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# Real Time Image Processing Based Intelligent Traffic Control System

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**Abstract -**Traffic control has become the most serious problem in the large cities. People are running behind schedule in this growing society and wasting time travelling. People need better traffic regulation to have a problem-free, pleasant travel experience and to live in a contamination environment. The project's purpose is to develop a density-based traffic flow signaling system. The signal time adjusts spontaneously when mass transit at the intersection is detected. A web camera is integrated into the traffic system. In order to calculate t, every image acquired by the camera is analyzed. With the rise in flow of traffic, the length of the line of vehicles waiting to be processed at the intersection is rapidly increasing, and traditional traffic lights are unable to adequately plan it. On the highway You Only Look Once, a deep Convolution Neural Network, are being used to compute the amount of vehicles (YOLO).The traffic management system uses Renasas microcontroller which manages the LED's illumination. The proposed system includes RF transmitter and RF receiver. This method is being utilized to detect traffic crashes and automobile rotational violations. When mounted on the road, the entire system helps in peaceful movement of ambulance, fire engine etc., with no necessity for a policeman.

**Keywords:** Renasas Controller, YOLOv3, RFID, Emergency Vehicle, Accident

## I.INTRODUCTION

"With over vehicle passing paths are controlled by transportation planning, and pedestrian crossings are controlled by pedestrian crossings. In the event of a multiple lane, it's also utilized when two modes intersect. A road traffic system's objective is to regulate vehicle movement across a channel and reduce collisions or jams. Throughout our nation, a sequential logic traffic system is currently in operation, with controlling indicators with one light operating after the other for a set amount of time. Time, day, season, weather, and unanticipated events such as crashes or infrastructure projects are all delay characteristics that affect traffic load. The problem of traffic jams can be alleviated by building new roadways. The only drawback is that the surroundings also become more congested. Rather than constructing additional infrastructure twice, it is necessary to modify the traffic system." [6]. "These issues can be handled by automatically detecting and modifying road traffic timings based on actual traffic volumes, a process known as smart road traffic, which can be accomplished using image processing techniques. A suitable camera can detect the occurrence of vehicles within a specific range. Depending on the amount of traffic, the traffic lights are modified. The key feature of developing an intelligent traffic control system is to decrease congestion and costs, to enable alternate routes and to improve the infrastructure capacity. In the field of image processing, edge detections play a vital role in which the image boundaries incorporate problems. These can be resolved by identifying the sudden change in the gray/ texture level in an image" [6]. In many places, traffic jams is a severe issue, and fixed cycle light signal controllers are failing to address the long delays at intersections. We frequently see a police commanding officer of congestion instead of a traffic light. He assesses the condition of the road and determines the length of time each way is permitted to travel. The human feat motivates us to develop an intelligent traffic light control system that reflects the current traffic situation and intelligently manages the junction. For put such a system in place, we'll require two primary components: eyes to monitor the current road state and a mind to analyze that. At its most basic level, a traffic signal system has two primary goals: to move as many people through an intersection as feasible while minimizing friction between them. "The initial goal of the article is to use appropriate analysis methods to observe traffic lights and intensity variation. The goal of the study is to create a system that can react to changing circumstances at a traffic intersection. This requires the least amount of physical alterations to the junction and gives the best feasible space for pedestrian and vehicle traffic in all directions. This results in a customizable traffic light system that guarantees variations in road congestion while also reducing traffic officer strain and deaths. Road congestion poses zero problems in the event of an accident and tends to minimize accidents. As a result, traffic may be controlled with no need for a commander, and the proposed approach saves people's lives and precious time" [6]. Ambulances have an each RF transmitter that transmits the signals. An RFID reader positioned several feet away from the traffic signal receives signals and identifies the ambulance on the road. "License plate recognition and theft vehicle detection, for example, are common applications. Road traffic is regarded as one of

  

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the most serious issues in city environments. As a result of the rising number of forms of transport and the new lower road infrastructure, traffic problems are likely to worsen. Furthermore, multiple researches and data have been produced in developing economies that show that the majority of road deaths are caused by limited roads and the damaging expansion of mobility means"[6]. "The generator road network is only appropriate for light traffic that is processed within a predetermined time frame. An proposed method that can manage traffic density is necessary for a high traffic system. The fundamental disadvantage of a broad traffic management system is the difficulty in detecting high-priority circumstances and emergency scenarios. This necessitates the development of smart signalized intersections capable of handling all circumstances and making judgments on its own." [6]. To create a Yolo-based self-adaptive traffic light control system. Inefficient use of the same time slot for each of them Shorter distances, longer journey periods, and shorter distances are all characteristics of this mode of transportation. Higher Due to uneven and varied traffic in various lanes, there is a significant amount of motor waiting. To develop a system that allows the traffic management system to use cameras to make time allocation decisions for a specific lane based on traffic density in other lanes.

