance and whenever data is updated all the clients receive the updates in realtime. Data format is based on JSON.

The Realtime Database is a NoSQL database and therefore varies significantly in terms of its functionality to relational database. It has immense utility for applications in which there is

realtime response. It can serve the needs of multiple users and without any compromise on reliability and responsiveness.

Advantages:

• It provides support for ios, android, os x and makes it highly flexible.

• It eliminates need for server side bulky code or complex server infrastructure.

• Scalability without disturbing the process.

• It benefits cloud, so no setup is included.

• Data storage is based on native JSON that is simple to execute.

• Developer need not worry about nuances of storage and synchronization.

• It coordinates nicely with systems like Angular JS. So it's extremely valuable and permits you to make an application in a brief timeframe.

3.2 Design

3.2.1 **Entry Exit Model**

The legend reads: "Indicates sensors placed along the road to detect the presence of a vehicle. 4 in each lane"
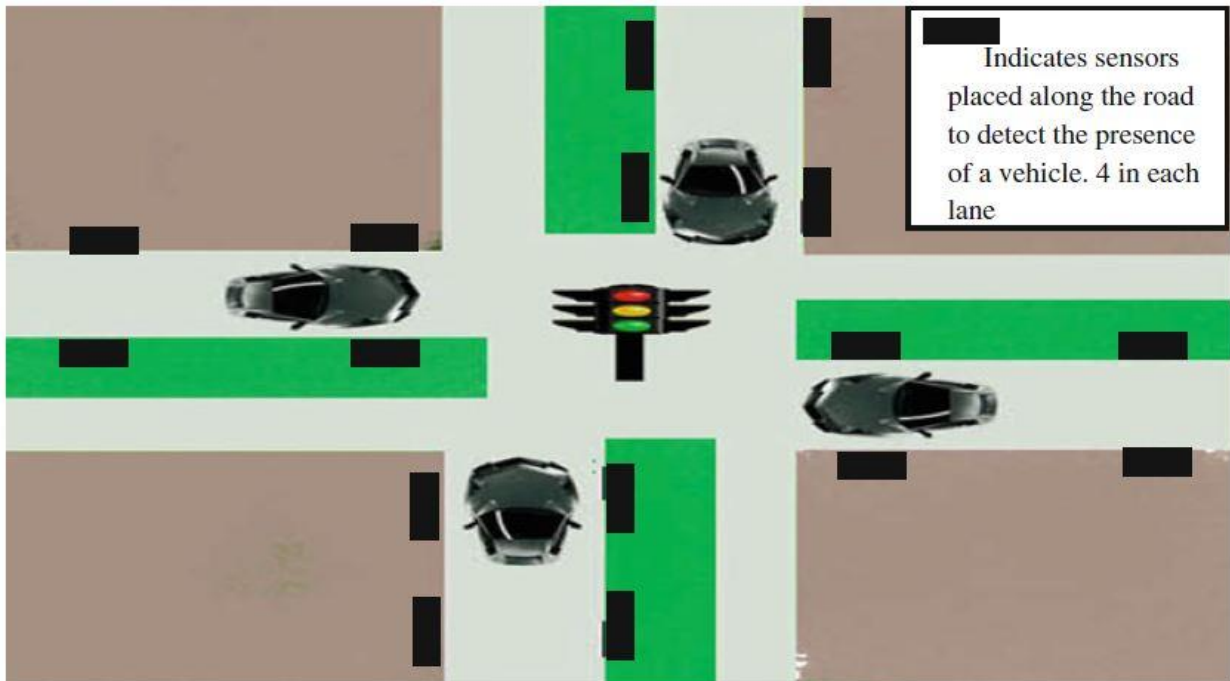
3.2.2

