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# An Iot Based Traffic Signal Monitoring and Controlling System Using Density Measure of Vehicles

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***Abstract:***

*In the world of Innovative and automotive world everything is getting computerized. Each data is in effect effortlessly available. Yet, the movement signals checking is as yet done physically. The activity signals are observed physically from the control room by the executives or a predictable time is settled for signals evolving. Rather than this a computerized controller-based activity checking framework will be useful for controlling the movement. This plan of movement foundation will be useful in decreasing the activity clog issue in urban communities. This paper depicts a framework where IR sensors are incorporated with an Arduino to work the paths which measure the movement thickness. This incorporated arrangement of movement is Internet of Things (IoT) based which likewise empowers to clear the activity for emergency vehicle by giving a catch in rescue vehicle so the activity gets cleared on that side. It additionally empowers the vehicles tally that move over the sensors. Subsequently, movement controlling gets upgraded effectively, which in the end prompts huge change in rush hour gridlock framework.*

***Keywords***

*Automated traffic monitoring and controlling, Arduino, IR sensors, Traffic congestion and IoT.*

## 1. Introduction

In this quick moving world everything is mechanized. Beginning from home apparatuses to following of vehicles every last framework is implanted. Installed frameworks are those which are intended for a specific undertaking rather that for broadly useful arrangement of taking care of numerous assignments.

Installed frameworks are intended to do some particular errand, as opposed to be a broadly useful PC for different undertakings. Some likewise have continuous execution limitations that must be met, for reason, for example, wellbeing and ease of use; others may have low or no execution prerequisites, enabling the framework equipment to be streamlined to lessen costs.

An installed framework isn't generally a different piece - all the time it is physically worked in to the gadget it is controlling. The product composed for implanted frameworks is regularly called firmware and is put away in read-just memory or glimmer convector chips as opposed to a circle drive. It frequently keeps running with constrained PC equipment assets: little or no console, screen, and little memory.

Remote correspondence has turned into an essential element for business items and a well known research subject inside the most recent ten years. There are currently more cell phone memberships than wired-line memberships. With new innovations and gadgets come new business exercises, and the requirement for representatives in these mechanical territories.

Architects who know about installed frameworks and remote interchanges will be popular. Shockingly, there are couple of cute situations accessible for advancement and classroom utilize, so understudies frequently don't find out about these innovations amid hands-on lab works out.

Presently a-days, every one of the works and things are getting to be mechanized and computerized. It began from looking through the notable places and came to home conveyance of anything. Be that as it may, in this quick age the activity framework is still carried on physically. Along these lines, to computerize it we have built up an undertaking.

The framework is an IoT based framework which flags the movement lights by thinking about the vehicles thickness. To do the we utilize sensors. The sensors will quantify the activity thickness and isolate it into low, medium and high classifications. In view of that outcome the signs get changed.

This task points in planning an IoT based framework in which movement signals are checked and controlled consequently by utilizing sensors. The framework utilizes an Arduino based circuit which

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controls the signs in view of the thickness of vehicles and transmit the information to the server.

The Arduino is a group of microcontroller sheets to improve electronic plan, prototyping and testing for specialists, programmers, specialists, yet additionally numerous experts. Arduinos (we utilize the standard Arduino Uno) are worked around an AtMega microcontroller basically an entire PC with CPU, RAM, Flash memory, and information/yield sticks, all on a solitary chip.

The Arduino associates with your PC by means of USB, where you program it in a straightforward dialect (C/C++, like Java) from inside the free Arduino IDE by transferring your arranged code to the board. Once modified, the Arduino can keep running with the USB interface back to your PC, or remain solitary without it — no console or screen required, simply control.

The framework measures the thickness of movement utilizing sensors that are set in an interim of separation. This framework likewise gives an alternative to avoid the flag to green at whatever point there a rescue vehicle is going through that course by keeping different sides in Red by giving a catch. Thusly the movement signals are observed consequently with the assistance of sensors. In this, we are utilizing IR sensors.

IR sensors work by utilizing a particular light sensor to recognize a select light wavelength in the Infra-Red (IR) range. By utilizing a LED which creates light at an indistinguishable wavelength from what the sensor is searching for, you can take a gander at the power of the got light. At the point when a question is near the sensor, the light from the LED bobs off the protest and into the light sensor. By utilizing the IR sensors, the thickness is estimated and the signs gets observed and controlled.

The information got from the sensors are refreshed at time to time to the server utilizing GSM. A GSM (Global System for Mobile correspondences) is an open, advanced cell innovation utilized for transmitting versatile voice and information administrations.

