Traffic Network Operation for Junction and Intelligent Surveillance System using IOT

[1]A.Divya, [2]Dr.Kedarnath Sahu
[1]M.E student, Dept. of ECE, Stanley College of Engineering & Technology for Women, Hyderabad, Telangana, India
[2]Proffessor Dept. of ECE, Stanley College of Engineering & Technology for Women, Hyderabad, Telangana, India

Abstract: ***The project aims at designing a system which can avoid the overcrowding issues. Traffic congestion is a major problem in cities of developing countries like India. Infrastructure growth is slow as compared to growth in no. of vehicles. Due to this, emergency service vehicles may not achieve the target of being in time. This leads to the loss of human lives. Many systems have progressed using embedded system. The system mainly involves in three activities, which are Congestion control, Ambulance clearance, and Detection of stolen vehicle. The project makes use of an onboard computer, which is commonly termed as Raspberry Pi processor. It acts as a heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The Raspberry Pi is a credit-card-size single board computer developed in the UK by the Raspberry Pi Foundation. It uses microSD card slot for loading operating system and data storage. We use RFID Reader, system-on-chip to read the RFID tags attached to vehicle and Raspberry-pi. It counts the number of vehicles that passes on a specific path during a specified duration. It also regulates the network congestion, and hence the green light duration for that path. In this project, Density of the traffic will be decided with the help of IR sensors. And in order to give Green path (Zero Traffic) for emergency vehicles RFID technology is used. Along with this RFID and GSM is used to detect the stolen vehicles. To perform this task, Raspberry Pi processor is programmed using embedded 'Linux'. In this project control of system consists of 2 modes i.e., 'automatic' without any human introversion and 'manual' with the human introversion.***

IndexTerms - Raspberry-pi, Image processing, Vehicle counting, Open CV, IR sensor, IoT, Traffic Management,

I. INTRODUCTION

In any city in the world, traffic monitoring is an important part of the smart-city infrastructure. Normal traffic to highway traffic requires adequate information about the support and logistics available on the highway and in turn the system can be made self-reliable and intelligent. Any type of congestion on roads will ultimately lead to loss of fuel and economic loss. Any foresight on traffic will always help to improve the whole system. With number of WSN and Sensor enabled communications, an IoT of traffic will be generated. This will be known as Traffic IoT (TIoT). The information collected from TIoT can be presented to travelers as in [4]. The traffic information will be dependent upon the queuing model on roads and infrastructure of roads itself. This identification of critical road points and present state of traffic information on all roads can be provided to the user. However, this traffic monitoring application needs to be secure to prevent any terrorist attacks frequent in urban cities.

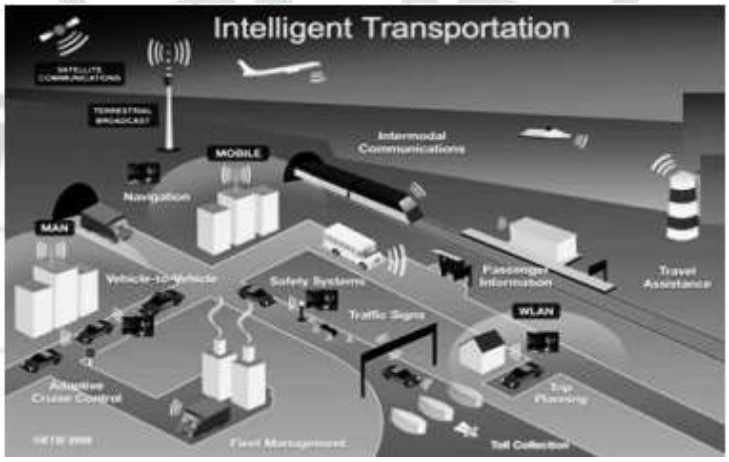

Figure 1: Intelligent Transportation System

Because of the traffic jams, and lack of proper traffic management system, time and money of the public is being wasted. Goods transportation, machinery and human transportation are the key factors which influence the development of industries. The development of traffic monitoring and controlling system is a very important requirement in all the countries. Figure 1 shows the blue print of Intelligent Traffic System. As there is a rapid growth in the traffic these days, the authorities have to find different ways to avoid these problems [1-4]. So in this paper the system was implemented based on present criteria that tracking three conditions in those one is heavy traffic control and another one is making a root of emergency vehicle like ambulance and VIP vehicle and finding theft or crime vehicle. Here each individual vehicle is equipped with special radio frequency identification (RFID) tag

(placed at a strategic location), which makes it impossible to remove or destroy. The systems also update the traffic information on internet which is helpful to the travelers and traffic control department. The ZigBee operates at low-power and can be used at all the levels of work configurations to perform predefined tasks. It operates in ISM bands (868 MHz in Europe, 915 MHz in USA and Australia, 2.4 GHz in rest of the world).

