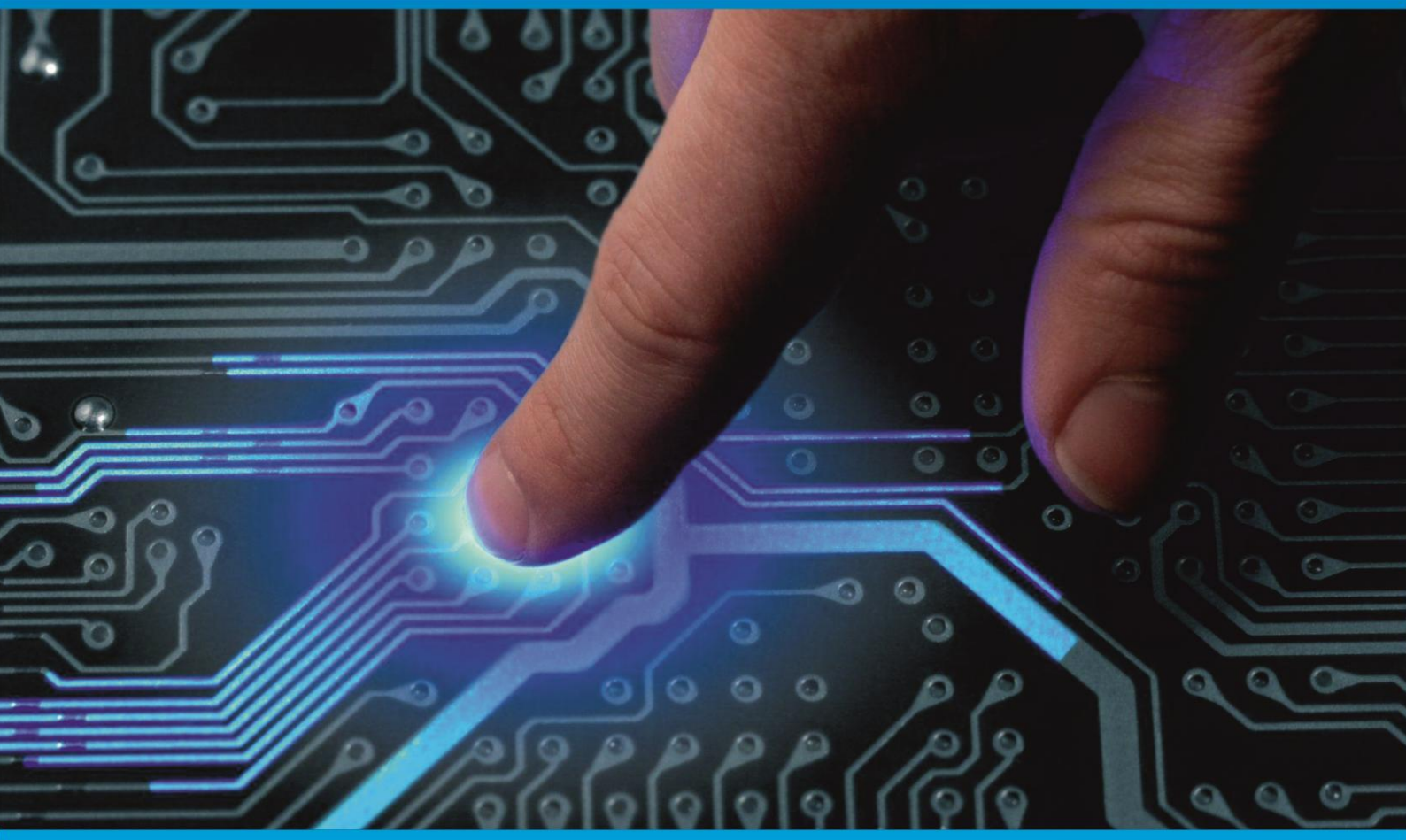
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 8, Issue 10, October 2020

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.488

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 10, October 2020 ||

Traffic Density Control Using Deep Learning

Avya Jose, Priyanga K.K

Department of Computer Science, Christ College (Autonomous), Irinjalakuda, Kerala, India

Assistant Professor, Department of Computer Science, Christ College (Autonomous), Irinjalakuda, Kerala, India

ABSTRACT: The growing population and increased vehicles lead to the main challenges in urban life. Therefore, the role of traffic management will save time and fuel consumption and reduce environmental pollution. In this paper, a new method for traffic light control is presented by using deep learning. In the proposed models, traffic light scheduling is determined based on the density and the number of passing vehicles. Emergency vehicles, such as ambulances and fire engines and protective scenarios, such as the passage of political authorities will be prioritized in this system. The drivers of the emergency vehicles can control this system by sending a message. If it is found that which direction should have longer signal time of the green light in the traffic, it can be expected to prevent unnecessary waiting time of the traffic light. In this system, vehicles are detected using deep learning techniques.