City In Which Proposed Idea Is Implemented

3.2.3

Flow Of Operations

```
┌─────────────────────┐
│  Vehicle Crosses A  │
│     Checkpoint      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   Count Recorded    │
└─────────────────────┘
          │
          ▼
       ◇ Violation? ◇ ──────────►  ┌─────────────────────┐
                                    │  Trigger Generated  │
                                    │    With Location     │
                                    └─────────────────────┘
                                              │
                                              ▼
                                    ┌─────────────────────┐
                                    │ PCR/Nearest Police  │
                                    │ Vehicle Alerted With│
                                    │        Proof         │
                                    └─────────────────────┘
          ▼
┌─────────────────────┐
│ Count & Violations(if│
│  any) Entered Into  │
│        Cloud        │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  Algorithm Decides  │
│ Traffic Light Time For│
│  Different Regions  │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  App/Webapp And     │
│  Traffic Light Times│
│      Updated        │
└─────────────────────┘
```
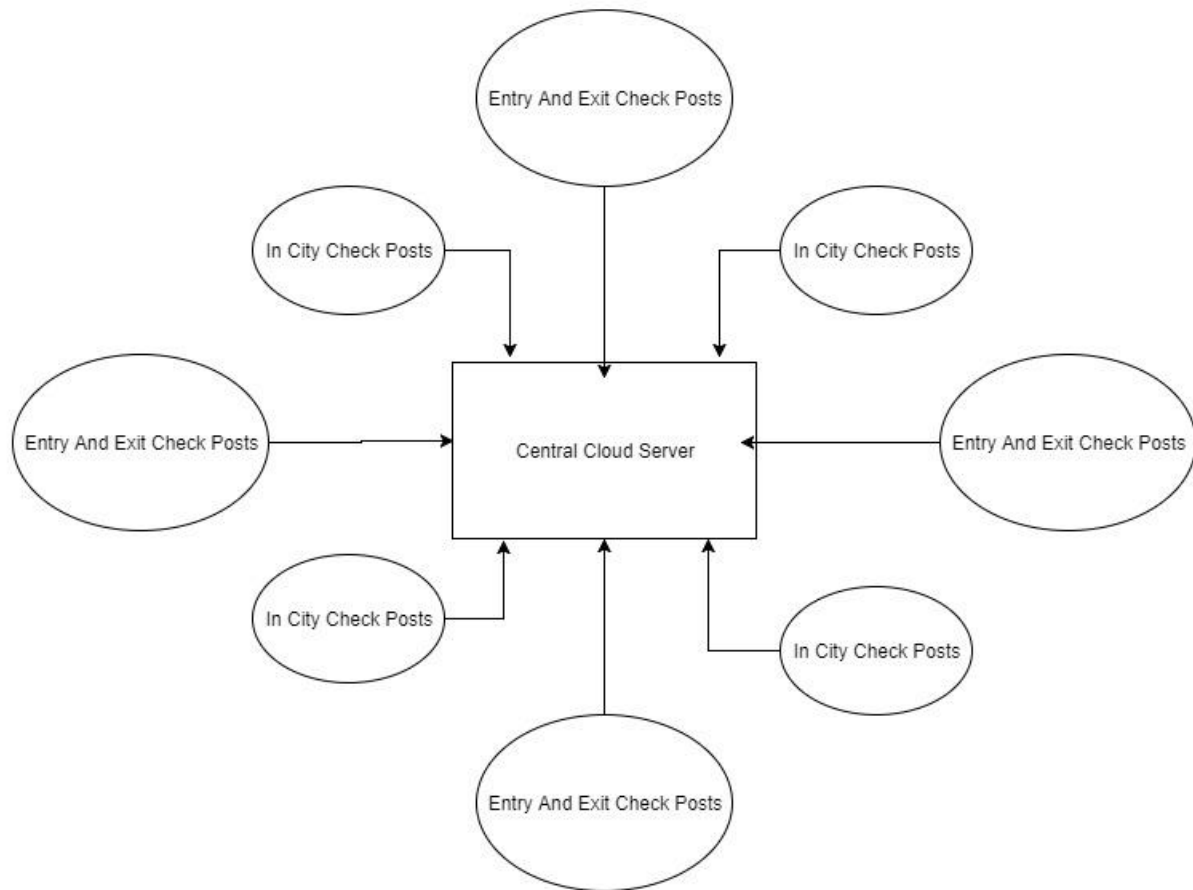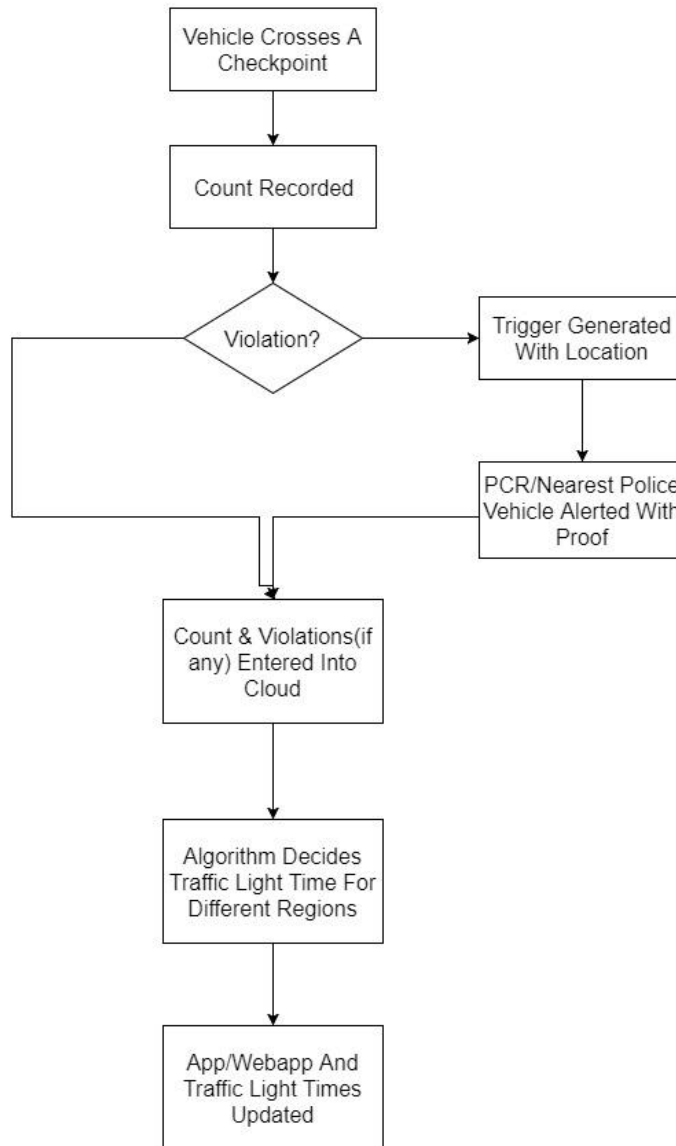
3.2.4