## II.LITERATURE SURVEY

[1] "**Highway Traffic Prediction Model for Transportation and Accident Management System**" – A sentiment road traffic model is presented for predicting traffic and informing all people who share the same lane about the traffic flow situation. Ultrasonic, PIR sensor, and camera data are collected in real time. To anticipate traffic conditions, the system combines automobile number, automobile spacing, and vehicle speed are all gathered via motion detectors, and the data is then semantically interpreted using a changing total mean approach. In order to give time efficient prediction, the work is being evaluated on Apache Spark, that will also decrease disc delay as contrasted to HDFS. The outcome of the forecast is announced to the public via a location-based notification system. [1].

[2] "**Dynamic Traffic Light Optimization and Control System"-** The present control scheme is ineffective because traffic signal system timers have a fixed time period for switching traffic between different phases, whereas traffic density patterns change over time. As a result, some vehicles may have to wait for an extended amount of time. This circumstance results in high traffic on one side of the road and no traffic on the other. We suggested a model that calculates the number of cars, specific phase traffic area, and road width to solve this problem. Machine learning and image processing (deep learning). The Viola Jones Haar Wavelet approach is used for image processing. Haar wavelet is a pixel distribution that aids in the classification of image edges. These wavelets can be utilized with Haar to overlay on a given object and create an XML file to identify the vehicles and traffic length" [2].

[3] **"Deep Reinforcement Learning and Image Processing for Adaptive Traffic Signal Control"-** Image processing techniques and deep reinforcement learning are used to create a road traffic system that is simple to use and maintains traffic control. This strategy involves placing a camera at any and every step of a traffic indicator to capture the roadways where congestion is likely to occur. Different durations are allocated based on the count and a model constructed using deep reinforcement learning, as well as a green signal for vehicles to pass, utilizing image processing technology" [4].

[4] "**Intelligent Traffic Clearance System for Emergency Vehicles using Zigbee"** – Congestion and traffic control are key issues in today's globe. As a result, traffic management is a major concern in many metropolitan areas. Because ambulances become delayed in traffic jams due to a lack of efficient traffic regulation, lives are lost. To address this problem, a framework is presented that ensures a steady flow of ambulances arriving at time to the hospital. To control traffic lights in the ambulance's path, a new mode called "paramedic control" is being created. The current method completely automates traffic light control, allowing the patient to arrive on time at health care center. This really is relevant not only to ambulances, and even to other fire truck. [5].

[5] "**Road Traffic Congestion Detecting by VANETs"**-Appropriate road traffic observation systems, particularly in metropolitan areas, are critically needed to reduce road traffic strain and congestion. The TraD-model is proposed in this study. The findings can be used to improve the efficiency and fluency of road traffic flow. To test TraD-performance, VANET's we ran a simulation against cooperative traffic congestion detection (CoTEC). TraD-VANET has a decent performance, according to the results obtained."[7].

[6] "**Traffic Signal Timing Control Using Deep Learning** –This gives solution is proper traffic signal control method, solution to this challenge is to use.To manage traffic signal timing and allocate longer time duration of green light to lanes with a greater number of cars, deep neural network machine vision technologies such as object detection are used."[8].

[7] "**Automated Traffic Control System for Ambulance"**– Automated Traffic Control Process for Ambulance is the suggested system, this handles with road traffic during areas of peak traffic. The Vehicle Counter, which is placed in a default location on the lane, can be used to determine traffic density. In this case, the essential scenario is that when road traffic is low, the go light. For a smaller duration, it activates. The peak traffic engages as traffic congestion intensifies until the predefined amount is reached." [10].

[8] "**Smart Traffic Management System with Real Time Analysis"** – This study tries to alleviate old and poor road

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traffic technologies that work on a schedule produce road congestion. Conventional methods set durations independent of the volume of congestion on a specific road, resulting in lengthy stop light waits. The solution we offer allows for better time and energy management by ensuring that road signs adjust to actual road traffic data. For accomplishing this, researchers use a combination of transducers and image analysis to calculate population density." [11].

