MODERN IOT TRAFFIC CONTROLLER SYSTEM FOR GROW UP THE TENDENCY OF MAINTAINING TRAFFIC RULES

Bharathi, V., Tamilselvi, T and P. Gurunathan

Dept. of Electronics and Communication Engineering
Madha Engineering College, Kundrathur, Chennai- 69, Tamil Nadu, India

ABSTRACT

Traffic jam is obstructing for trade and commerce also waste valuable time. The main reason of traffic jam can be not maintain traffic rules, faulty traffic signalling systems. Illegal parking is another reason for traffic jam. Faulty traffic signalling systems, inadequate manpower and narrow road spaces and overtaking tendency of drivers create pro-longed traffic congestions and intensify sufferings of commuters keeping people motionless as well as creating suffocating condition in the streets. We overcome this problem we must install a modern IOT traffic controller system also grow up the tendency of maintaining traffic rules. The reason of taking Traffic Controller as a project to reduce that problem, hopefully this is a good effort.

Keywords: Traffic jam, IOT traffic controller, signal and software control.

INTRODUCTION

Traffic lights, also known as traffic signals, traffic lamps, signal lights, robots are signaling devices positioned at or near road intersections, pedestrian crossing sand other locations to control competing flows of traffic. Traffic lights were first installed in 1868 in London, United Kingdom; now used in almost every city of the world (1). Traffic lights alternate the right of way accorded to road users by displaying lights of a standard colour (red, yellow/amber, and green) following a universal colour code(and a precise sequence to enable comprehension by those who are colour blind).

A smart traffic management system utilizing sensor data, communication and automated algorithms is to be developed to keep traffic flowing more smoothly. The aim is to optimally control the duration of green or red light for a specific traffic light at an intersection. The traffic signals should not flash the same stretch of green or red all the

time, but should depend on the number of cars present. When traffic is heavy in one direction, the green lights should stay on longer; less traffic should mean the red lights should be on for longer time interval. This solution is expected to eliminate in efficiencies at intersections and minimize the cost of commuting and pollution.

There are three colours (or traffic lights)
RED - personal for named recipients only. In the context of a meeting, for example, RED information is limited to those present at the meeting. In most circumstances, RED information will be passed verbally or in person.
AMBER - limited distribution: The recipient may share AMBER information with others within their organization, but only on a „need-to-know" basis. The originator may be expected to specify the intended limits of that sharing.
GREEN - Community wide: Information in this category can be circulated widely within a particular community. However, the information may not be published or posted publicly on the Internet, nor released outside of the community.

Australian Standard: Green: a green man means cross. Flashing Red: a red flashing man means finish crossing. Red: a red man means do not cross. Some traffic lights in Melbourne have countdown timers for pedestrian crossing lights, usually they countdown from 30 when the red flashing man appears (2).
European Standard: The light sequence is: Green: Cross. Yellow/Orange: Continue to cross only if unable to stop safely. Flashing Yellow/Orange: Cross with caution (usually used when lights are out of order or shut down). Red: Do not cross.
British Standard: In the United Kingdom, British Crown Dependencies and dependent territories, and former possessions like Hong Kong:Green walking-man: Cross with caution (pedestrians have the right of way; motorists turning left or right must yield to pedestrians. Flashing green walking-man: Continue to cross if already in the intersection, but do not start to cross. Red/Orange standing-man: Do not cross the same system is used also in Macau.
China Standard: Green: Cross. Yellow/Orange: Do not cross. Flashing Yellow/Orange: Do not cross. Red: Do not cross.
North American Standard: The light sequence is: Green/white walking human or Walk: Cross with caution (pedestrians have the right of way; motorists turning left or right must yield to pedestrians). Flashing red/orange stop hand or Don't Walk: Do not

cross unless in middle of intersection. Red/orange stop hand or Don't Walk: Do not cross intersection.

Lane control: Lane-control lights are a specific type of traffic light used to manage traffic on a multi-way road or highway. Typically, these lights allow or forbid traffic to use one or more of the available lanes by the use of green lights or arrows (to permit) or by red lights or crosses (to prohibit). In the US, lane-control lights are often used to control and/or direct the flow of traffic through toll plazas and highway tunnels, such as during unusually heavy traffic flow when more lanes may be required in one direction than in the other direction, or during a hurricane evacuation, when the lane signals for all lanes will show green for one direction to assist in more rapid traffic flow from the evacuation site. Lane-control lights are also used at highway weigh stations to direct tractor-trailers and other heavy or oversized vehicles into the proper lanes for weighing, inspection or exit (3).