Setup of Devices and Sensors

Outer Shell (Metal)

Camera

IR Blasters

Speed Sensor

Magnetometer

LAN/ GSM Connection
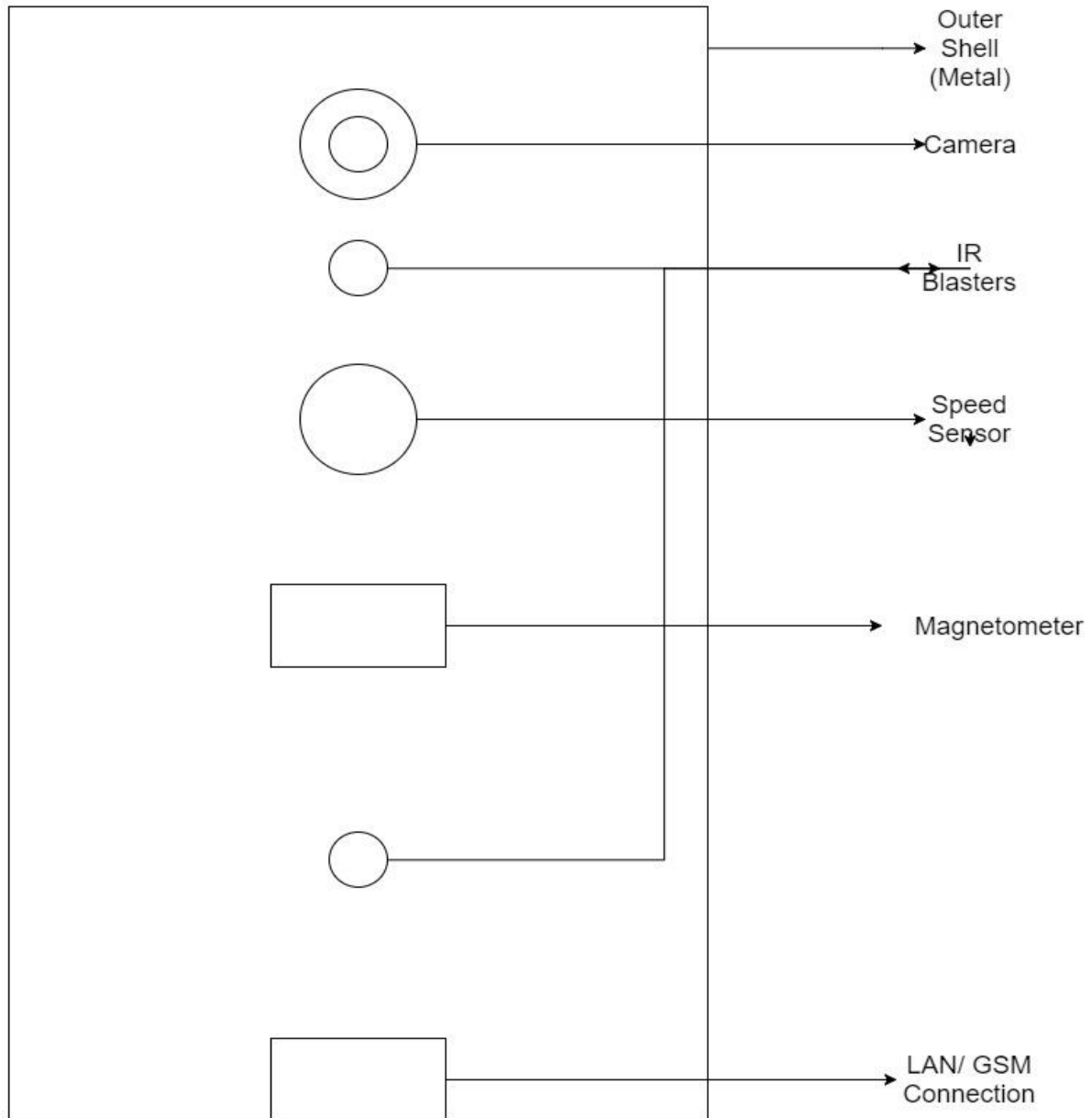
Chapter 4:ALGORITHMS

