

# An Improved Traffic Congestion Control and Vehicle Monitoring System

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**Abstract:**—A new approach for controlling Traffic System is designed. The proposed system uses a concept of Internet of Things it is an intelligent traffic controller is designed with components like Raspberry Pi, Pi-Camera, RFID, IR sensors. Raspberry Pi is the main component which is used to control all, it acts like a controller. Density of the traffic will be decided with the help of IR sensors, IR Sensor checks the vehicles passing on that particular path, It also determines the network congestion, and hence changes the green light duration for that path. when an emergency vehicle is approaching the junction, it will communicate to the traffic controller and in order to give Green path (Zero traffic) for emergency vehicles Web application is used which is monitored by a public authority all this process of monitoring is achieved through Wi fi. We proposed control of system in 2 modes i.e. 'automatic' without any human intervention and 'manual' with human intervention and IoT based traffic management solutions for smart cities such as Hyderabad, new Delhi, Mumbai also included for centralized monitoring and control .

**Keywords**— *Arduino, Raspberry Pi, IR Sensor, Led Lights, Pi-Camera.*

## I. INTRODUCTION

Traffic congestion is a severe problem in most of the major cities across the world and it has become a nightmare for the commuters in these cities. The Traffic congestion can also be caused by large Red light delays, etc. The delay of respective light is hard coded in the traffic light and it is not dependent on traffic. Therefore for simulating and optimizing traffic control to better accommodate this in today's world there is no efficient traffic system, one way of providing efficient traffic system is by manipulating traffic lights dynamically based on traffic size. Also there are no priority services for any priority vehicles like ambulance hence some services other than normal services must be provided to priority vehicles. One of the major problems faced by heavy traffic is by Ambulances. As we all know that Ambulances are the most important medical means of transport in any country as they carry patients to the nearby hospitals. But due to heavy traffic, one can often see the Ambulances stuck in traffic for long durations thus causing danger to patient's life. So, our project

aims to solve this problem of Ambulances. When an Ambulance arrives, its corresponding lane traffic light becomes green and all the others become red, thus paving traffic less way for the Ambulance and thus helping it to reach the hospital swiftly. This is possible by the use of Switches in the ambulances. In the second use of our project, we aim at controlling traffic density using microcontroller. The system contains IR transmitter and IR receiver which are mounted on the either sides of roads respectively. The IR system gets activated whenever any vehicle passes on road between IR transmitter and IR receiver. The traffic light is situated at a certain distance from the IR system. Thus based on traffic density microcontroller defines different ranges for traffic light delays and updates those accordingly. Finally, using the concept of IR we are providing passage to vehicles of extreme priority (VIP and Police cars), here we have installed IR transmitter in one such vehicles, the moment it comes within the line of sight of the corresponding IR receiver installed at a distance from the traffic light, it will send a signal to microcontroller and the respective lane's light goes green.

## II. BACKGROUND

There has been conception of smart, communicating objects even before the global computer network was launched forty-five years ago. As the Internet has grown to link all signs of intelligence (i.e., software) around the world, a number of other terms associated with the idea and practice of connecting everything to everything have made their appearance, including machine-to-machine (M2M), Radio Frequency Identification (RFID), context-aware computing, wearables, ubiquitous computing, and the Web of Things. In 1999, Kevin Ashton, a British technologist coined the term

'Internet of Things,' but the idea of devices connecting with each other hails from as far back as the creation of the internet itself. The dawn of the internet age kick started an era of growing and shrinking. The amount of information that could be created, stored, and shared grew exponentially with the ability to create and harvest from across the world—or, at least, from across the world wherever servers were at the time. Simultaneously, places and people that once seemed far away and beyond one's own scope could now be reached and interacted with on a more personal level.

Traffic Congestion is a major issue. Because of this congestion problem, time taken for travelling will be increased. A design was developed using wireless technology with PIC microcontroller, IR sensor. IR sensor was used to decided traffic density and timing for the traffic light. Switch was used to provide Green path for emergency vehicle [1].