MATERIALS AND METHODS

Existing System: Traffic congestion mainly focuses on the signals failure, reduced law enforcement and improper traffic management. Many ways have been developed to manage traffic and reduce congestion. Infrared sensor, inductive loop detection, video data analysis, wireless sensor network, and other are used to somewhat solve the congestion in the traffic and to manage the traffic smartly. There is no IOT based Traffic management System.

In the traffic light control system, the main controller, control circuit, counter, timer, decoder, clock signal generator, decoder drive circuit and digital display decoder drive circuit are needed to complete the whole process of controlling the traffic light. The second pulse generator is the standard clock signal source of timer and controller in the system. The decoder outputs the control signals of two sets of traffic lights, which drive the traffic lights to work after passing through the driving circuit, namely controlling the change of green traffic light, red light signal and yellow traffic light; The controller is the main part of the system, which controls the work of timer and decoder. And then the signals are passed by the clock signal generator to the main control circuit and counter, and then from counter to the decoder, finally revealed on the display.

Proposed System: This given system overcomes the flaws of previous manual traffic administered systems. The structure takes traffic solidity as input resultantly

giving output as signal data, resultantly giving output as signals management using IOT.

Our project aims to eliminate the delay on roads by reducing traffic on road automatically using embedded system. It determines traffic on each road by using sensors. Using that traffic information we can manage the signal time and handle the traffic on road. On each road we place IR sensors which detect the vehicle and give current traffic information on each road. The timing of signal is adjusted according to traffic level on each road. The road which has level more than other road then this road assign green signal and for others have red is assign. It is also provide the additional functionality of release the emergency vehicle on its occurrence that means when emergency vehicle occur. In our project we focus on optimization of traffic light controller in a city using IOT real-time controlling unit and developed system using microcontroller Arduino UNO.

Hardware Required: Arduino UNO, LED, Connecting wires and USB cable

Software Required: Python, Django Server Scripting and **Arduino IDE**

Design Procedure: The idea was to implement a traffic light controller for an intersection with four lights. Each street has one lane, the diagram below best illustrates this picture.

Block Diagram (fig.1):

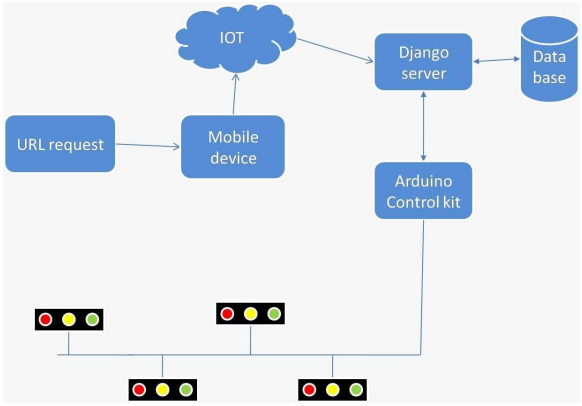

Figure 1. Block Diagram

Circuit Diagram (fig.2)

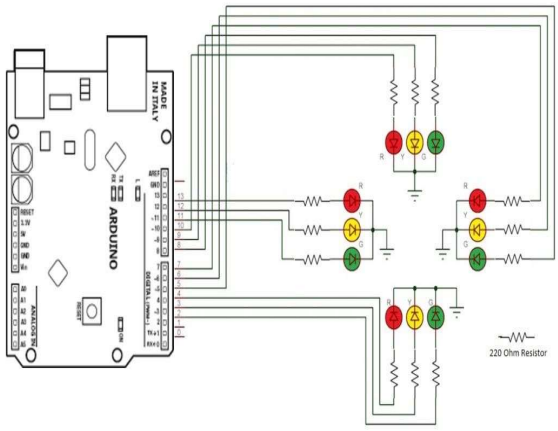

Figure 2. Circuit Diagram

Arduino Serial Programming: Serial communication on pins TX/RX uses TTL logic levels (5V or 3.3V depending on the board). Don't connect these pins directly to an RS232 serial port; they operate at +/- 12V and can damage your Arduino board. Serial is used for communication between the Arduino board and a computer or other devices.