## 2. Literature Review

As per the exploration paper by G.Kavya and B.Saranya , Density Based Intelligent Traffic Signal System Using PIC Microcontroller, the enhancement of activity light controller in a city utilizing sensors and microcontroller. By utilizing this framework setup the potential outcomes of congested roads are lessened to some degree which are caused by activity lights, and effectively gets the outcomes. Number of passing vehicles in the settled availability out and about chooses the thickness scope of movement .The recorded information can be downloaded to the PC through correspondence amongst microcontroller and the PC.

As per Shwetha N. Pable, Density, speed, and stream are the three basic parameters for street movement examination. Superior street movement administration and control require ongoing estimation of room, mean speed and thickness as contribution for substantial spatial and fleeting scope of the roadway organize.

As indicated by K.Vidhya and A.Bazila Banu , utilize the Density estimation by utilizing open instrument as programming for picture preparing by simply showing the different change of picture in the screen lastly encompassing the container on the vehicle in the given picture, the quantity of vehicles are computed. They can figure the thickness of the vehicle by utilizing mat lab device by looking at the four side of the picture which is given as an information.

As indicated by Mehal Zaman Talukder and Hasan U.Zaman look into paper,the movement blockage can be lessened by sorting the movement into low, medium and high and in light of the class the signs are rearranged among the four lanes.The additionally utilized sensors on the zebra crossing path so at whatever point the people on foot are utilizing the zebra crossing a ringer is rung and the signs change their exercises.

## 3. System Design and Architecture

In this design architecture we mainly have 4 components:

1) Arduino
2) GSM
3) IR Sensors
4) LCD display

The block diagram of this system is as follows:

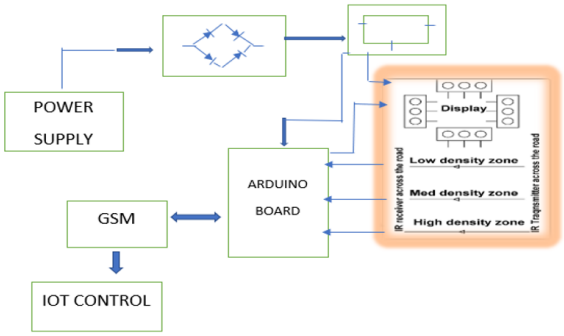


Fig 1: Block Diagram of the Design

Fig.2 show the design of the system. In the system the four lanes are provided with IR sensors which are fixed at some particular distance. These sensors receives the reflected IR rays and send the information to Arduino.

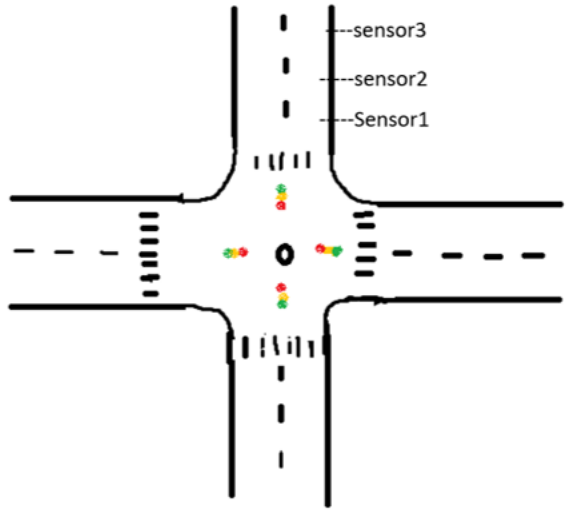


Fig 2: Practical Design of the System

The Arduino uses the data send by the sensors to set the signals according to the categories of density and update this data to the server. We have used only 3 IR sensors that are fixed only in one lane as it functions same in all the four lanes.

1. Arduino:

Arduino is a mini-computer that can be used as a development tool for different software and hardware based projects. The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. The Arduino connects to your computer via USB, where you program it in a simple language. Once programmed, the Arduino can run with the USB link back to your computer, or stand-alone without it.

2. IR Sensor:

IR Sensor is a type of sensor that can sense objects within the range of 15cm to 150cms.

3. Light Emitting Diode (LED):

LED is used for traffic light operation and signal.

4. LCD Display:

LCD display is used to display the data that is sent to the server.

5. GSM:

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

***Operation Of The System:***

- ***Computing Traffic Density:***

The density of traffic is categorized into 3 categories. The three levels of traffic are low, medium and high. Each lane uses the data from the three IR sensors to evaluate the level of traffic. If the sensors receives reflected rays of IR the output from that sensor is taken as '1'otherwise the output is considered as '0'.An output of '1' specifies that a vehicle is present at that place whereas '0' specifies that the lane is empty at that location. The traffic signal lights are activated based on the following conditions:

LOW: (Ir sensor1 =1 ,Ir sensor2 = 0,Ir sensor3 =0) or (Ir sensor1 =0,Ir sensor2 =0,Ir sensor3 =0)

MEDIUM: (Ir sensor1 =1,Ir sensor2 =1,Ir sensor3 =0)

HIGH: (Ir sensor1 =1,Ir sensor2 =1,Ir sensor3 =1)

Based on the levels of traffic a timer is fixed for each level in the program code.The timer is set as

Low: 3 secs

Medium: 50 secs

High: 1 min

***Algorithm:***

The code for this system was written in Arduino using embedded C. The process flow of the system is displayed in the flowchart of the algorithm.