[9]"**Density Based Traffic Control System using Image Processing"** – The unique real-time road congestion system is introduced that utilizes image processing techniques for easily keep traffic under control. The Laptop Camera is utilized in traffic signal to click photographs on roadways in this strategy, significant activity is estimated to happen. The number of cars in these photos is counted using Matlab's computer vision tools, as well as a variety of durations are assigned based on the density, as well as a go sign to allow vehicles to drive. The introduced method uses LEDs to represent the green and red signals, while a 7 fragment view is used for predicting the green signal's decrementing timer"[12].

[10] "**Traffic Clearance for Emergency Vehicles using Priority Mode"** - This project's major goal is to give a clever manner of controlling traffic light timing during peak hours, as well as a smooth flow for ambulances to get at the hospital on time. We're planning to add a new mode dubbed "ambulance mode" that will manage traffic lights in the ambulance's path. This system is totally automated, so it manages traffic lights and assists in getting to the hospital on time. This isn't only a good idea for an ambulance. Other emergency vehicles, such as fire engines, should use it instead" [13].

## III.PROPOSED MODEL

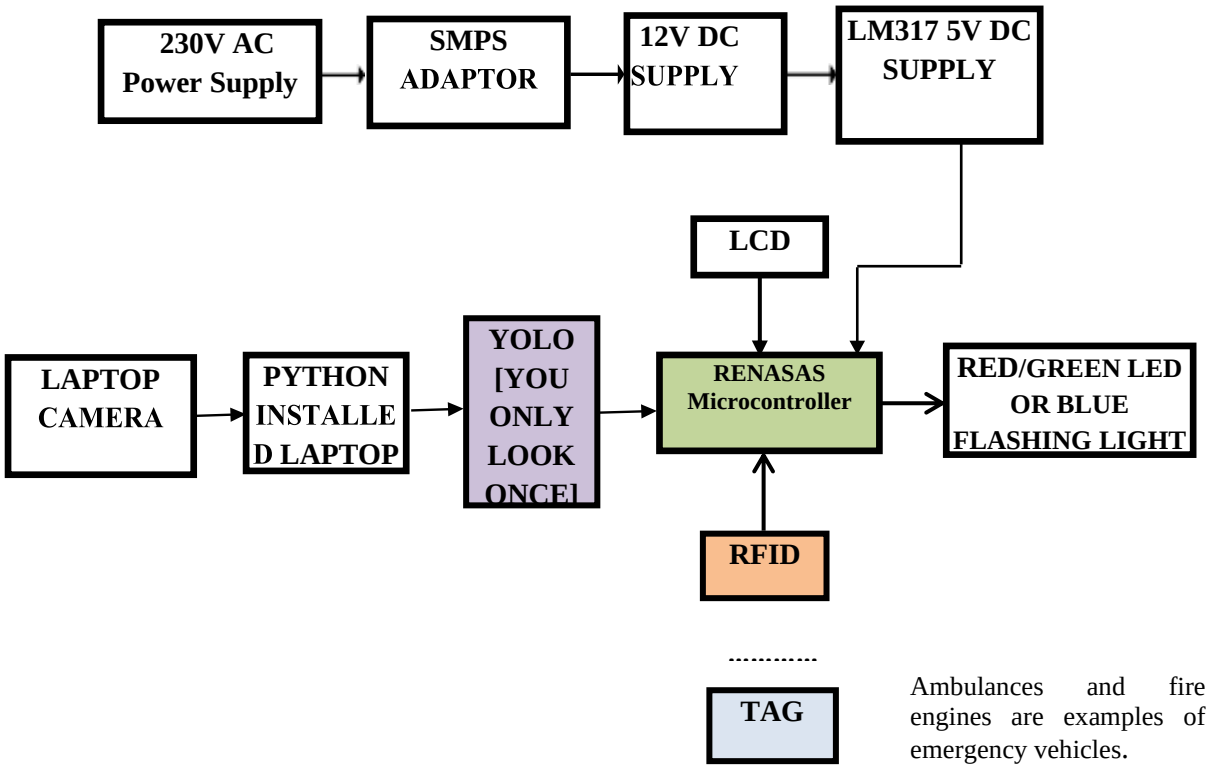


Figure 1: Proposed Model

The proposed model gives "emergency situations should be given higher consideration. Leading to a shortage of consciousness in the congestion, the traffic conditions system has various traffic concerns. To avert tragedies, traffic laws should be improved. These issues must be resolved in order for the existing road system to function properly" [6]. "Scanning technique to detect and evaluate the cars in the developed framework. It eliminates the requirement for smart devices. To acquire scanned image, a laptop camera is positioned near the stoplight. The planned system's focus is to eliminate traffic problems as well as the duration required for such organizations to function in the absent of vehicular traffic. It gives greater thought to vehicle estimation by anticipating a automobile metal composition" [6]. The Proposed System contains Renasas Microcontroller, LCD Display, RFID, RFID Tag, Traffic Signals, and YOLOs. The System is

