© April 2019 | IJIRT | Volume 5 Issue 11 | ISSN: 2349-6002

Traffic Control System

Rohan K Antony[1], Stebin Wilson[2], Vishnu Govind PR[3], Sheril Shaju[4]
[1,2,3,4] *Sahrdaya College of Engineering, Thrissur, Kerala*

Abstract- **As the problem of urban traffic congestion spreads, there is a pressing need for the introduction of advanced tech- nology and equipment to improve the state-of-the-art of traffic control. Traffic problems nowadays are increasing because of the growing number of vehicles and the limited resources provided by current infrastructures. The simplest way for controlling a traffic light uses timer for each phase. Another way is to use electronic sensors in order to detect vehicles, and produce signal that cycles. We propose a system for controlling the traffic light by computer vision. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light. It will capture image sequences. The image sequence will then be analyzed using digital image processing for vehicle detection, and according to traffic conditions on the road traffic light can be controlled. Traffic violations like red light violation and vehicles moving in wrong direction are detected and violating vehicles are tracked and its details are passed on to authorities.**

I. INTRODUCTION

In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high tome of vehicles, the scanty infrastructure and the irrational distribution of the development are main reasons for augmented traffic jam. The major cause leading to traffic jam is the high number of vehicle which was caused by the population and the development of economy. To unravel this problem, the government should encourage people to use public transport or vehicles with small size such as bicycles or make tax on personal vehicles. Particularly, in some Asian countries such as Vietnam, the local authorities passed law limiting to the number of vehicles for each family. The methods mentioned above is really efficient in fact. That the inadequate infrastructure cannot handle the issue of traffic is also a decisive reason. The public conveyance is available and its quality is very bad, mostly in the establishing countries. Besides, the highway and roads are incapable of meeting the requirement of increasing number of vehicle. Instead of working on roads to accommodate the growing traffic various techniques have been devised to control the traffic on roads like embedded controllers that are installed at the junction. These techniques are briefly described in next section.

II. SYSTEM ANALYSIS

System analysis as the process of studying a procedure or business in order to identify its goals and purposes and create systems and procedures that will achieve them in an efficient way. Another view sees system analysis as a problem- solving technique that decomposes a system into its component pieces for the purpose of the studying how well those component parts work and interact to accomplish their purpose. Analysis and synthesis, as scientific methods, always go hand in hand; they complement one another. Every synthesis builds upon the results of a preceding analysis, and every analysis requires a subsequent synthesis in order to verify and correct its results.

The field of system analysis relates closely to requirements analysis or to operations research. It is also an explicit formal inquiry carried out to help a decision maker identify a better course of action and make a better decision than she might otherwise have made.

A. EXISTING SYSTEM

There are about 5 types of systems are existing now. They are manual controlling, fixed time controlling, dynamic controlling, co-ordinated controlling, adaptive controlling.

1)Manual Controlling

Manual controlling the name instance it require man power to control the traffic. Depending on the countries and states the traffic polices are allotted for a required area or city to control traffic. The traffic polices will carry sign board, sign light and whistle to control the traffic. They will be instructed to wear specific uniforms in order to control the traffic.

1) Fixed time controlling

In traffic control, simple and old forms of signal controllers are what are known as electro-mechanical signal controllers. Un- like computerized signal controllers, electro-mechanical signal controllers are mainly composed of movable parts (cams, dials, and shafts) that control signals that are wired to them correctly. Aside from movable parts, electrical relays are also used. In general, electro-mechanical signal controllers use dial timers that have fixed, signalized intersection time plans. Cycle lengths of signalized intersections are determined by small gears that are located within dial timers. Cycle gears, as they are commonly known, range from 35 seconds to 120 seconds. If a cycle gear in a dial timer results in a failure, it can be replaced with another cycle gear that would be appropriate to use. Since a dial timer has only one signalized intersection time plan, it can control phases at a signalized intersection in only one way. Many old signalized intersections still use electro-mechanical signal controllers, and signals that are controlled by them are effective in one way grids where it is often possible to coordinate the signals to the posted speed limit. They are however disadvantageous when the signal timing of an intersection would benefit from being adapted to the dominant flows changing over the time of the day.