4.1 Counting no of vehicles using IR sensor

Step1:Start

Step2:Declare variables state, last-state, input pin number.

Step3:Read values for state according to pin for input.

Step4:if state is high and last-state is also high

      last-state←LOW

      increase the count of no of vehicles

    else if(state is low)

      last-state←HIGH

Step5:delay the loop by 500millisecond

Step6:Stop

4.2 Receive data from arduino and send it to Cloud.

Step1:Start

Step2:Connect arduino and python using Serial

Step3:Connect python to firebase

Step4:Read data from arduino and store it in variables

Step5:if data is changed

      Update in cloud

    else

      write Updating

Step6:Stop

4.3 Receive data from cloud and calculate the time for green light.

Step1:Start

Step2:declare variables greentime,count for each lane

Step3:Connect python to firebase

Step4:Read data from firebase and store it in variables

Step5: if (count on road1==0)

    greentime1=2

    else if (count on road1>0 and count on road1<=10)

    greentime1=10

    else if(count on road1>10 and count on road1<=20)

    greentime1=20

    else if(count on road1>20 and count on road1<=30)

    greentime1=30

    else if(count on road1>30)

    greentime1=40

Step6:Repeat for all other lanes

Step7:Update the greentime on server and send it to the signal.

Step8:Stop

Chapter 5:RESULTS AND PERFORMANCE ANALAYSIS

5.1 Model implementation

The model has been implemented successfully for the system shown schematically in Fig. 3.2.1. But we can say that this algorithm can manage more complicated traffic problems in a large scale deployment of the above algorithms.
This model can be further used in the coming future to work more and more efficiently and helping to decrease the human interaction work on daily basis which is the main motive for my project.

5.2 Results

In our results we can see different data updating on firebase in real time which is needed for the