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controlled with the Renasas Microcontroller. Initially, Microcontroller manages the traffic congestion by turning the signal light to green according to a number of vehicles on road. The Renasas Microcontroller is a general-purpose register with 8 bit 32 registers. It has a capacity of 512 KB ROM, 32KB RAM and 8KB data flash memory. It has on-chip single-power supply flash memory with block erasing and writing disabled. This high speed as well as a low-speed oscillator. Most of the pins of Renasas microcontroller have multitasking feature and comparatively has low cost. It operates with 5v power supply and has a rigid body which makes it less prone to damages. A segment LCD driver is included inside the RL78/L3 micro-controllers. Three LCD driving voltage methods are provided, corresponding to a range of segment LCD panels (outside protection rupture, capacity rupture, as well as inside intensity hike). External resistance division consumes 1.61 A, internal voltage boost consumes 1.42 A, and captive split consumes 0.77 A intersections. RFID (Radio Frequency Identification) is a technology that employs Electrical signals are used to recognize and screen chips affixed to objects. Once stimulated by an electrical interrogator pulse from a nearby RFID reader device, the tag returns numerical message to the receiver, which is usually an item number. By establishing an RFID reader on the road, the problem of traffic signal regulation can be solved. With this system, we can consider the priority of different types of vehicles as well as the density of traffic on the roadways. The Emergency vehicle like Ambulance, Fire Engine etc., which has RFID receiver that signal is immediately given green signal along with a blue flashing light to indicate the presence of emergency vehicle so that other vehicles can make way. You simply have to look once. (YOLO) is a cutting-edge, real-time object detection system that represents a new approach for object tracking In prior work on object detection, classifiers were reprogrammed to do detection. Rather, we think of image classification as a regression problem with spatially separated enclosing boxes, as well as the confidence score that go with them. A unified network predicts enclosing boxes and class probabilities directly from complete images in a single assessment. Because the entire detection pipeline is a single network, it can be optimized directly on detection performance from beginning to end.

The following are the stages that YOLO takes to work:

1. Take a picture of each lane in real time.
2. Scan the area to determine the amount of traffic.
3. Use the Time Allocation module to enter this information.
4. The result will be the appropriate time slots for each lane.
5. The camera provides photos to our system at regular brief intervals.
6. The algorithm calculates sum of automobiles on the road based on sum of cars in the road.
7. The time allotment module uses data from this system (such as traffic density) to find the most efficient and effective time slot.
8. The microprocessor then sends this value to the appropriate Traffic Lights.