II. REALTED WORKS

In this section we discuss about several approaches of monitoring and control related to the traffic monitoring and vehicle monitoring, many strategies and approaches were proposed [5]. It involves rule based learning to the brand new fuzzy and neural network techniques. Findler and Stapp described an expert procedure based on connected roads and traffic lighting procedure. These knowledgeable techniques use a set of rules and established on those ideas, the next action shall be decided. As mentioned in [6], the principles are furnished they make slight adjustments and simplified assumptions. In [7], a traffic mild approach utilizing a simple predictor was developed by way of Tavladakis and Voulgaris. It takes measurements for the duration of current cycle and makes use of these measurements to test a couple of feasible settings for the subsequent cycle. This procedure proves to be incredibly adaptive but could not handle excessive traffic fluctuations. In [8], Liu has validated some methods to beat the fluctuations by way of incorporating site traffic detectors at each side of a junction and vehicle identification have been used to measure the traditional delay at a junction. Tan describe a fuzzy common sense controller for a single junction that must mimic human intelligence [9]. Traffic is quantized as many, medium and none. This procedure uses a predetermined order of states and the states can also be skipped if there is not any traffic volume in that certain state. In [10], Lee et al. Used fuzzy good judgment to control traffic at more than one junctions. In [11], Choi et al. used fuzzy logic controllers and is used to adapt them to the congested traffic waft. A greater strategy in comparison with the fixed fuzzy logic traffic gentle controller is proven in [12]. This approach will work flawlessly even in greater visitors glide underneath very crowded traffic conditions. In [13], fuzzy system augmented with the hierarchy and interpolations are applied to the enormous quantity of lanes and extra street intersections to curb the complexity. Taale et al. Evaluate utilizing evolutionary algorithms evolution method to evolve a visitors gentle controller for a single simulated intersection to utilizing the usual visitors gentle controller in the Netherlands (the RWS C-controller). There are many different methods and procedures in lots of exclusive packages, every have their possess professionals and cons.

III. PROPOSED SYSTEM

This is the proposed project which presents an Intelligent Traffic Control System using Image processing techniques to know about the congestion of traffic. The system comprises of three units such as Image processing based congestion controller system, Ambulance clearance and stolen vehicle detection. Depending on the congestion, traffic light will be altered by using IR Sensors. Ambulance vehicles will be detected by using its RFID Reader, RFID Tags and it will send the information to control room through web page so that the Green is on and after passing away the ambulance from the lane red light is switched on. If the stolen vehicle's number is identified using RFID Reader and Tag it will send the information to the police control unit and the owner through SMS about the stolen vehicle. The Block Diagram is shown in below Figure.2.