green light optimization.
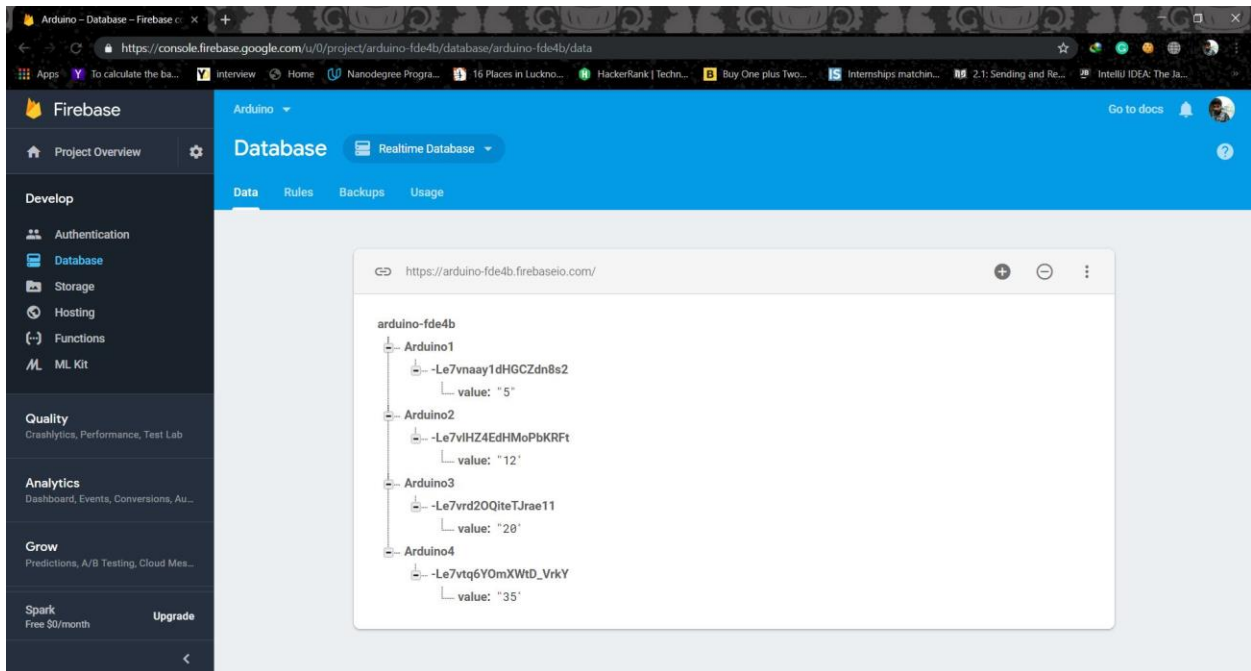
In output we can see that according to no of vehicles in a particular lane the green time is changing.

If the no of vehicles have been increased then according to real time no of vehicles the green time is set to on. If there is no addition in count then there are no cars on that lane hence the green light will not be turned on for that lane.
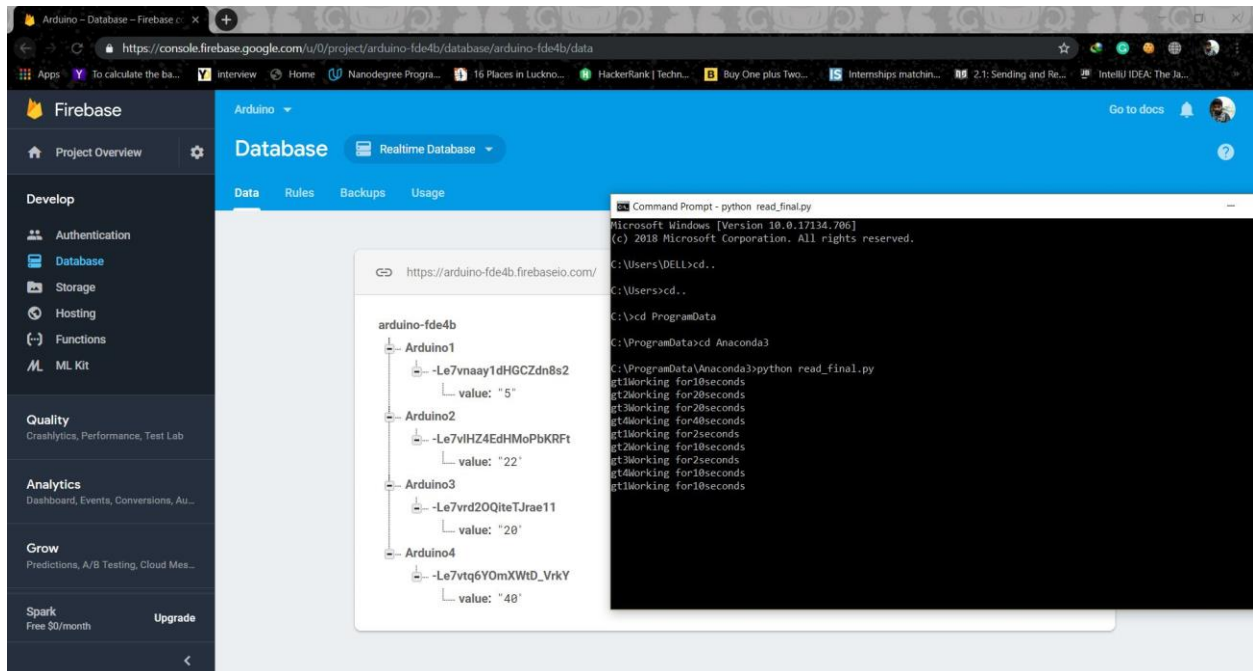
Chapter 6:CONCLUSIONS