KEYWORDS: Deep Learning, OpenCV, YOLO, Arduino idle 1.8.5, ATMEGA 328, GSM, CNN

I. INTRODUCTION

The rapid growth in the vehicle ownership is one of the measures for economic growth of country. However indirect effect of vehicle ownership is acute traffic congestion. The exploitation of new trends and technologies requires fast transportation of goods, machinery and manpower for various reasons. The goal of each one is to reach at destination without wasting time and money. But resources provided by current infrastructures are limited. So the Traffic management at road is crucial to reduce waiting and travelling times, save fuel and money. Even though present traffic light controlling system handles the traffic at intersections, many times congestion, accidents happened due to its poor performance. The expansion of road infrastructure is not ultimate solution to the traffic congestion. It requires some smart mechanism that deals with the problems in the present traffic controlling system. The proposed system also provides the map feature, which shows the traffic situation of requested traffic signal. The problems of typical conventional traffic light Controller are mentioned below:

• **Fixed time interval**: Due to the fixed time interval of red and green light, suppose a road is always crowded with vehicles and go-ahead time is short.
• **Emergency Vehicle Stuck in Traffic Jam**: Usually, during traffic jam, the emergency vehicle, such as ambulance, fire brigade and police will be stuck especially at the traffic light junction. This is because the road users waiting for the traffic light turn to green. This is very critical problem because it can cause the emergency case become complicated and involving life. To solve these problems, this system is introduced.

II. RELATED WORKS

There have been different studies conducted on traffic management for a smart city.
G. S. Khekare proposed vehicular ad-hoc networks (VANETs) that is a typical example of a variety of networks in wireless technologies. Their methodology is based on the smart city framework that will transfer information about traffic conditions and help drivers choose a suitable direction to prevent traffic congestion.
The role of traffic management will save time and fuel consumption and reduce environmental pollution. In recent years, Internet of Things (IoT) and smart cities drive a new field of intelligent traffic management. In this paper, a new method for traffic light control is presented by using the combination of IoT and image and video processing techniques. In the proposed models, traffic light scheduling is determined based on the density and the number of passing vehicles. Moreover, it is implemented by Raspberry-Pi board and OpenCV tool. The analytical and experimental results indicate the efficiency provided by the proposed models in intelligent traffic management.

III. PROPOSED SYSTEM

To improve the safety for both pedestrians and the vehicles Traffic signal is must. Emergency vehicles, like Ambulance have responsibility to reach patients or those who are met with accidents have to quickly transfer them to hospital. Due to traffic signals they may be delayed for rescue operations. This paper define how traffic signal lights will detect emergency vehicles, how to manipulate the traffic light and how to provide free way to emergency vehicle.

This system does:
- **Vehicle detection.**
- **Vehicle counting.**
- **Traffic light control.**
- **Alert message passing.**

The problem with the traffic system is that for every minute the vehicles at the 4-way road will be heavy and the traffic lights shall be changed to each side for some fixed time. Even though there are no vehicles at particular side, the traffic signals will glow for given fixed time. Due to that there is time waste process and other side vehicles have to wait for the time to complete the process. So to reduce the wastage of time, we can implement the system that controls the traffic based on the heavy flow of vehicles at any particular side. With this system, we shall count the number of vehicles at each side at the junction and give the path to the particular side which has heavy flow of vehicles and keep remaining stop position. Whenever an emergency vehicle wants to go through the signal, they can control our system by sending an emergency message and then changes the Red light to Green.
This system aims at reducing traffic congestion and unwanted time delay during the traffic light switch overs especially when the traffic is very low. It is designed to be implemented in places nearing the junctions where the traffic signals are placed, in order to reduce the congestion in these junctions. It keeps a track of the vehicles in each road and accordingly adjusts the time for each traffic light signals. The higher the number of vehicles on the road the longer will be the time delay allotted for that corresponding traffic light signal. It also handles emergency cases.
The advanced version of machine learning called deep learning is used to develop this system. Supervised learning is used here. There is an algorithm-Convolutional Neural Network. It is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.