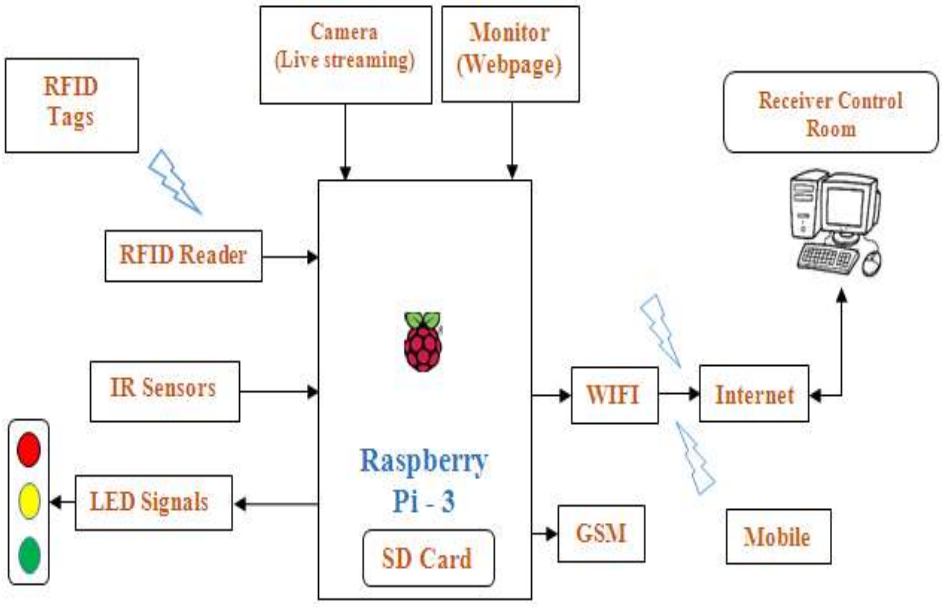

Figure 2: Block Diagram of Traffic Network Operation for Junction and Intelligent Surveillance System using IOT

Hardware specification:

A. Raspberry-pi device: The Broadcom SoC used in the raspberry-pi is equivalent to a chip used in an old smart phone. While operating at 700 MHZ by default, the Raspberry-pi provides a real world performance roughly equivalent to the 0.041 GFLOPS on

the CPU level the performance is similar to 300 MHZ Pentium of 1997-1999. The GPU provides 1 Gpixel/s of general purpose computing performance. The raspberry-pi chip will not become hot enough to need a heat sink. The default split was 192 MB (CPU RAM), which should be sufficient for standalone 1080p video decoding or for simple 3D but probably not for both together. 224 MB was Linux only, with just a 1080p frame buffer, and was likely to fail for any video or 3D. 128 MB was heavy 3D, possible also with video decoding.

B. IR sensor: This IR sensor detects vehicle and also detect the emergency vehicle. Thermal radiation is emitted by all the objects in the infrared spectrum. The infrared sensor detects is type of radiation which is not visible to human eye. Use of IR LEDs to send the infrared waves to the object. Another same type IR diode is to be used to reflected wave from the object.

C. Power supply: As per the power requirement of the hardware in traffic light control system using raspberry-pi is required power supply of 5V with respect to Ground.

D. Liquid Crystal Displays (LCD): The voltage needed is preferable 2-20 V in A.C. The threshold voltage for watch type LCD displays is 1 to 2V. It is a 16 pin device with 16*2 displays. LCD is consists two modes N (normal mode) and C (high density). All time it displays NNNN for the four lanes, depicting a NO traffic density. The moment there is traffic density it displays CNNN, means that lane 1 has traffic density and requires to be cleared.

E. RFID reader-125 kHz: Radio Frequency Identification (RFID) is an IT system that transmits signals without the presence of physical gadgets in wireless communication. It is categorized under automatic identification technology, which is well established protocol. The reader reads the radio frequency and identifies the tags. RFID range depends on transmit power, receive sensitivity and efficiency, antenna, frequency, surroundings, tag orientations. RFID reader uses frequency 125 KHZ with a range of 10 cm.

F. GSM module SIM 800: Here, GSM modem is connected with the microcontroller. This allows the computer to use the GSM modem to communicate over the mobile network. GSM modem must support "extended at command set" for sending/receiving SMS messages. SIM 800 is designed for global market and it is a tri-band GSM engine. It works on frequencies EGSM 900 MHZ, DCS 1800 MHZ and PCS 1900 MHZ. SIM 300 features GPRS multi-slot class 10/class 8(optional) and supports the GPRS coding schemes. This GSM modem is a highly flexible plug and play quad band GSM modem, interface to RS232, it supports features like voice, data, SMS, GPRS and integrated TCP/IP stack.

In this system, the module will keep track of the traffic. We assumed a 4 way junction in our implementation. This module operates in two modes namely manual and automatic modes.

Manual operation: This is done by authorized person in control room. Person in control room will see the traffic present through the pi-camera output. Depending on that output or depending on situation we can overwrite the automatic operation output. Depending on the information through website in control room that particular colour traffic light will be turned ON.

a). Advantages

• These 3 parts are available as convenient modules in the market and easily connectable to Raspberry Pi Processor.
• The critical levels of the traffic jam have been indicated through alerting unit.
• The system successfully detected the primary appearances of emergency vehicles.