1) Dynamic controlling

The controller uses input from detectors, which are sensors that inform the controller processor whether vehicles or other road users are present, to adjust signal timing and phasing within the limits set by the controller's programming. It can give more time to an intersection approach that is experiencing heavy traffic, or shorten or even skip a phase that has little or no traffic waiting for a green light. Detectors can be grouped into three classes: in-pavement detectors, non-intrusive detec- tors, and detection for non-motorized road users.

1) In-pavement detectors

These detectors are buried in or under the roadway. Inductive detector loops are the most common type. They are sensors buried in the road to detect the presence of traffic waiting at the light, and thus can reduce the time when a green signal is given to an empty road. A timer is frequently used as a default during times of very low traffic density and as a backup in case the sensors fail. The sensor loops typically work in the same fashion as metal detectors. Consequently, small vehicles and bicycles or vehicles with low metal content may fail to be detected causing them to wait indefinitely unless there is also a default timer as part of the control system.

1) Non-motorized user detection

Non-motorized users are classified as pedestrians, bicyclists, and equestrians.

Provisions for detecting these users include demand buttons and tuned detectors.

Some traffic lights at pedestrian crossings, especially those away from junctions, include a button called "Pedestrian Push Call Button" which must be pressed in order to activate the timing system. This is generally accompanied by a large display reading "wait", which lights up when the button is pressed; this turns off when the vehicular lights enter the "red" phase. In the United States, the pedestrian signals continue to display a steady red "hand" or "Don't Walk" signal when the button is pressed, turning to a white "man" or "Walk" signal at the end of the vehicular phase. Often, other displays, such as countdowns or the green & red pedestrian lights are included in this panel. With the advent of computer-controlled traffic lights in many countries, activation buttons have become obsolete. In fact, most in New York City have been disconnected. Conversely, new installations of activation buttons increasingly provide for specific user groups, including audible buttons and signals for visually impaired users and so- called Pegasus crossing buttons for users on horseback.

Standard signal detectors have a hard time detecting bi- cyclists, because of the low ferrous metal content of typical bicycles. If a bicyclist rides directly over the wires of a detector loop, it may detect the cyclist. However, it does not always work, and few cyclists know to do it. At locations where cyclists are common, a special detector loop tuned for cyclists may be used. A small bicycle symbol is often marked on the pavement to inform the cyclist where to stop in order to actuate the signal. Other places simply place an additional pedestrian button near the curb where a cyclist can reach it.

1) Coordinated controlling

In modern coordinated signal systems, it is possible for drivers to travel long distances without encountering a red light. This coordination is done easily only on one-way streets with fairly constant levels of traffic. Two-way streets are often arranged to correspond with rush hours to speed the heavier volume direction. Congestion can often throw off any coordination, however. On the other hand, some traffic signals are coordinated to prevent drivers from encountering a long string of green lights. This practice discourages high volumes of traffic by inducing delay yet preventing congestion. Speed is self-regulated in coordinated signal systems; drivers travelling too fast will arrive on a red indication and end up stopping, drivers travelling too slowly will not arrive at the next signal in time to utilize the green indication. In synchronized systems, however, drivers will often use excessive speed in order to get through as many lights as possible.

Benefits include:

- Increasing the traffic handling capacity of roads
- Reducing collisions and waiting time for both vehicles and pedestrians
- Encouraging travel within the speed limit to meet green lights
- Reducing unnecessary stopping and starting of traffic this in turn reduces fuel consumption, air and noise pollution, and vehicle wear and tear
- Reducing travel time
- Reducing driver frustration and road rage

1) Adaptive controlling

Midtown in Motion - New York City's adaptive traffic control system that employs multiple technologies. Cameras, microwave motion sensors and radio- frequency identification (RFID) E-ZPass tag readers are used as inputs as a mean to for monitoring traffic flow. The data is fed through the government-dedicated broadband wireless infrastructure to the traffic management centre to be used in adaptive traffic control of the traffic lights