Green path for emergency vehicles was also designed before which use to provide Green signal to all sides of signal in traffic junction so that ambulance will get path to move [2].Traffic Management on the road has become a severe problem of today’s society. An efficient traffic management technique is needed to reduce waiting and travelling times, save fuel and money. We are known to the fact that, number of vehicles is increasing exponentially, but infrastructure for transportation we have, is not sufficient to satisfy their needs. Due to this, valuable time of public is being lost every day. This also leads to huge economic problems. Main problem occurs when this traffic congestion costs life of someone. It should not be surprising that traffic congestion affects almost all emergency vehicles, which can be too much hazardous to affected people [3]. There isn’t any quick solution for this. Government can’t continue making roads everywhere. The traffic system in today’s world is not up to date there is no update of traffic density also there are no priority services provided for priority vehicles such as ambulance. Traffic jam is the main cause of inefficient traffic system and it occurs because user is not aware of current traffic density or size. No strict laws have been implemented for rule breakers. There is a drastic need to solve these problems for efficient flow of traffic system. Today’s Traffic Scenario in Metropolitan Cities Generally traffic light controllers use microprocessors and controllers which used predefined hardware and have no flexibility for modification on real time basis. This results in wastage of car fuel, so they have implemented traffic signal controller with powerful hardware interface. In this paper, GSM interface is also provided for sending traffic alerts Traffic is a critical issue of transportation system in most of all the cities of Countries. This is especially true for Countries like India and China, where the population is increasing at higher rate [4].

Manual Traffic Control in which man power was required to control the traffic. Depending on countries and states the traffic polices are allotted to different areas to control traffic. These men carry sign board, sign light and whistle to control the traffic. They are instructed to wear specific uniforms in order to be easily identified by the drivers. After this “Vehicle Actuated Control System” in which, lights are loaded with constant numerical value in the form of timers. The lights are automatically getting ON and OFF depending on timer value changes.

III. DESIGN

In the raspberry pi first the digital pins would receive the data from IR sensors and by comparing the density the signal would be changed.USB camera would send the video data to the raspberry pi and this Live Streaming data would be sent to the server and represent the video data in the webpage data

from the aurdino would be received by the raspberry pi and basing on the data received the signal would be changed to green basing on the presence of ambulance

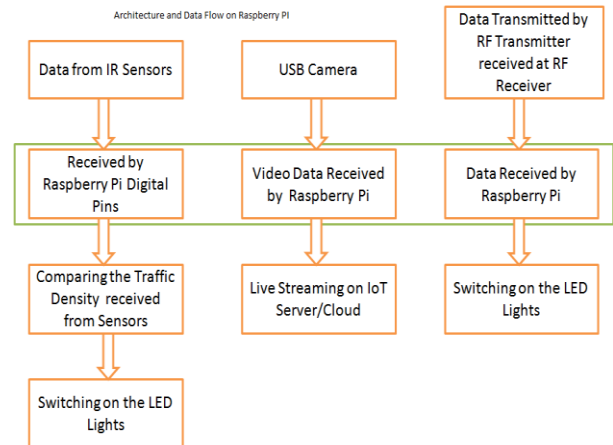


Figure 1 Data Flow in Raspberry Pi

Data from the switches present in ambulance is received by the digital pins present in the arduino and this data is transmitted to the raspberry pi Accelerometer would measure the position of the ambulance in x,y,z coordinates and this data would be verified and basing on the position of the coordinates alert would be sent using GSM module.

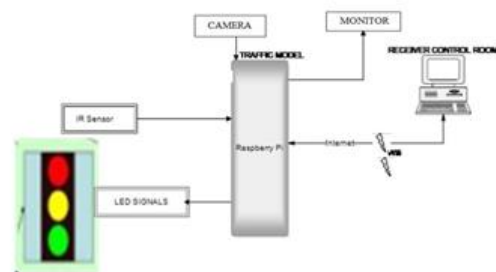
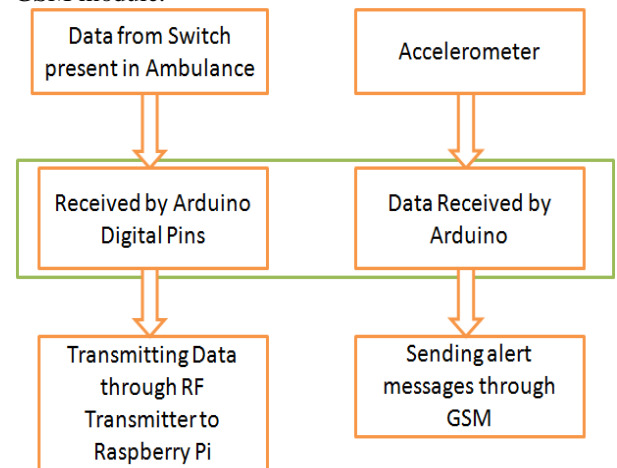