Congestion Control: First part contains automatic signal control system. Here, each vehicle is equipped with an RFID tag. When it comes in the range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track how many vehicles have passed through for a specific period and determine the congestion volume.

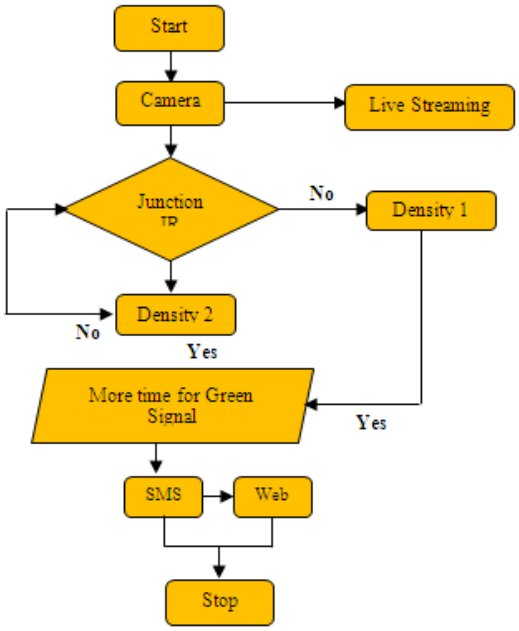

Figure.3: Flow chart of Congestion Control

Ambulance Clearance: Second part is for the emergency vehicle clearance. Here, each emergency vehicle contains IR sensors and RFID Reader and Tags, which transfer the information through Raspberry Pi IOT (Internet of Things) processor and pass the information to the web page in the control room. From the Control room the signals automatically turn the traffic light into green. Once the ambulance passes through, the traffic light is turned to red. All emergency vehicles will be embedded with RFID cards and the numbers of the cards will be saved in control room system. RFID reader will be kept at certain distance approximately near 2nd sensor. When emergency vehicle arrives, RFID reader will read RFID card. The number obtained from card will be compared with number present in control room system. If it matches the same then automatically green light will be turned ON. The flow of this system works as shown in Figure 4.

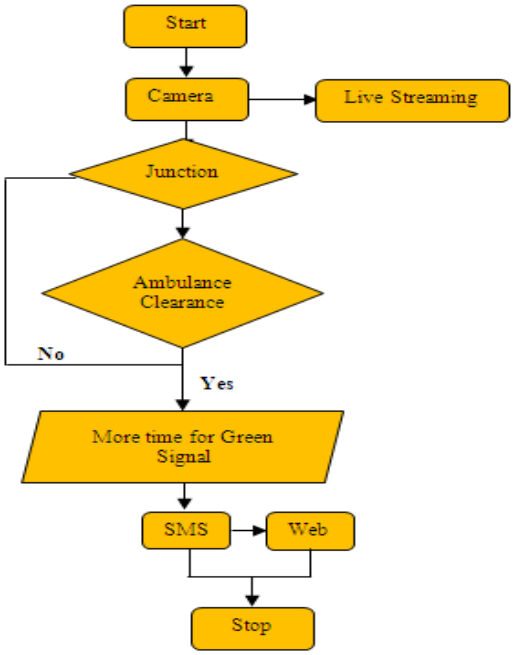

Figure.4: Flow chart of Ambulance Clearance

Stolen Vehicle Detection: The third part is responsible for stolen vehicle detection. Here, when the RFID reader reads the RFID tag, it compares it to the list of stolen RFIDs. If a match is found, it sends SMS to the police control room and the owner of the vehicle immediately and changes the traffic light to red, so that the vehicle is made to stop in the traffic junction and local police can take appropriate action.