6.1 Conclusions

The major issues that will be tackled include but are not limited to:

1. A complete record of vehicles entering and exiting the city including the data regarding the present congestion of vehicles inside the city.

2. The Speed Guns installed at checkpoints will continuously check for speed violations and the supporting camera will be able to take snapshot of the violator and the number plate of the vehicle so that a ticket can be raised after examination of incident by a concerned official.

3. Weight Sensors will be installed to look for overloading of HWVs. The sensors will be installed just prior to speed-breakers so that the vehicles slow down near the sensors for accurate measurements.

4. The Traffic Lights of the concerned city will be directly related to the cloud server to which all the checkpoints of the city will be connected. Hence through a calculated algorithm, the timings for the traffic lights will be calculated based on the real time data received from the concerning checkposts.

5. Any observed violation will be immediately sent to the nearest police personnel, based on their location, with the GPS location of the violation and the type of violation along with a snapshot of the number-plate of the vehicle.

6.2 Future Scope

The proposed Model can be extended with some new features as follows:

i. Checking Violations of overloaded Heavy Weight Vehicles

One of the major problem regarding the HWVs is that it is practically not possible to check the violations with respect to overloading for each vehicle. Weighing a HWV is a cumbersome task and therefore the officials are not able to monitor the problem of Overloading. Also if every HWV has to go through the process of weight verification, the transport system will collapse due to delays.

Our model proposes to install Weighing sensors at the check posts. The weighing sensors will check the weight of the HWV and if it is more than the permitted load, a trigger will be generated and it will instruct the camera to take snapshot of the violator along with the number plate.

ii. Checking the permits Validity and Registration of Vehicles

The vehicles will need to install a tag which will contain all the information about that particular vehicle. The information like Registration number, Chassis number, etc. will be stored in the tags and for HWVs, additional information like Permit Validity, State Registration, etc. will also be checked.

The Tag Scanning Sensors will be installed at the check posts which will read the data in the tag of all the vehicles and raise a trigger in case of any violation.

If the Permit of any vehicle has elapsed or is due in near future, a notification will be sent to the owner on his App regarding the renewal of the same.

✓ These Future Aspects of the model will greatly reduce the work of government officials like traffic police, RTOs, etc. and thus the government need not keep large number of officials in these departments as a much better and efficient system will be in place to monitor and tackle the situation.

REFERENCES

Following are some of the articles that we have cited while researching for this project:

1. Mehaseb Ahmed Mehaseb , Yasser Gadallah , Hadia El-Hennawy,2013

   Available: http://ieeexplore.ieee.org/document/6726350/?reload=true

2. Mahesh Lakshminarasimhan ," IoT Based Traffic Management System"

   Available:
   https://www.researchgate.net/publication/310036684_IoT_Based_Traffic_Management_System

3. L.Andreone,M.Bertozzi, "Vehicle detection and localization "

   Available: https://ieeexplore.ieee.org/document/1041203

4. Chen Lifeng , Chen Wenjie, "A realtime dynamic traffic control system based on wireless networks. "

   Available: https://ieeexplore.ieee.org/abstract/document/1488703

5. Hodjat Hamidi, Ali Kamankesh,"An Approach to intelligent traffic monitoring system"

   Available: https://link.springer.com/article/10.1007/s13177-017-0142-6

6. S.Mandeep ,"Arduino and Its Working ",2015,Online
   Available https://www.arduino.cc/en/main/arduinoBoardUno

7. R.Dovina,"IR sensor with Arduino ",2013,Online
   Available:http://www.instructables.com/id/Simple-IR-proximity-sensor-with-Arduino

