SMART TRAFFIC SYSTEM

S Amirthavarshini[1], Barath L[2], Kishore A[3], Sindhu M[4], Esther Florence S [5]

[1] *Student, Electronics and Communication Engineering, SSN College of Engineering, Tamil Nadu, India*
[2] *Student, Electronics and Communication Engineering, SSN College of Engineering, Tamil Nadu, India*
[3] *Student, Electronics and Communication Engineering, SSN College of Engineering, Tamil Nadu, India*
[4] *Student, Electronics and Communication Engineering, SSN College of Engineering, Tamil Nadu, India*
[5] *Associate Professor, Electronics and Communication Engineering, SSN College of Engineering, Tamil Nadu, India*

ABSTRACT

This paper presents the design for a Smart Traffic System, implemented using Image Processing, Arduino and Wireless Communication. Arterial roads of a metropolitan city bear witness to a huge amount of traffic during the peak office hours. The commuters face difficulties in reaching their desired destination due to faulty traffic signals at various places, in addition to unmanned junctions at various points along the arterial road. There are also numerous instances of emergency vehicles stuck in long traffic jams, leading to loss of critical time for imparting first aid to patients in need. This paper aims to provide a solution for the various issues caused by improper traffic signals, in the form of a compact and cost-efficient set up for handling the traffic signals. The traffic at a particular point is estimated by image processing, processed by Arduino and used for the appropriate manipulation of the traffic signal at the junction. The problem of faulty traffic signals also has an undesirable effect in the case of emergency vehicles. Emergency vehicles are often caught up in the middle of traffic snarls, causing distress and loss of crucial time that could instead be utilized towards the treatment of the patients. The proposed system identifies emergency vehicles among the group of vehicles in the traffic, by using Beacon Technology and appropriately manipulates the duration of the Traffic light, enabling fast clearance of vehicles and easier medical access to patients. The proposed system comprises of minimal hardware and software without compromising on efficiency, thus making it affordable and reliable.

Keyword : - *Image Processing , Arduino, Wireless Communication, Traffic management.*

1. INTRODUCTION

The 21st century is known for rapid economic development, causing increased wealth among households and increase in vehicle ownership. The demand for transport in India has increased eight folds from the 1980's due to the high population and population density and an under-developed public transportation system. The lack of proper traffic management has resulted in a huge amount of time wasted in peak hour congestion, causing loss of revenue, time and increased exposure to pollution. There also arises the case of emergency vehicles stuck in the middle of peak hour congestion, delaying necessary treatment for the critical. These issues make it necessary to bring in innovative solutions to reduce traffic snarls at important junctions and assist emergency vehicles. The proposed system aims to provide a three-point solution to these issues, namely, to analyze the traffic at a junction in the city at any point of time and calculate the number of vehicles, to compare this count with a pre-emptive threshold and manipulate the duration of the signals accordingly, to identify the presence of emergency vehicles amidst the vehicles in traffic and increase the signal duration appropriately to provide faster access to medical treatment for those in distress.

2. SYSTEM OVERVIEW

The proposed system comprises of three sections namely – Image Interpretation section, Communication section and Emergency section. The working of the system is highlighted using the block diagram given below
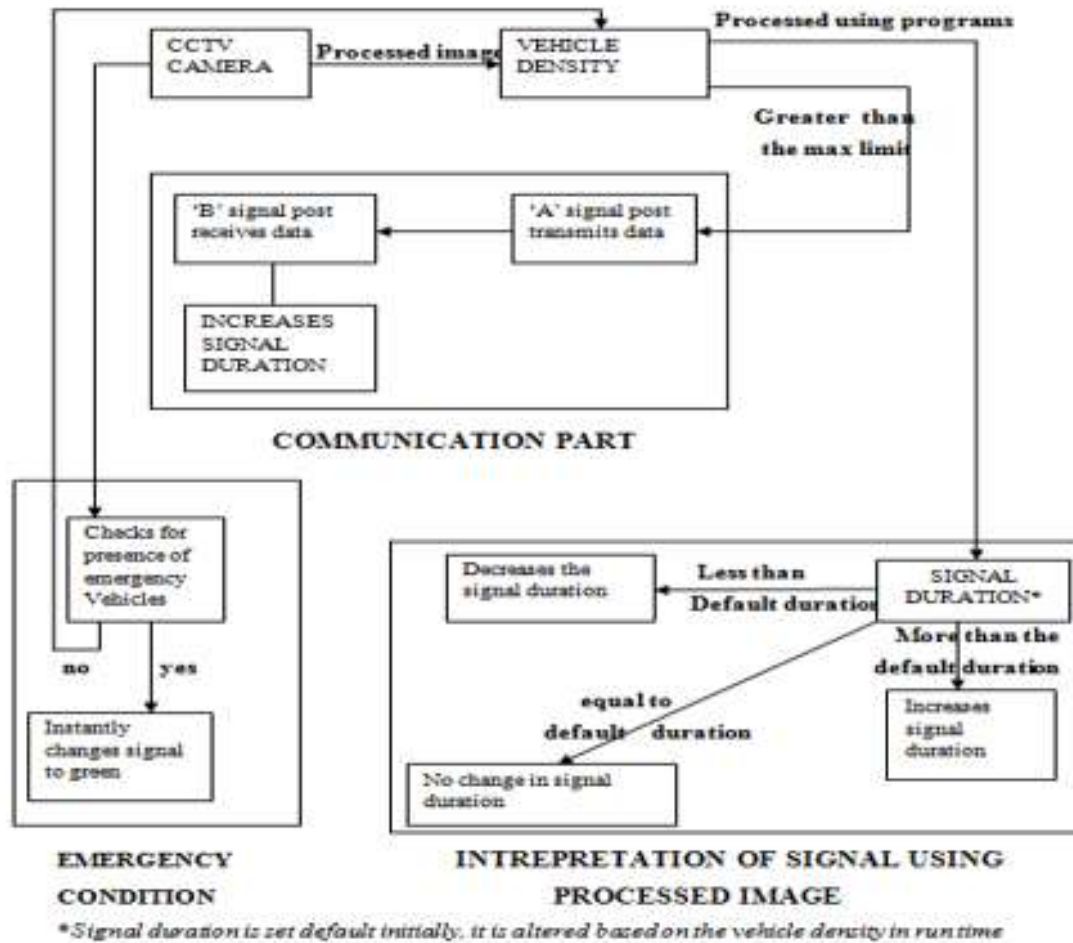
The working of each of the sections is explained below.

