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Density-based real-time traffic control system using image processing and emergency vehicle clearance using mat lab

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Abstract - *Traffic congestion has become a major problem in today's life. This is mainly due to the increased number of vehicles in the roads. In order to reduce this traffic density, we are proposing a density-based traffic control system using image processing. Along with this, we are also proposing a system which would clear out the emergency vehicles on roads. The emergency vehicles would include ambulance, VIP vehicles, fire engines etc... For this we are using an RFID tag and a reader module. The image processing is done with the help of Mat Lab.*

Key Words: Traffic density, density-based traffic control system, image processing

1. INTRODUCTION

In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. The major cause leading to traffic jam is the high number of vehicle. Cars in urban traffic can experience long travel times due to inefficient traffic light control. Optimal control of traffic lights using sophisticated sensors and intelligent optimization algorithms might therefore be very beneficial.

Traffic control system has become a major scenario in controlling the highly populated roads. In order to control these density driven roads, we propose here a density-based traffic control system. Along with this, an RF tag and a reader module is also placed in order detect the emergency vehicles on the densely populated roads and thereby controlling the traffic signals, giving them way to pass through

2. LITERATURE REVIEW

Intelligent traffic control system using 8051 microcontroller in which an IR sensor is being placed in order to detect the vehicles on each roads. It also provides a functionality that includes the release of emergency vehicles whenever they are detected. The main part of this system is the microcontroller AT89s52.The IR sensor would generate a digital signal that is given as input port of the microcontroller which would eventually detect which road has the maximum vehicles and accordingly the signal will be generated.

Traffic control system using PLC and configuration technology includes a new model in which the original relay wiring is replaced with programs and the hardware and software PLC is used. The traffic signal is displayed with two seven-segment digital tubes in countdown order. By using this model, we can control the traffic on roads.

Adaptive traffic light timer control is a model in which the images are captured at fixed time intervals. This is then sent to the processing tool which would process the images and then would send the output to the controller. The controller would compare it with the predefined thresholds and would send the required signals to the traffic light time and accordingly the signals would be generated.

Traffic light circuit using IC555 consists of two timer ICs which is biased with12v power supply, the left side timer provides the output the red LED, and the right side timer provides output through yellow LED and green LED. By varying VR1 and VR2 variable resistors the time delay between the LEDs can be varied.
Real-time traffic control system using morphological edge detection and fuzzy logic involves taking an image of a traffic

road. This step is then followed by conversion from RGB to Grey level image and image enhancing. Then we have to dilate the image and then erode the same image which is dilated and the taking the difference of the dilate and eroded image to get edges. Accordingly the signals will be generated.

3 PROPOSED SYSTEM

The density-based traffic control system along with emergency clearance allows the smooth controlling and functioning of the densely populated roads. The density of the road is controlled by using Mat Lab. The camera placed on the traffic lights will sense the vehicles that occupy on roads. By using the Mat Lab we would count the slot (road) which has the largest number of vehicles.

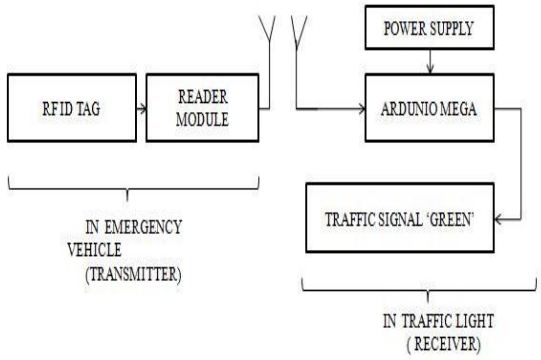

Fig - 1 Emergency Vehicle Unit

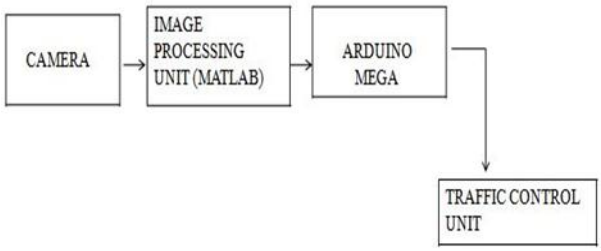

Fig - 2 Traffic control unit

Accordingly the green signal would be generated on the traffic light. By using the RFIDtag the emergency vehicles could be detected by reading the RFIDtag with the help of a reader module. Finally, the green light signals will glow which allows easy flow of the emergency vehicle on densely populated roads.