B.PROPOSED SYSTEM

We propose a system for controlling the traffic light by image processing. In this project we bring an idea of smart traffic control system using image processing by integrating it into an existing CCTV camera commonly installed on street poles. The cams are focused on to the vehicles .Cameras are placed in different angles to get clear view of vehicles and their number plates. And from the live feed from this camera we create and grey scale image of present traffic in that line is created and then from this grey scale image edges of vehicle are detected .From this edge detected image the vehicle count is taken with help of trained models we have given before. And using this vehicle count density is calculated and using this value traffic signal are shifted accordingly. When the traffic signal is red our system will check for any vehicles violating this red light and their vehicle number plate are recognized and using this number the vehicle movement can be tracked and their location can be passed to patrolling vehicles or patrolling vehicles can send vehicle number to traffic signal to track the vehicle .And also can check vehicle moving in wrong direction.

The background difference method is commonly used in video processing. A background image without vehicles is firstly obtained. This image is then subtracted from the current input image, and the difference image is obtained. One can determine whether vehicles exist in input image by binarization of the difference image. This method is computationally fast. However, it needs to update the background image in real time when the environment changes.

C.FEASIBILTY

Image Processing is a technique to enhance raw images received from cameras/sensors placed on space probes, air- crafts and satellites or pictures taken in normal day-today life for various applications. An Image is rectangular graphical object. Image processing involves issues related to image representation, compression techniques and various complex operations, which can be carried out on the image data. The operations that come under image processing are image enhancement operations such as sharpening, blurring, brightening, edge enhancement etc. Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video; the output of image processing can be either an image or a set of characteristics or parameters related to the image. Most imageprocessing techniques involve treating the image as a two-dimensional signal and applying standard signal- processing techniques to it. Image processing usually refers to digital image processing, but optical and analog image processing are also possible.

- Can reduce traffic congestion.
- Waiting time for vehicles can reduce to minimum.
- Traffic violation can be checked.

Vehicle can be tracked using our system if needed.

III. DESIGN AND DEVELOPMENT

Design & Development is a long evolving process with a series of intermediate stages, each one with its own significant importance towards a successful outcome.

A.MODULE DESIGN

Many techniques have been developed in Image Processing during the last four to five decades. Most of the methods are developed for enhancing images obtained from unmanned space probes, spacecrafts and military reconnaissance flights. Image Processing systems are becoming widely popular due to easy availability of powerful personnel computers, large memory devices, graphics software and many more. Image processing involves issues related to image representation, compression techniques and various complex operations, which can be carried out on the image data. The operations that come under image processing are image enhancement operations such as sharpening, blurring, brightening and edge enhancement .Traffic density of lanes is calculated using image processing which is done of images of lanes that are captured using digital camera. We have chosen image processing for calculation of traffic density as cameras are very much cheaper than other devises such as sensors. Making use of the above mentioned virtues of image processing we propose a technique that can be used for traffic control.

Here we show the flow chart for the proposed system .It describes that, the input to the system will be the images captured by cameras that are focused on the pedestrian and vehicles. These images will undergo for image processing. Image processing include the stages like RGB to Grey conversion, Edge detection, image resizing, image enhancement, Flood fill operation and Binary image formation. After image processing apply the proposed Traffic density algorithm on these images. Both vehicle and pedestrian density are compared and the appropriate mode is on. When the pedestrian mode on, a recorded voice would play using speaker to notify them.