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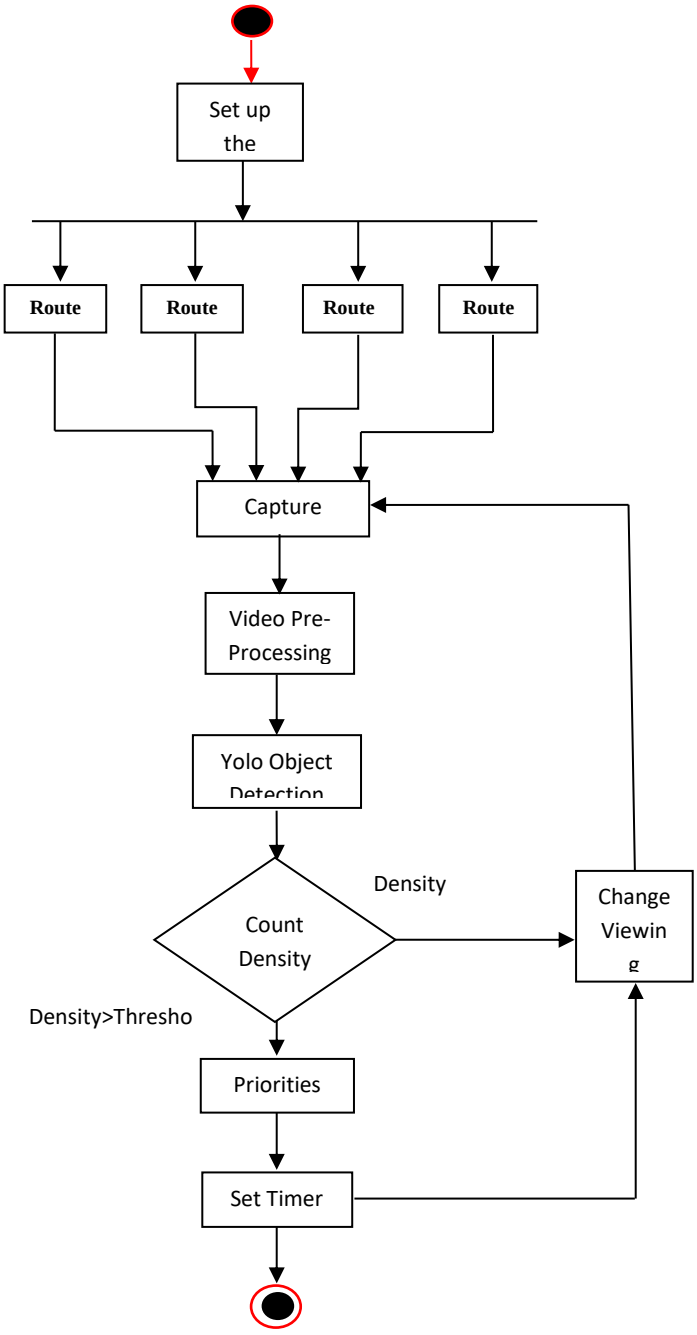


Figure 2: Flow Chart of YOLO Object Detection

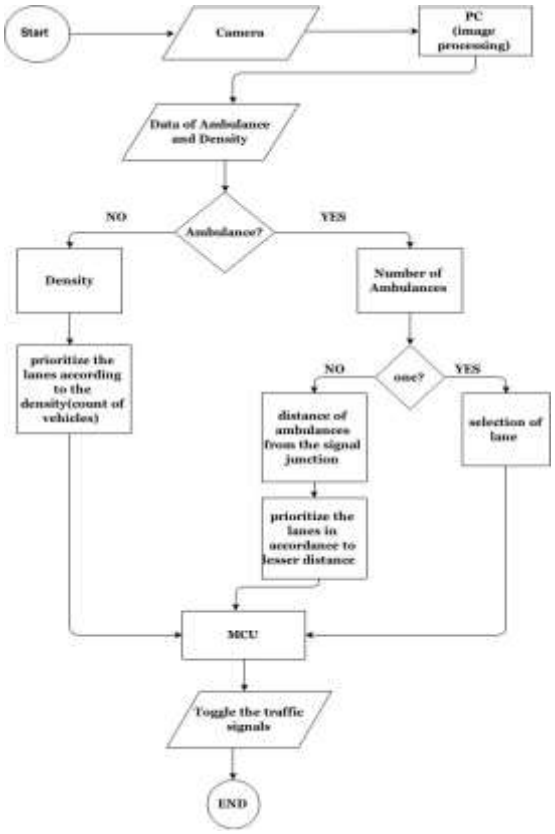


Figure 3: Schema Chart of proposed model [11]

"The image processing-based intelligent traffic management system is depicted in below flow chart. The camera, which is positioned high above the road junction, provides real-time traffic monitoring. Periodically, frames are acquired and transferred to the PC for picture processing. Image processing is used to estimate traffic density and spot ambulances."[11].

"Image processing is used to determine traffic density and identify ambulances. If no ambulance is located, the traffic density is assessed, and the MCU (Renasas Microcontroller) prioritizes the signal accordingly, and the signal is turned on and off. Even when an ambulance is identified, that lane receives signal priority, and if several paramedics are detected in distinct lanes, the lane with the most ambulances receives priority" [11].

  

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## IV.METHODOLOGY OF IMAGE PROCESSING

Instead of employing electrical sensors placed in the pavement, image processing is used to detect automobiles by analyzing photos and live video.

Steps in Image Processing:-

1. Obtaining Images
2. Gray scale conversion from RGB
3. Image Scaling
4. Image Retouching
5. Detection of the edge [Canny's Edge Detection]

1." **Obtaining Images"**

The process to obtain a picture from a suitable alternative is referred to as data acquisition. The basis for this project is a webcam (preferably CCTV, to avoid additional setup). The object is made by breaking down a movie into numerous parts and analyzing each one individually. Depending on the camera utilized, the file size can range from 720*480p to 1280*720p"[16].