APPENDICES

Code for Arduino UNO board

```
const int in_pin=8;

const int in_pin1=7;

int state,state1;

int  LastState=HIGH;

int  LastState1=HIGH;

int c=0,c1=0;


void setup()

{

 Serial.begin(9600);

 pinMode(in_pin, INPUT);

 pinMode(in_pin1,INPUT);

}


void loop()

{

 state =  digitalRead(in_pin);

 state1=digitalRead(in_pin1);
```

```
if (state==HIGH && LastState==HIGH)

{

 LastState=LOW;

 ++c;

}

else if (state==LOW)

 LastState=HIGH;



 if (state1==HIGH && LastState1==HIGH)

{

 LastState1=LOW;

 ++c1;




}

else if (state==LOW)

 LastState1=HIGH;

  Serial.print(c);

 Serial.print("ac");

 Serial.println(c1);
```

```
    delay(500);

}
```

Code for writing data from arduino to firebase

```python
import serial

arduino = serial.Serial('COM10',9600)

from firebase import firebase

firebase=firebase.FirebaseApplication("https://arduino-fde4b.firebaseio.com/")

def update(data,root):

firebase.delete("/",root)

firebase.post("/"+root,{"value":data})

prev_ar1=""

prev_ar2=""

i=1

while True:

        i+=1

        a=(str(arduino.readline()).split("'"))[1].split("\\r")[0]

        a=a.split("ac")

        ar1=a[0]

        ar2=a[1]

        if ar1!=prev_ar1:

        if ar1!='':
```

```
        update(ar1,"Arduino3")

        prev_ar1=ar1

        if ar2!=prev_ar2:

        if ar2!='':

        update(ar2,"Arduino4")

        prev_ar2=ar2
```

Code for reading Data and calculating green light time

```
from firebase import firebase

import time

firebase=firebase.FirebaseApplication("https://arduino-fde4b.firebaseio.com/")

def val(a1):

    for i in a1.items():

        a1=int(i[1]['value'])

        return (a1)

def light(g,val):

    print(g+"Working for"+str(val)+"seconds")


    time.sleep(val-2)

    root=firebase.get("/","")

    return root

prev_a1,prev_a2,prev_a3,prev_a4=0,0,0,0
```

```python
while True:

    root=firebase.get("/","")

    gt1,gt2,gt3,gt4=0,0,0,0

  # print(root)

    if 'Arduino1' in root:

        a1=val(root['Arduino1'])

    elif 'Arduino1' not in root:

        a1="Updating"

    if a1!="Updating":

        a1=a1-prev_a1

        prev_a1=a1

    if (a1==0 ):gt1=2

    elif (a1>0 and a1<=10):gt1=10

    elif(a1>10 and a1<=20):gt1=20

    elif(a1>20 and a1<=30):gt1=30

    elif(a1>30):gt1=40

    root=light("gt1",gt1)

  # print(root)

    if 'Arduino2' in root:

        a2=val(root['Arduino2'])

    if a2!="Updating":
```

```
    a2=a2-prev_a2

    prev_a2=a2


elif 'Arduino2' not in root:

    a2="Updating"

if (a2==0):gt2=2

elif (a2>0 and a2<=10):gt2=10

elif(a2>10 and a2<=20):gt2=20

elif(a2>20 and a2<=30):gt2=30

elif(a2>30):gt2=40

root=light("gt2",gt2)


if 'Arduino3' in root:

    a3=val(root['Arduino3'])

elif 'Arduino3' not in root:

    a3="Updating"

if a3!="Updating":

    a3=a3-prev_a3

    prev_a3=a3


if (a3==0):gt3=2
```

```
elif (a3>0 and a3<=10):gt3=10

elif(a3>10 and a3<=20):gt3=20

elif(a3>20 and a3<=30):gt3=30

elif(a3>30):gt3=40

root=light("gt3",gt3)

if 'Arduino4' in root:

    a4=val(root['Arduino4'])

elif 'Arduino4' not in root:

    a4="Updating"

if a4!="Updating":


    a4=a4-prev_a4

    prev_a4=a4

if (a4==0):gt4=2

elif (a4>0 and a4<=10):gt4=10

elif(a4>10 and a4<=20):gt4=20

elif(a4>20 and a4<=30):gt4=30

elif(a4>30):gt4=40

light("gt4",gt4)
```