State chart Diagram

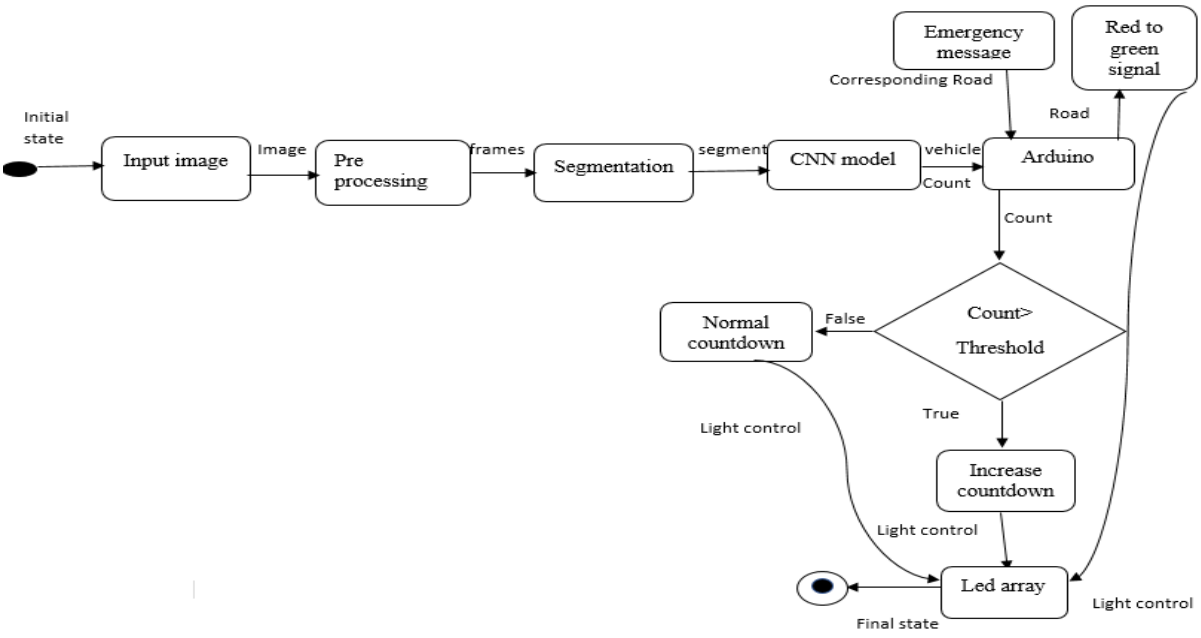


FIGURE 1: STATE CHART DIAGRAM

IV. METHOD

The modularity criteria are:

- Train the model for vehicle detection using deep learning.
- Count the number of vehicles on each road.
- Arduino controls the traffic light based on vehicle count.
- GSM is used in emergency situation to open a particular road.

Train the CNN model for vehicle detection using YOLO technique. YOLO trains on full images and directly optimizes detection performance. It is extremely fast and it learns generalizable representations of objects.

Please refer to Fig. 1, which illustrates the proposed method. The next subsection defines the brief description about the Tools/Scripts for Implementation:

- **OpenCV**: OpenCV-Python is an appropriate tool for fast prototyping of computer vision problems.
- **Arduino idle 1.8.5:** The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board.
- **ATMEGA 328:** It is an 8-bit and 28 Pins AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash type program memory of 32KB.
- **GSM:** GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users.