2. **"Gray Scale Conversion from RGB"**

Each pixel in an image pixels merely depicts its strength. As a result, each pixel's color range is limited to gray areas varying from white to black. During the acquisition phase, the image is transformed from RGB to gray scale. The process of transforming a picture from RGB to black and white is known as gray scaling. Only an image data can be supplied as a parameter to numerous OpenCV functions. Gray scale photos are also used in Canny Edge detection. For all recognized edges, the edge detection method returns white, while the remainder of the image is black.To convert a pixel from RGB to grayscale, OpenCV employs the following formula:

**Y ⟵ 0.299R+0.587G+0.114B**

The values of the red, green, and blue hues of a single pixel in a picture are denoted by R, G, and B"[16].

3." **Image Scaling"**

The actual quality of the acquired image is simplified to 400*300p. This improves the image acquisition screen resolution and so helps the system avoid latency concerns. By transforming information from all camera sources into a single resolution, picture scaling ensures that the images acquired are consistent. By ignoring minor details, it minimizes the number of edges discovered. When the device's processors can't manage a high density of pixels at high rates, image scaling is required. When compared to a non-resized image, picture scalability can create highly diverse effects depending on the algorithm utilized.

New height = Previous height/Previous width*new width

New width = Previous width/Previous height*new height"[16].

4. **Image Retouching**

It's the process of enhancing the clarity and data content of raw data before it's processed. Contrast enhancement, spatial filtering, density slicing, and FCC are all common techniques.

5. **Detection of the edge [Canny's Edge Detection]**

The technique of edge detection is used to segment the image of objects in photographs. It works by sensing brightness changes. It's used for picture segmentation and data extraction in image analysis, machine vision, and object recognition.

**Canny Edge Detection**

Canny edge detection is a method for obtaining architectural information from a wide range of visual features while drastically lowering the amount of data to be processed. It's been implemented in a variety of computer vision.

Edge detection is used in traffic control because edges define the outline. To find the most efficient approach, image sequences from a camera are evaluated using several edge detection and object counting methods. The amount of vehicles at the crossroads is then assessed, and traffic is efficiently handled as a result. We chose it because canny edge detection has the best quality and is simple to use.

The Canny edge detection technique can be separated into five distinct steps:

1. To eliminate the noise from the image, apply a Gaussian filter.
2. Find the brightness gradients in the image.
3. Use gradient magnitude threshold or lower bound cut-off suppression to eliminate erroneous edge detection responses.
4. Determine probable edges using a twofold threshold.
5. Hysteresis edge tracking: Finish the edge detection by suppressing the rest of the edges.

The main objective is to avoid traffic congestion and perform edge detection effectively using Canny Edge Detection. To calculate the density by subtracting foreground and background image from the total area of vehicle the green signal

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is set for the allocated time. Comparing to other edge detection algorithm like Boolean, Martt Hildrethh, Sobel, Prewitt, Canny Edge detection algorithm gives more accuracy.

## V. RESULTS

The prototype's results are promising, and the device does assist in improving the efficiency including its traffic management system. These approach can be used to detect traffic collisions and infractions of car spiral rotations. When deployed on the road, the entire system allows for quick traffic clearing for emergency vehicles without the need for a commander. This system also manages. By allowing an ambulance to arrive at a specific spot without having to stop anywhere until it reaches the hospital, road traffic can be reduced.

## VI. FUTURE ENHANCEMENT

The project can be enhanced by displaying traffic data in a public-accessible application. Thermal image processing can help improve the precision of this job even more. Even in the presence of harsh Haze or foggy are examples of weather conditions, thermal image processing remains effective.

## VII. CONCLUSION

“The number of vehicles is counted for all roadways using edge detected pictures. Time is provided to each road based on the amount of vehicles”[6]. If there are no vehicles in the lane, the lane signal is ignored. “The presence of an ambulance is identified by allocating a glowing time to LEDs dependent on the density of the road” [6]. With this approach, a specific lane's traffic light is given a specific amount of time based on the traffic intensity on the road, with attention paid to emergency vehicles such as ambulance and fire engines. “If an ambulance is identified in a lane, that lane will receive first attention. In the absence of an ambulance, the road with the most vehicles is given top priority in order to reduce traffic”[6].

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