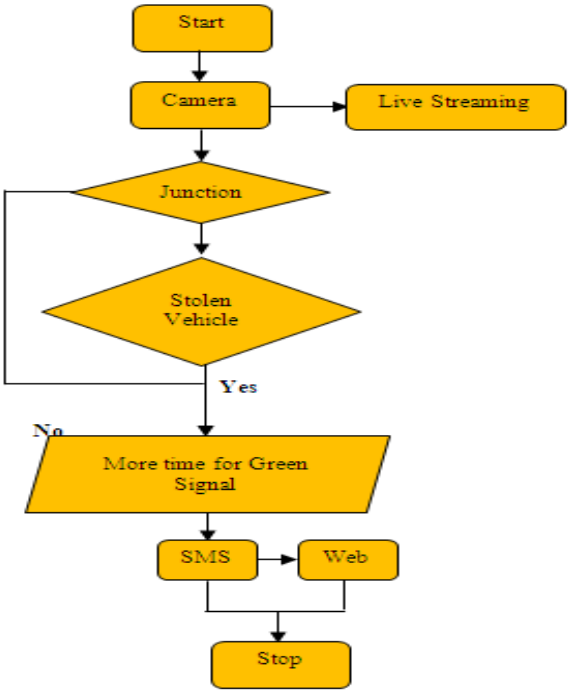

Figure.5: Flow Chart of Stolen Vehicle Detection

The following list of components used in the experiment are GSM module, Camera, for tracking the stolen vehicle, RFID cards will also embedded in all vehicles. The ID of card must be known by the owner. As the vehicle is lost, the owner of the vehicle will give this ID to police and to control room. RFID reader will be kept at certain distance approximately near 2nd sensor, when the vehicle arrives through that sensor it reads the RFID card of that vehicle, and if match is found then and SMS is dropped to owner and local police present near that locality. If it matches the same then automatically green light will be turned ON. The flow of this system works as shown in Figure.5.

IV. RESULTS AND DISCUSSION

In the present work over all kit is ready and it is working with Linux Operating system using Raspbian OS with putty software python code is compiled to get the output results through internet (Wi-Fi) using raspberry pi. There are three activities which are experimented below with der results.

Case-A: As Shown in the below Figure 6 the traffic signals at the junction which are connected to Raspberry pi and IR Sensors. IR Sensors are connected to the GPIO pins of Raspberry pi on Lane 1 and Lane 2 to detect the Traffic Density.