2.1 IMAGE INTERPRETATION SECTION

In this section, images of the traffic at a junction is taken at periodic intervals. These images are processed subsequently to obtain a count of the number of vehicles present at the junction at the time the image was captured. CCTV cameras can be used for this purpose. The results of this section, which is the vehicle count, is passed to the next section for further processing.

2.2 COMMUNICATION SECTION

In this section, the vehicular count is used for performing further processing and manipulation. The vehicular count is compared with a pre-determined threshold by the Arduino. If the value of the count is greater than the threshold, then the traffic at the junction is considered to be high and the traffic light duration is varied accordingly. If the value is less than the threshold, then the signal duration is not varied.

2.3 EMERGENCY SECTION

In this section, Emergency vehicles are identified in the traffic and assistance is provided. If there exist any emergency vehicles like Ambulance in the traffic at the junction, the duration of the green signal is increased, allowing movement of traffic and faster access to medical intervention for the patient in distress. This is achieved by using Beacon technology via LINKIT 7697 Microchip.

3. IMPLEMENTATION

The proposed system is implemented using MATLAB and Arduino. The Image Interpretation section comprises of two images, namely a reference image of the junction without any traffic and the image taken at regular intervals. MATLAB is used for processing the image, which is done as shown below.

**Fig 1:** Image Interpretation – Case 1

The figure above highlights the image interpretation performed at a particular junction at a particular time. The vehicles are indicated by the red boundary around the object.

Fig 2: Image Interpretation – Case 2

The figure above shows the Image Interpretation using MATLAB for another scenario, identifying the vehicle at the junction.

The hardware used for the implementation of the proposed system is shown below.
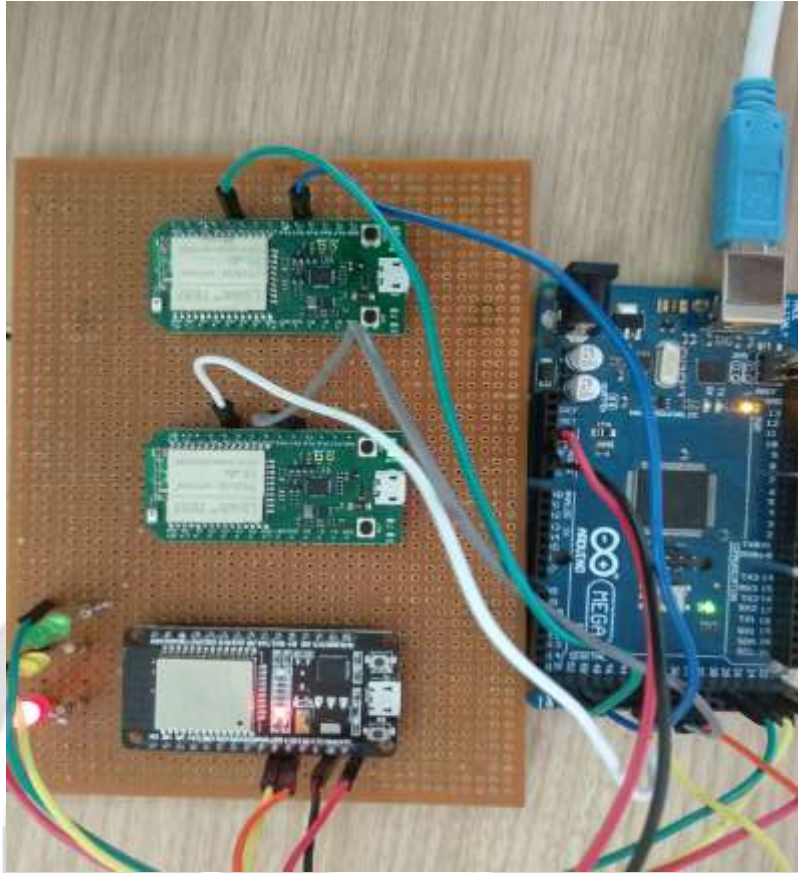
Fig -3: Prototype of the proposed system

The hardware comprises of the Arduino, ESP 8266 Wi-Fi Modules and the LINKIT 7697 Microchip. These components are interfaced with three LED's of Red, Orange and Green color, representing the three traffic lights. Based on the results of the processing done by the Arduino from the CCTV Camera and the LINKIT 7697 chip, the duration of the three LED lights are varied.

4. CONCLUSIONS

The proposed system serves as a low cost, compact and an efficient model for the manipulation of the traffic signals under various situations. It was observed that the Image Interpretation section provides results with high accuracy thus enabling efficient manipulation of the traffic signals. It was also observed that this model can be implemented efficiently in the city's traffic scenario. There is negligible delay involved in the transmission and reception of data by the devices involved in the system, thus providing high level of accuracy in the results.

5. REFERENCES

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