B.MODULE DESCRIPTION

1) RGB to Grey Conversion: Humans perceive colour through wavelength-sensitive sensory cells called cones. There are three different varieties of cones, each has a different sensitivity to electromagnetic radiation (light) of different wavelength. One cone is mainly sensitive to green light, one to red light, and one to blue light. By emitting a restricted combination of these three colours (red, green and blue), and hence stimulate the three types of cones at will, we are able to generate almost any detectable colour. This is the reason behind why colour images are often stored as three separate image matrices; one storing the amount of red (R) in each pixel, one the amount of green (G) and one the amount of blue (B). We call such colour images as stored in an RGB format. In grayscale images, however, we do not differentiate how much we emit of different colours, we emit the same amount in every channel. We will be able to differentiate the total amount of emitted light for each pixel; little light gives dark pixels and much light is perceived as bright pixels. When converting an RGB image to grayscale, we have to consider the RGB values for each pixel and make as output a single value reflecting the brightness of that pixel. One of the approaches is to take the average of the contribution from each channel: $(R+B+G)/3$. However, since the perceived brightness is often dominated by the green component, a different, more "human- oriented", method is to consider a weighted average, e.g.: $0.3R + 0.59G + 0.11B$.

2)Edge Detection: Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more technically, has discontinuities or noise. The points at which image brightness alters sharply are typically organized into a set of curved line segments termed edges. The same problem of detecting discontinuities in 1D signal is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is a basic tool in image processing, machine vision and computer envisage, particularly in the areas of feature reveal and feature extraction. Different colours has different brightness values of particular colour. Green image has more bright than red and blue image or blue image is blurred image and red image is the high noise image.

3)Image Resizing / Scaling: Image scaling occurs in all digital photos at some stage whether this be in Bayer demosicing or in photo enlargement. It happens anytime you resize your image from one pixel grid to another. Image resizing is necessary when you need to increase or decrease the total number of pixels. Even if the same image resize is performed, the result can vary significantly depending on the algorithm. Images are resized because of number of reasons but one of them is very important in our project. Every camera has its resolution, so when a system is designed for some camera specifications it will not run correctly for any other camera depending on specification similarities. so it is necessary to make the resolution constant for the application and hence perform image resizing.

4)Background substraction: The background difference method is commonly used in video processing. A background image without vehicles is firstly obtained. This image is then subtracted from the current input image, and the difference image is obtained. One can determine whether vehicles exist in input image by binarization of the difference image. This method is computationally fast. However, it needs to update the background image in real time when the environment changes.

C.DATA FLOW DIAGRAM

A data flow diagram (DFD) is a graphical representation of the “flow” of data through an information system, modelling its process aspects. Often they are preliminary step used to create an overview of the system which can later be elaborated. DFDs can also be used for the visualization of data processing structured design. A DFD shows what kind of data will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It does not show information about the timing of processes, or information about whether process will operate in sequence or in parallel. shows the level 0 Data Flow diagram for the proposed system. It shows that the input images from the cameras given for image processing. After processing the density of vehicle are compared with the reference image and the traffic light signals comes out as output.

shows the level 1 Data flow diagram for the proposed system. This diagram explains the main functions happened in this proposed system. Such as RGB to Grey conversion, Edge detection, image resizing, image enhancement, Flood fill operation, Binary image formation and Traffic Density algorithm shows the level 1 Data flow diagram for the proposed system. This diagram explains the main functions happened in this proposed system. Such as RGB to Grey conversion, Edge detection, image resizing, image enhancement, Flood fill operation, Binary image formation and Traffic Density algorithm

IV.RESULTS

An efficient density based traffic control system is simulated and implemented which provides a good traffic control mech- anism without time wastage. It is also a much better way of detecting the presence of vehicles on the road since it makes use of image data. So it surely operates much better than systems which rely on the metal content of the vehicles to detect their presence. Image processing techniques overcome the limitations of the all the traditional methods of traffic control. It eliminates the need for extra hardware and sensors. The use of multiple cameras will help to analyze and control traffic in a particular region. The proposed system outperforms the existing system in terms of accuracy and simplicity

We have developed a system that can detect violations, track vehicles effectively, and automatically save and display the information.

V.CONCLUSION

Expensive transport programmes are often justified on the basis of congestion alleviation to prevent regional economic stagnation. This report explores the effects of congestion on economic growth and evidence using instrumental variables suggests that congestion’s drag is most strongly a function of restrained travel capacity and only more modestly a function of congestion induced delay. Results indicate that higher congestion through restraining capacity for additional travel appears to be associated with decreasing regional employment growth rates and that higher levels of congestion appear to be associated with slower productivity growth per worker.