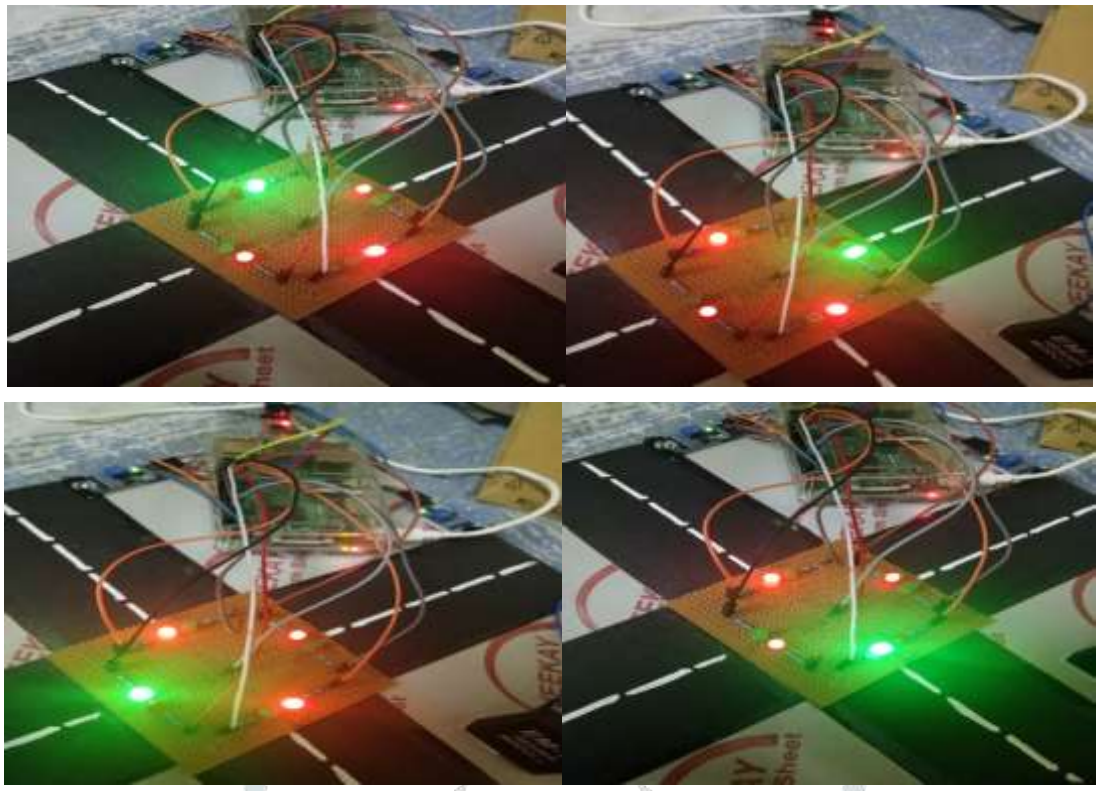

Figure 6: Traffic Signals connected to Raspberry pi

Using putty software python code is compiled and the output result is based on the Traffic Congestions in Lane 1 and Lane 2 the IR Sensors will detect the vehicle count. If the count is more than 10, the green light duration is set to 30 seconds, duration is set to 10 seconds. The red light duration will be for 10 seconds and orange light duration will be for 2 seconds. Information is displayed on the webpage through internet to the traffic control room. Through GSM Module an SMS is also sent to the nearest Traffic Police and if there is problem through internet manual operation can be possible as shown in the below Figure 7.