Fig 3 Proposed System Architecture

#### IV. IMPLEMENTATION

We have developed an web application to connect with wifi module and display given live traffic which are collected from the hardware module and finally upload/sends this values on the raspberry pi. This developed web app will active on any platform and it will always connected to hardware module. Screenshots of developed project

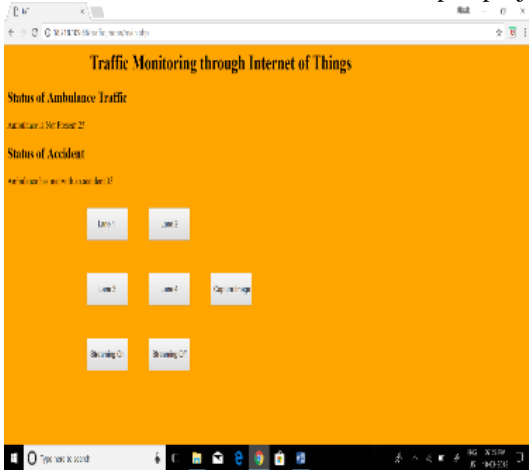


Figure 4 Web application

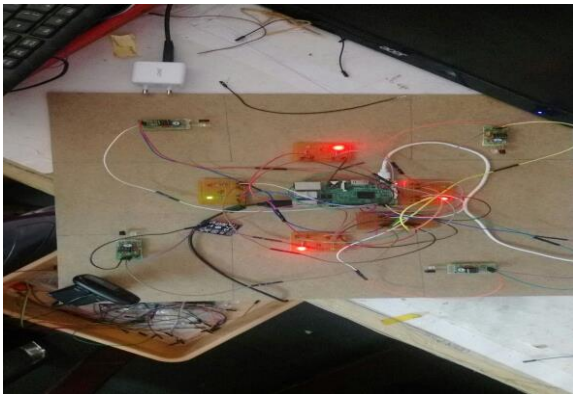


Figure 5 image of raspberry pi module

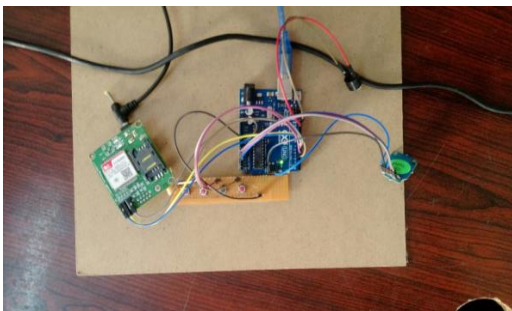


Figure 6 image of arduino module

#### IV. CONCLUSION

After considering facts presented in introduction section, there is a vital need of research in ITS. We have presented vehicle traffic congestion control and monitoring system in IoT to develop an real-time software for tracking, broadcasting, managing traffic. This system contains a server for reporting

and displaying traffic related events (traffic condition, traffic jams, traffic density, pollution/weather condition, etc.). It also includes a web application for the system administrators, data management and analysis. The interface of client application is intuitive and it is easy and safe to use while driving. Also, here we can dynamically manage traffic signal depending on traffic density.

#### VI. FUTURE WORK

The design can be further implemented in a more advanced way by introducing the GPS to track the emergency vehicle and also RF ID to IR sensors to track the stolen vehicles that passes through traffic signals. Also the design of Multi road circuit and a complete design circuit needs to be implemented further. It will be a challenge to design such circuit that can implemented with all these components along with Satisfying requirements. Number of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle count microcontroller decide the traffic light delays for next recording interval. In future This system can be used to inform people about different places traffic condition. This can be done through RADIO. Data transfer between the microcontroller and computer can also be done through telephone network, data call activated SIM This technique allows the operator to gather the recorded data from a far end to his home computer without going there. Traffic lights can be increased to N number and traffic light control can be done for whole city by sitting on a single place. In ambulance system, the data of the patient in the ambulance can be sent to the Hospitals via GSM technology [11]. Thus, it can provide early and fast treatment of the patient.

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