The program runs an endless loop where each lane is activated either serially or according to the priority conditions. The data collected from the IR sensor is used to generate vehicles density. The information regarding the density is sent to the server time to time using GSM.

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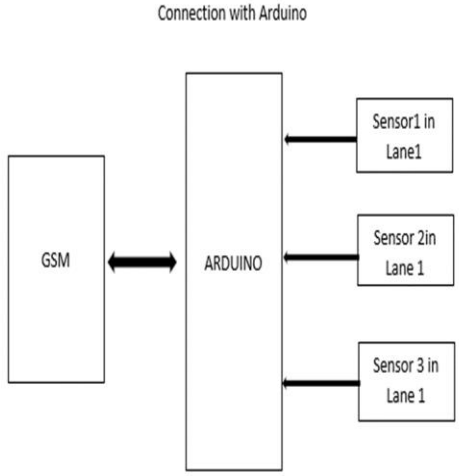



Fig 3: Sensor Connections with Arduino

## 4. Results

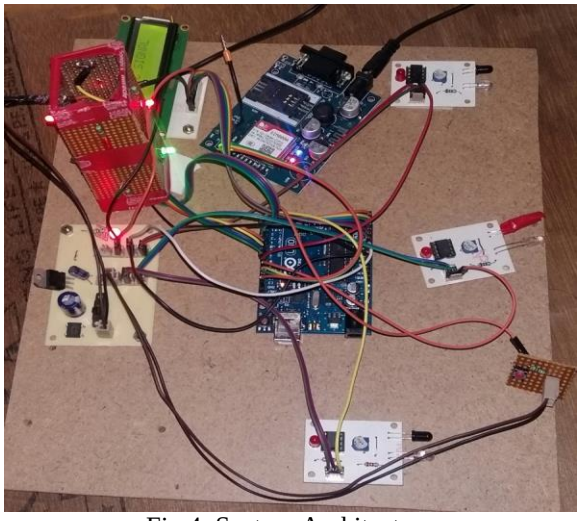
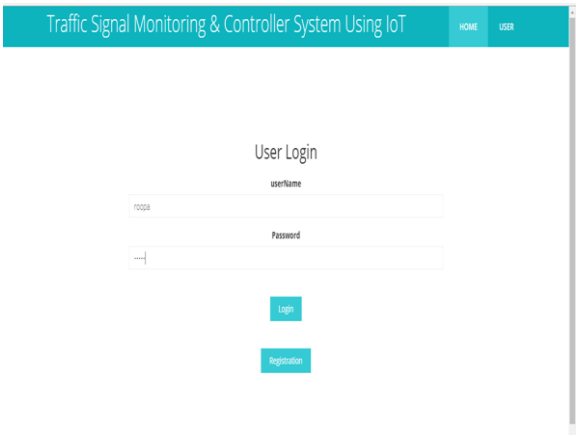
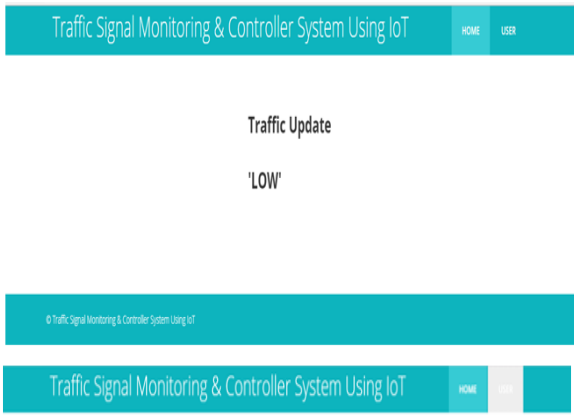


Fig 4: System Architecture


Fig 5: Traffic Signal Monitoring using IOT







## 5. Conclusion

So in this way, apart from operating the signal manually or by keeping them constant, the signal can be monitored and traffic can be controlled using the sensors and by measuring the density of traffic.

Even, instead of clearing the traffic by the traffic police, the green will be signaled automatically, to give way for the ambulance by clicking the button provided.

We can count the vehicles that pass through that lane by evaluating the number of times the IR rays have been obstructed

In this system we have used IR sensors but instead of the other sensors like ultrasonic sensors or some other efficient sensors can be used for more effective working of the system. The well efficient sensors can distinguish from one obstacle to other.

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