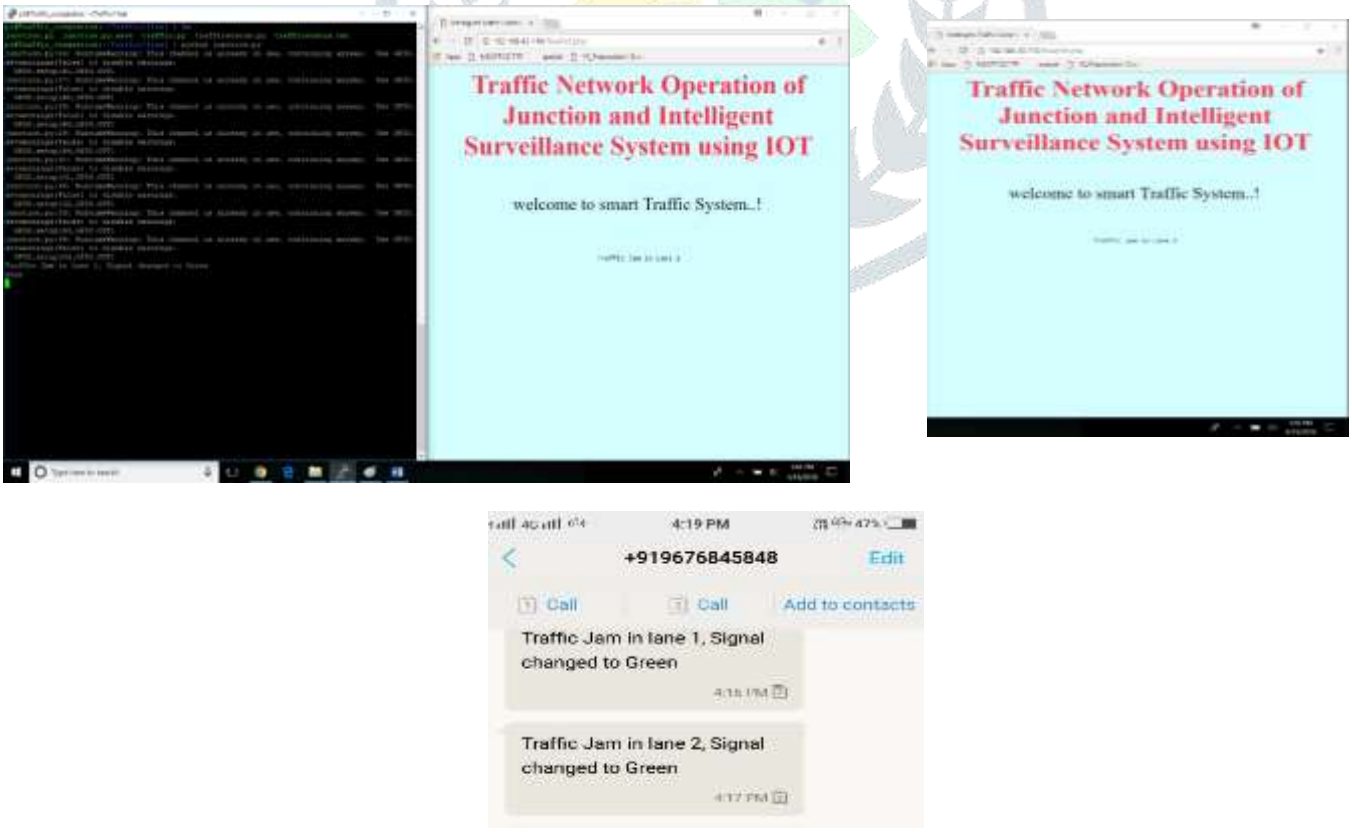

Figure.7: Traffic Jam at lane1, 2 and 3

V. CONCLUSION

The paper was designed that the system results is as we expected. By this system time management for signal lights is done which will reduce the traffic congestion problem. And the system has automatic and manual operation. This proposed system reduces the possibilities of traffic jams, caused by high red light delays and provides the clearance to the emergency vehicle, to an extent successfully. The road has given highest priority which is cleared first. This system also gives importance to the ambulance. If any ambulance is waiting near signal then the particular lane is given highest priority and the traffic in that lane is cleared. Emergency vehicles need to reach their destinations at the earliest. With emergency vehicle clearance, the traffic signal turns to green as long as the emergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through. Hence, much precious life would be saved. And at present we have implemented the design for only one road of junction. This can be extended to more number of junctions. Currently, it is implemented system by considering one road of the traffic junction. When stolen vehicle is identified an SMS is dropped to the vehicle Owner and to the local police. Tracking of stolen automobile is done successfully and is fast.

REFERENCES

[1]. G. Varaprasad and R. S. D. Wahidabanu, "Flexible routing algorithm for vehicular area networks," in Proc. IEEE Conf. Intell. Transp. Syst. Telecommun., Osaka, Japan, 2010

[2]. A. Akl, C. Feng and S. Valaee, "A novel accelerometer-based gesture recognition system," IEEE Trans. Signal Process., vol. 59, no. 12, pp. 6197–6205, Dec. 2011.

[3]. W.C.Bang, W.Chang, K. H. Kang, E.S. Choi, A. Potanin, and D. Y. Kim, "Self-contained spatial input device for wearable computers," in Proc. IEEE Int. Conf. Wearable Comput., Oct. 2003, pp. 26–34.

[4] M. Zhang, T. Yu, G. F. Zhai, Smart Transport System Based on "The Internet of Things," Amm. 48-49 (2011) 1073–1076.

[5] Crompton Greaves Limited: Official Website: http://www.cglonline.com

[6] Liao, "Problem solving and knowledge inertia. Expert Systems with Applications" 2002. 21-31.

[7] Yang and Recker, "Simulation studies of information propagation in a self-organizing distributed traffic information system", Transportation Research Part C. Vol. 13, 2005 370-390.

[8] Findle, "On-line decision about permitted/protected left-hand turns in distributed traffic signal control "Journal of Engineering Applications in Artificial Intelligence. Vol 10, No.3, 1997, pp. 315-320.

[9] Chen and Yang, "Minimization of travel time and weighted number of stops in a traffic-light network", European Journal of Operational Research. Vol. 144, pp565-580. \

[10] Pappis, C.P. and Mamdani, E.H., "A Fuzzy Logic Controller for a Traffic Junction", IEEE Transactions on Systems, Man and Cybernetics, 1977, pp. 707-717.

[11] Wei, W., Zhang, Y., Bosco, Mbede, J., Zhang, Z., Song, J., "Traffic signal control using fuzzy logic and MOGA" Proceedings of the 2001 IEEE International Conference on Systems, Man and Cybernetics. Tucson, USA, October 7-10, 2002, pp. 1335-1340.

[12] Hoyer and Jumar, "An advanced fuzzy controller for traffic lights", Annual Review in Automatic Programming Vol. 19, 1994, pp. 67-72.

[13] Ikeda et al., Ikeda, T., Hsu, M.Y., & Imai, H., "A fast A., Algorithm for finding better routes by AI search techniques" IEEE Proceedings of Vehicle navigation and information systems conference, 1994, pp. 291-296. \