Operation and Working Principle of Traffic Controller: At first main power is stepped down by transformer X1 to deliver a secondary output of 9v, 300 mA. The transformer output is rectified by a full-wave bridge rectifier comprising diodes D1 through D4. Filtered by capacitor C1 and regulated by voltage regulator IC1 7805. IC2 is wired as a multi vibrator with „ON" and „OFF" periods of 35 and 30 seconds. As soon as main power is switched on, pin 3 of IC2 goes high for 35 seconds. This in turn energies relay RL1 its normally-open(N/O) contact through transistor T1 then the red lamp R1, R2 glows for stopping Road1 and Road2"s vehicle also green lamp G3, G4 glows through its normally-open contact to running Road3 and Road4"s vehicle for 35 seconds shown in figure 3.

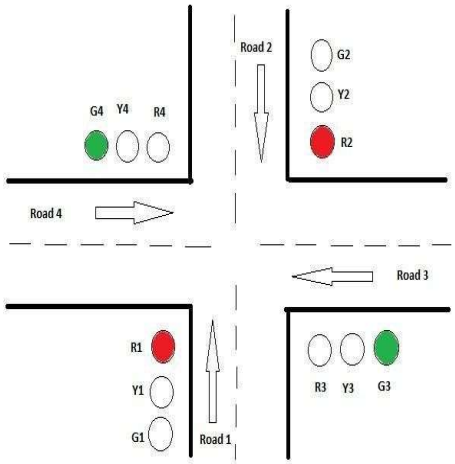

Figure 3. First step of traffic controller

At the same time main power is disconnected from the pole of relay RL2. As the on time of IC2, a pulse at its pin 3 triggers IC3 through C5. IC3 is configured as a monostable with „ON" time of about 5 second. which means pin 3 of IC3 will remain high for this period and energies relay RL2 through driver transistor T2. The yellow lamps Y1,Y2,Y3 and Y4 lights up for 5 seconds shown in figure 4-5.

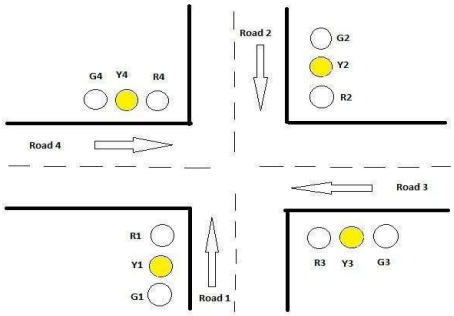

Figure 4. Second step of traffic controller

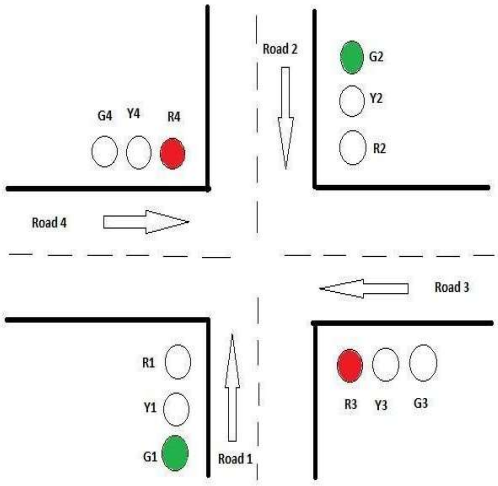

Figure 5. Final step of traffic controller

As soon as 5 second time period of timer IC3 at pin 3 lapses, relay RL2 de-energies and finally the red lamp R3, R4 glows for stopping Road3 and Road4‟s vehicle also green lamp G1,G2 glows through its normally-closed (N/C)contact to running Road1 and Road2‟s vehicles for 30 seconds shown in figure.