COMPONENT DIAGRAMS

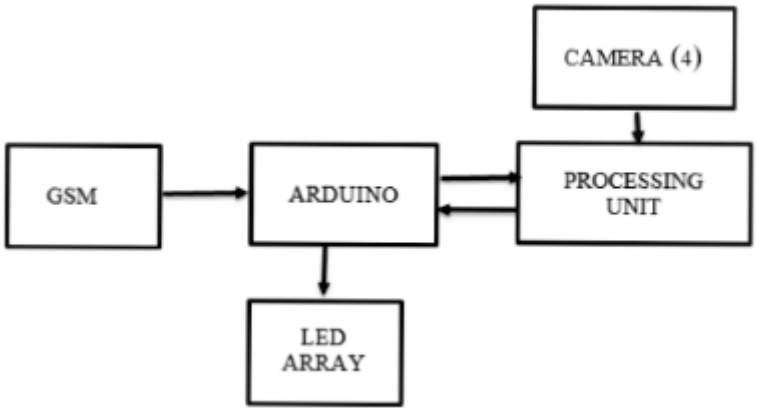


FIGURE 2: HARDWARE

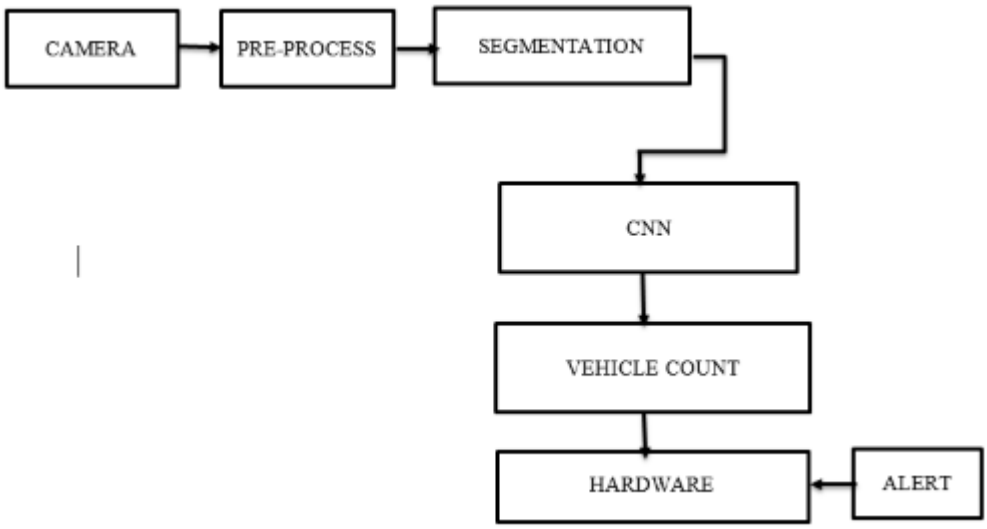


FIGURE 3: SOFTWARE

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 10, October 2020 ||

V. IMPLEMENTATION

MODULE HIERARCHY

- **Vehicle detection and counting:** CNN model is trained to detect vehicles using YOLO technique. Images of four roads are given as input in to the model and then count the number of vehicles on each road. This count is given as input to the hardware.
- **Arduino:** Arduino is connected to the processing unit through port COM3.It takes the vehicle count as input and then control the traffic light based on it. The road which has more count than a threshold value is open for more seconds. When an emergency message from GSM is received, it stops the current activities and opens the requested road.
- **GSM:** GSM is used to send messages in emergency situations such as ambulance; fire forceetc. wants to pass through a particular road immediately.