3.1 PROPOSED SYSTEM ARCHITECTURE

3.1.1 Traffic control unit

The steps involved in this project are:

- Image capturing
- RGB to HSV conversion
- Foreground background subtraction
- RGB to Grey conversion
- Binary image
- Density count estimation
- Comparison
- Slot allocation

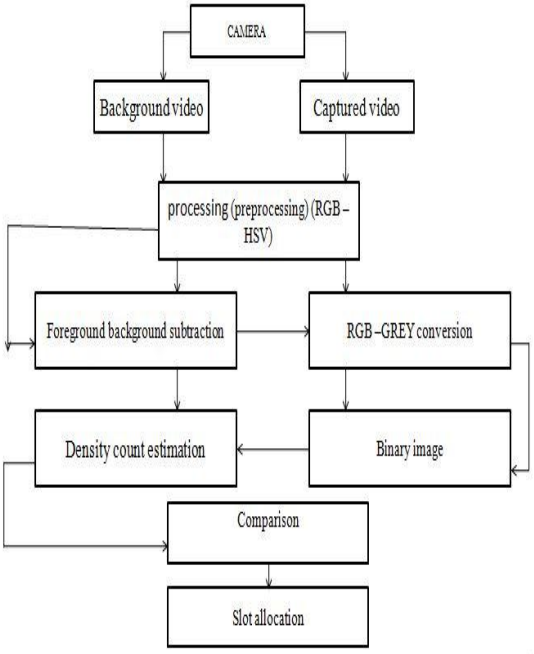

Fig – 3 Flow Chart of the working of traffic control

The first step involves image processing which includes capturing the background video which includes video when there is no vehicles on roads. Then, a real-time videos are captured which includes videos when there are vehicles on roads. This, two videos are then undergoing an RGB to HSV conversion. Hue describes the dominant wavelength. Saturation is the amount of Hue mixed into the colour. Value (brightness) gives the amount of light in the colour. An HSV colour space is relative to an RGB colour space. The next step we use is the RGB to Grey conversion which convert a 3D pixel value (R, G, B) to a 1D value.

All the coloured RGB images are then converted into a black and white image. Then the Grey code is converted to a binary

number. Binary number is expressed in the base-2 numeral system or binary numeral system, which uses only two symbols: typically "0" (zero) and "1" (one). A binary count estimation is being done which involves counting the total number of 1's and 0's and after getting the total number of each of these, the system would decide whether black or white is to be generated. Accordingly, slot allocation is given. The slot which means the road which was allotted the mostly densely populated would get the signal as "green". All other signals would be "red" then.

3.1.2 Emergency vehicle unit

This unit deals with emergency vehicle clearance. For this, an RF tag and a reader module is being used. The RF(Radio-frequency identification (RFID)) tag is used by the emergency vehicle which uses electromagnetic fields to automatically identify and track tags attached to objects. When the emergency vehicle approaches the traffic, it can swipe the RF tag present in them and accordingly the traffic signal would turn "green". This allows the smooth transportation of the emergency vehicles**.**

6 COMPONENTS SPECIFICATION

- Arduino MEGA
- Web-based camera
- RGB LED
- Yellow LED
- RFID tag
- Reader module
- Connection wires

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a power jack, a USB connection, an ICSP header, and a reset button.

The web-based camera is used to capture images on roads. RGB LED and Yellow LED are used to display various lights when the density of the traffic varies. The RGB LED can enhance Red, Green and Yellow lights. For now, we use here the Red and Green lights only. Yellow LEDs are used to diplay Yellow light. They are used to show the delay in turning the Red and Green accordingly.

The RFID tag is used by the ambulance inorder give a signal that the traffic signal have to be changed from 'Red' to 'Green' light.The reader module is used to sense the RFID tag and give the signal of 'Green light' in the required road. The connection wires are used for various connections.

4 RESULT

The proposed project consists of image processing which involves controlling the traffic based on the density on roads. Here, edge detection and image enhancement is not done as it would make the system more complex. This complexity would make delays in the system and so the above methods are not used. The RF tag is used to detect the emergency vehicles on roads and accordingly the "green" signal is generated on the side which the vehicle wants to go through

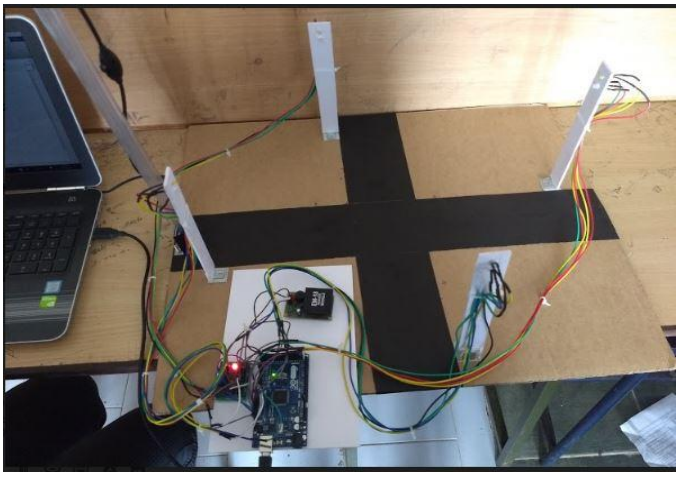

Fig – 4 Proposed sytem

5 CONCLUSION

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