Methodology

In this project, a simple traffic light system for a 4 way intersection is implemented using Arduino UNO development board. Although it is not the practical implementation for real life scenarios, it gives a general idea of the process behind the traffic light control system. Simple traffic light controller is made using Arduino UNO, where the traffic is controlled in based on programmed timings .For better understand let's consider time delays as Green – 20 Sec., Yellow – 5 Sec., Red – 75 Sec .Each lane gets time duration of 25 seconds including the yellow light time to move. The yellow light turns ON for short duration after green light, indicating vehicles to slow down before the red light appears to avoid sudden stoppage Vehicles in every lane have to wait for 75 Sec. during red signals.

Controller Logic: The logic of the controller is very simple. All it has to do is switch lights according to the low or high signal comping from the controlling unit. The initial state of the control is that works are regular intervals. If uncertain traffic density using IOT monitoring system we can control the Signals for the high density traffic roads and make the clearance faster for the populated roads.

RESULTS AND DISCUSSION

In this project, a simple traffic light system for a 4 way intersection is implemented using Arduino UNO development board. Although it is not the practical implementation for real life scenarios, it gives a general idea of the process behind the traffic light control system (Figure 6). Simple traffic light controller is made using Arduino UNO, where the traffic is controlled in based on programmed timings. For better understand let's consider time delays as below Green – 20 Sec., Yellow – 5 Sec., Red – 75 Sec.

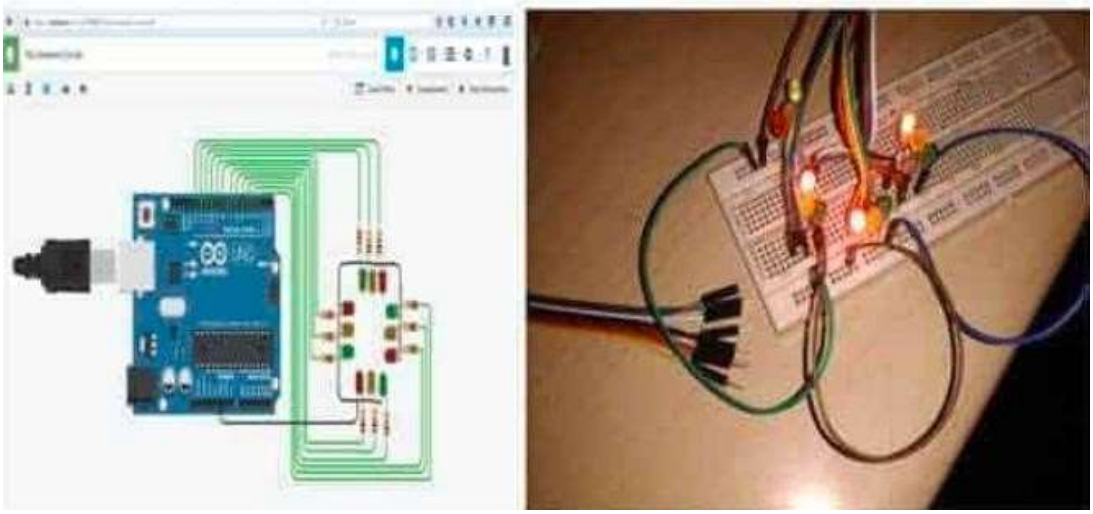

Figure 6. Traffic light control system

Each lane gets time duration of 25 seconds including the yellow light time to move. The yellow light turns ON for short duration after green light, indicating vehicles to slow down before the red light appears to avoid sudden stoppage (Table 1).

Table 1: Vehicles in every lane have to wait for 75 Sec. during red signal.

		Lane 1	Lane 2	Lane 3	Lane 4
Lane Green	1	20G	25R	50R	75R
		5Y	5R	30R	55R
Lane Green	2	75R	20G	25R	50R
		55R	5Y	5R	30R
Lane Green	3	50R	75R	20G	25R
		30R	55R	5Y	5R
Lane Green	4	25R	50R	75R	20G
		5R	30R	55R	5Y

Traffic signal is one of those elements that, for every commuter, seem to be part of everyday life. Wherever there are more number of cars, there will probably be one of these systems are present. Nowadays traffic lights are quite complex within and have various kinds of sensors, timers, and also traffic monitoring systems that helps to control the traffic. Having personal vehicles is very common today and a result, vehicles on the roads are exponentially increasing in numbers. Roads without any traffic lights or guidance can lead in to traffic congestion or could lead to accidents. The traffic light system provides instructions to the users (drivers and pedestrians) by displaying lights of standard colour on four cross streets. The colours used in traffic lights are Red, Yellow and Green for stop, slow and go respectively. The system is programmed to control the traffic lights for smooth and safe movement of vehicle traffic. The system consists of electro mechanical controllers with modern solid state computerized systems which has easy setup and maintenance (4-6).