In this project report, a smart traffic control system availing image processing as an instrument for measuring the density has been proposed. Besides explaining the limitations of current near obsolete traffic control system, the advantages of proposed traffic control system have been demonstrated. For this purpose, video sample of different traffic scenario have been attained. Upon completion of edge detection, the similarity between sample images with the reference image has been calculated. Using this similarity, time allocation has been carried out for each individual image in accordance with the time allocation algorithm. In addition, similarity in percentage and time allocation have been illustrated for each of the four sample images using C++ programming language. Besides presenting the schematics for the proposed smart traffic control system, all the necessary results have been verified by hardware implementation.

REFERENCES

[1] M. Sweet, “Traffic Congestion’s Economic Impacts: Evidence from US Metropolitan Regions,” Urban Studies, vol. 51, no. 10, pp. 2088–2110, Oct. 2013.

[2] Md. Munir Hasan, Gobinda Saha, Aminul Hoque and Md. Badruddoja Majumder, “Smart Traffic Control System with Application of Image Processing Tech- niques,”in 3rd International Conference on Informatics, Electronics & Vision, Dhaka, May 2014.

[3] Pallavi Choudekar, Sayanti Banerjee and M. K. Muju, “Implementation of image processing in real time traffic light control,” in 3rd international conference

[4] T. Semertzidis, K. Dimitropoulos, A. Koutsia and N. Grammalidis, “Video sensor network for real-time traffic monitoring and surveillance,”The Institution of Engi- neering and Technology, Volume 4, Issue 2, June 2010, pp. 103 – 112.

[5] Lei Yang, Dewei Zhao and Xiaoyu Wu, “An improved Prewitt algorithm for edge detection based on noised image,” in 4th International Congress on Image and Signal Processing, Shanghai, China, October 2011.