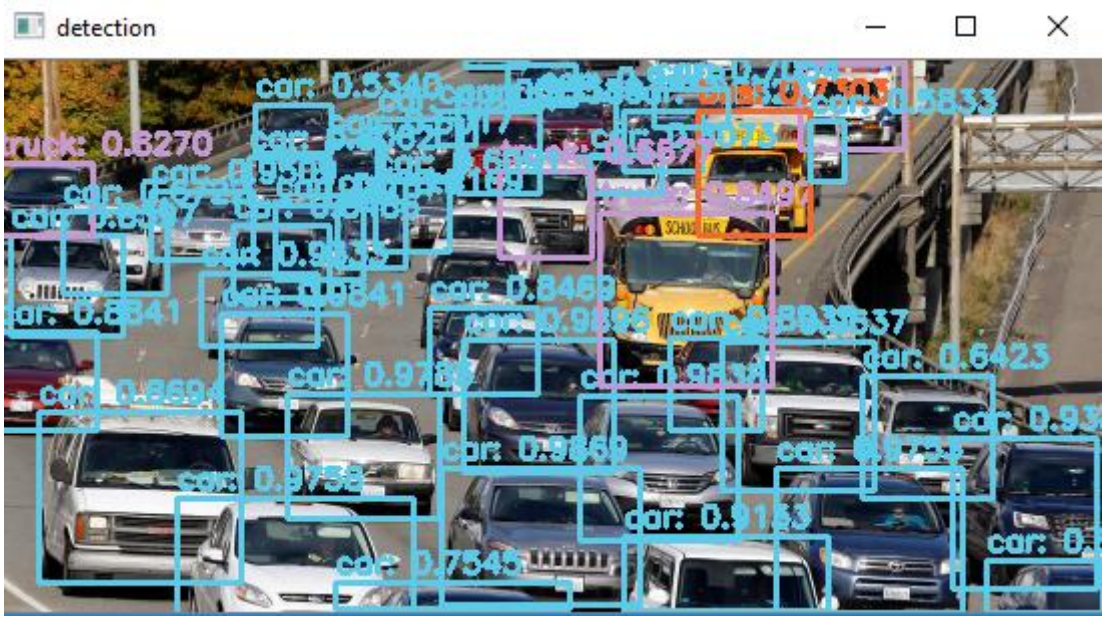


Figure 4: VEHICLE DETECTION

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 10, October 2020 ||

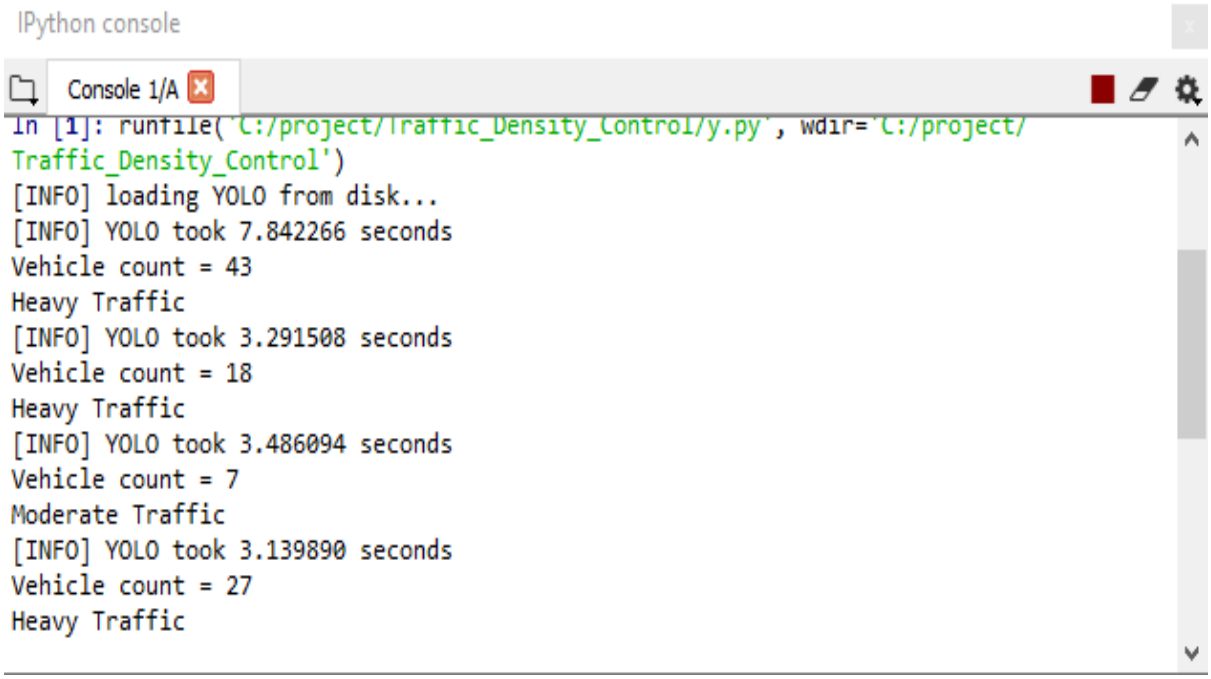


FIGURE 5: VEHICLE COUNT

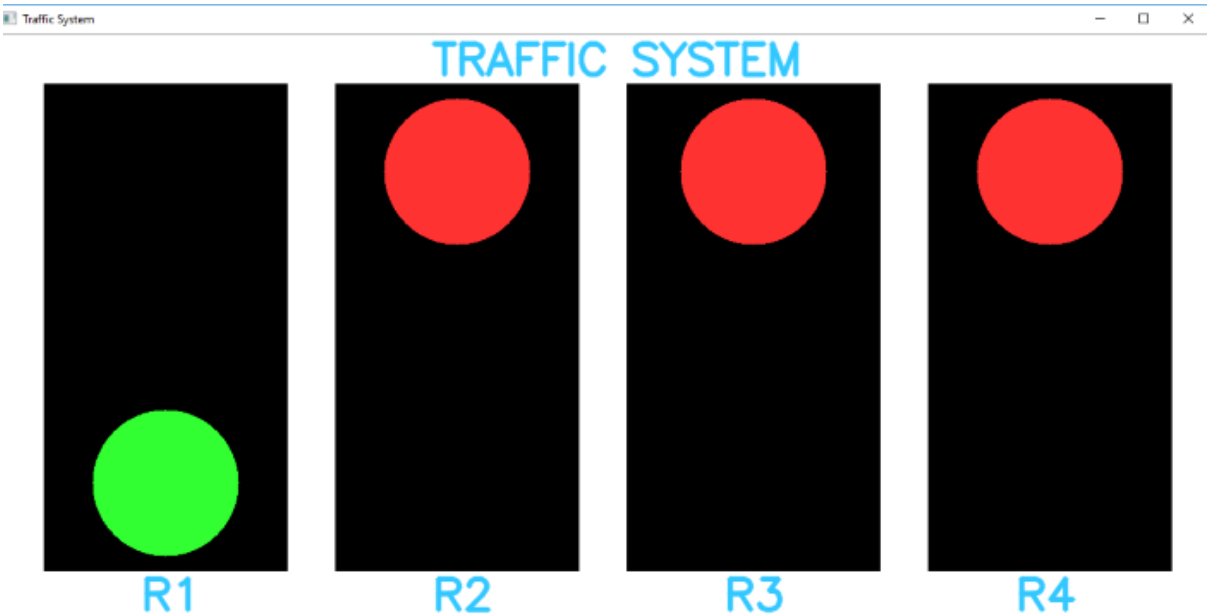


FIGURE 6: TRAFFIC LIGHT CONTROL

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 10, October 2020 ||

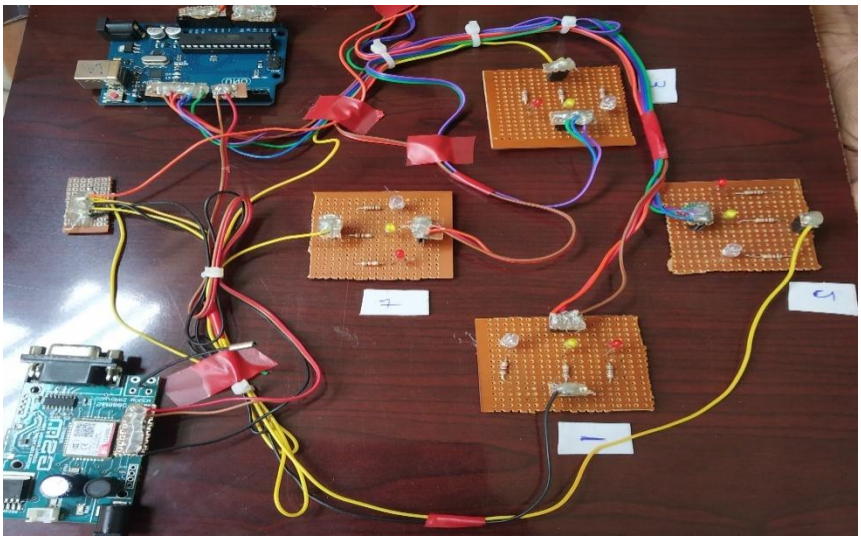


FIGURE 7: HARWARE PICTURE

VI. CONCLUSION

Here there is an intelligent solution to control and manage the crossroad traffic using deep learning model and hardware. Scheduling of green and red traffic lights is determined based on the density and number of vehicles passing through the main streets leading to the crossroads in the proposed models. Usually, during traffic jam, the emergency vehicle, such as ambulance, fire brigade and police will be stuck especially at the traffic light junction. This is because the road users waiting for the traffic light turn to green. This is very critical problem because it can cause the emergency case become complicated and involving life. This system solves this problem.
Use of sensors to check whether emergency vehicle passed or not will be prioritized in the future.

REFERENCES

[1] G. S. Khekare, “A Smart City Framework for Intelligent Traffic System Using VANET,” pp. 302–305, 2013.
[2] S. Badura and A. Lieskovsky, “Intelligent traffic system: cooperation of MANET and Image processing,” 2010.
[3] A. Kanungo, A. Sharma, and C. Singla, “Smart traffic lights switching and traffic density calculation using video processing,” 2014 Recent Adv. Eng. Comput. Sci., pp. 1–6, 2014.
[4] Meisam Razavi, Mehdi Hamidkhani and Rasool Sadeghi “Smart Traffic Light Scheduling in Smart City Using Image and Video Processing”, 2019
[5] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, “Internet of Things (IoT): A vision, architectural elements, and future directions,” Futur. Gener. Comput. Syst., vol. 29, no. 7, pp. 1645–1660, 2013.
[6] Software Engineering a practitioners approach by Roger S.Pressman
[7] Neural Networks and Deep Learning by Michael Nielsen.
[8] Gulli and Kapoor’s TensorFlow Deep Learning Cookbook.

INNO SPACE

SJIF Scientific Journal Impact Factor

Impact Factor:
7.488

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details