Today, Internet application development demand is very high. So IOT is a major technology by which we can produce various useful internet applications. “Things” in the IOT sense, is the mixture of hardware, software, data, and services. “Things” can refer to a wide variety of devices such as DNA analysis devices for environmental monitoring, electric clamps in coastal waters, Arduino chips in home automation and many other. These devices gather useful data with the help of various existing technologies and share that data between other devices. Examples include Home Automation System which uses Wi-Fi or Bluetooth for exchange data between various devices of home.

Currently, there is no international standard of compatibility for the tagging and monitoring equipment. I believe this disadvantage is the most easy to overcome. The manufacturing companies of these equipment just need to agree to a standard, such as Bluetooth, USB, etc. This is nothing new or innovative needed. As with all complex systems, there are more opportunities of failure. With the Internet of Things, failures could sky rocket. For instance, let’s say that both you and your spouse each get a message saying that your milk has expired, and both of you stop at a store on your way home, and you both purchase milk. As a result, you and your spouse have purchased twice the amount that you both need. Or maybe a bug in the software ends up automatically ordering a new ink cartridge for your printer each and every hour for a few days, or at least after each power failure, when you only need a single replacement (7).

SUMMARY AND CONCLUSION

Traffic jam is the common phenomena in city area. The city is the most traffic jam affected area. Traffic jam is obstructing for trade and commerce also waste valuable time. The main reason of traffic jam can be not maintain traffic rules, faulty traffic signalling systems. Illegal parking is another reason for traffic jam. Cars, trucks and other vehicles are parked almost everywhere. Faulty traffic signalling systems, inadequate manpower and narrow road spaces and overtaking tendency of drivers create pro-longed traffic congestions and intensify sufferings of commuters keeping people motionless as well as creating suffocating condition in the streets. Also there are bus terminals not authorized by the traffic department and drivers do not go by traffic rules. VIP protocol maintaining is another reason for frequent traffic jams in the streets and divider problem in the city's different important roads also causes congestion. So if we want to overcome this problem we must install a modern IOT traffic controller system also grow up the tendency of maintaining traffic rules. The reason of taking Traffic Controller as a project to reduce that problem, hopefully this is a good effort.

REFERENCES

1. Babu, P. R. K. S. M. R. (2016). Real-time smart traffiffiffic management system for smart cities by using internet of things and big data. *2016* International *Conference on Emerging Technological Trends (ICETT)*.
2. Chandana K K, Dr. S. Meenakshi Sundaram, C. D. M. N. S. N. K. (2013). A smart traffiffiffic management system for congestion control and warnings using internet of things (iot). *Saudi Journal of Engineering and Technology*, 2:1-5.
3. Dave, P. N. D. M. . P. S. P. (2018). Smart traffiffiffic management system using iot. *International Journal of Computer Engineering and Applications*, 12: 10-15
4. Sabeen Javaid, Ali Sufifian, S. P. M. T. (2018). Smart traffiffiffic management system using internet of things. *20th International Conference on Advanced Communication Technology (ICACT)*.
5. Viswanathan, V. and Santhanam, V. (2013). Traffiffiffic signal control using wireless sensor networks. *2nd International Conference on Advances in Electrical and Electronics Engineering (ICAEE'2013)*.

6. Yucheng Huang, Linbing Wang, Y. H. W. Z. Y. Z. (2018). A prototype iot based wireless sensor network for traffic information monitoring. volume 11.

7. Zantout, S. (2017). Traffic light controller project final report.

8. S. Kumar Janahan, M. R.M. Veeramanickam, S. Arun, K. Narayanan, R. Anandan and S. Javed Parvez, "IoT primarily based totally clever site visitors sign tracking machine the use of automobiles counts", International Journal of Engineering and Technology, vol. 7, no. 221, pp.309, 2018