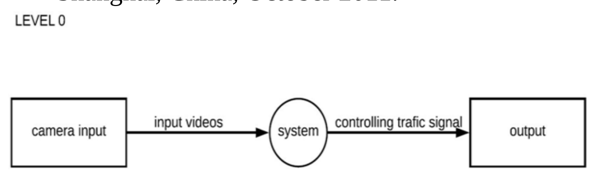

Fig. 1. DFD Level 0 Diagram

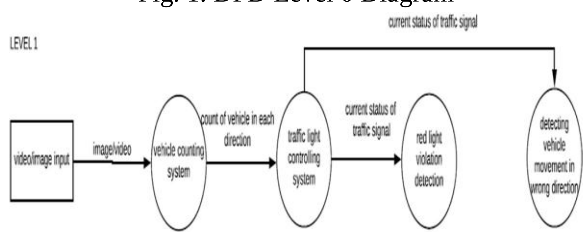

Fig. 2. DFD Level 1 Diagram

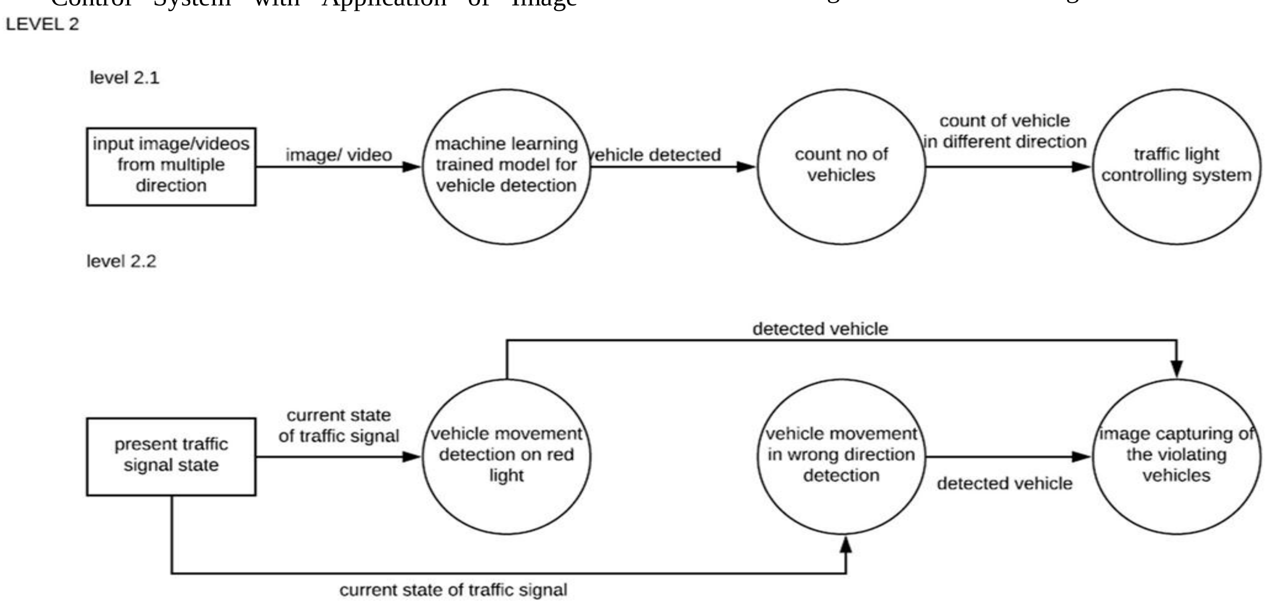

Fig. 3. DFD level 2 Diagram

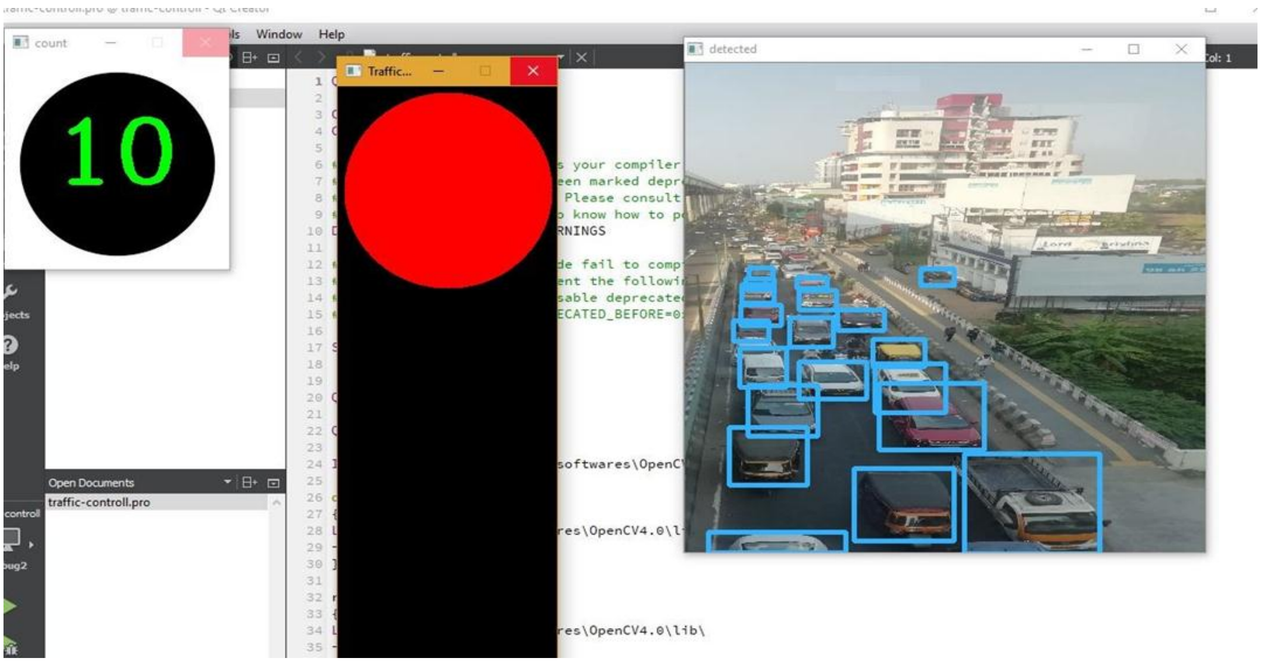

Fig. 4. Traffic Control System

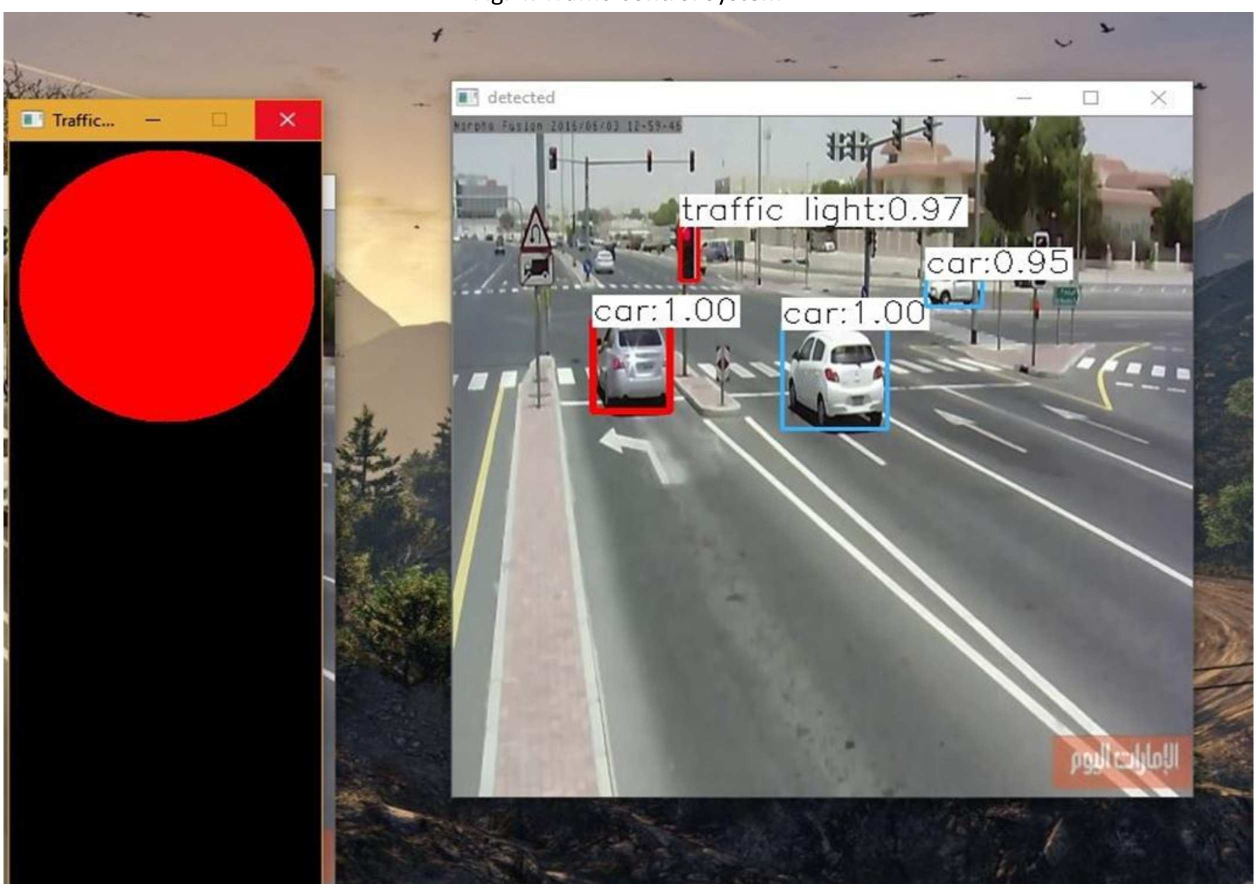

Fig. 5. Red light violation detectio