RESEARCH ARTICLE

A REVIEW ON EMBEDDED SYSTEM FOR TRAFFIC DENSITY MONITORING AND UPDATE SERVICE FOR TRAVELLER

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ARTICLE INFO	ABSTRACT

We are facing the traffic congestion and traffic jams day by day, due to increasing number of vehicles. This paper proposes a method to make control on heavy traffic issue. This method is based on real time traffic density measurement, by using image processing technique. The theme is to measure traffic density on every road and provide the IVR System to the traveler arriving on the road for traffic density updates. Due to this facility the incoming traveler on the heavy traffic road can be diverted to another road and jamming will avoided. This paper will presents the algorithm to determine the number of vehicles on the road and measure the density by comparing the real time frame of live video with the reference image (i.e. empty road image).

INTRODUCTION

As the population and luxurious life increasing, traffic and jamming of road also increases day by day, because of raising the number of vehicle on road.It is the serious issue in metro cities as well as developing cities. The traffic congestion evokes the other issues like costly transport, road accidents, wastage of time and fuel, increasing noise and air pollution. Also it makes problematic situation with some medical and security emergency. The general way to control the traffic is timer based traffic signals on square and RTO police. But this is not sufficient, because in the both cases there is not any provision to determining the traffic density and no control on the incoming vehicles leading toward the highly rushed road. The rising number of vehicle on road is leading to the traffic congestion and congestion leads to the traffic jamming. So the best way is to make control on incoming vehicle on road and give it another way to reduce the traffic. There are lots of intelligent system proposal available based on fuzzy logic control, edge detection technique to control the traffic signals automatically depending on the traffic. These systems are useful only on the traffic signal i.e. on the one square. But we have control the traffic on whole road with and without squares. This project does this job on real time. The road is covered by cameras and continuously capturing the video of road.

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These video images are continuously compared and calculate the vehicles on the road by digital image processing techniques. The circuit available with the camera calculates the density based on the image comparison and updates the server about the traffic density. This is the first part of the project. In the second past the IVR calling module is set up for public information facilities. Travelers along with one IVR traffic information number, so they can make a call and take traffic density information on the road in which they are interested. People are also not interested to involve in the traffic jamming and therefore they change their way through low traffic. In this way the incoming flood of the vehicles is avoided and the traffic congestion and jamming is refused. This information also helpful for RTO office in case of jamming occurs; they can update themselves and make a proper way to solve it.

Literature review

There is lots of research done on traffic density monitoring as this is not a new issue. A very simple approach to control the traffic signal is use by M. Ashwin Kumaar (Ashwin Kumaar *et al.,* 2016), in this propose work the traffic density is measure by using IR sensor. In this IR sensor are fixed on road so that traffic reaches to high pick the IR sensor sense it and the barrier gates are open for that lane. But IR sensor is not a proper solution of traffic density measurement. Abubakr S. Eltayeb (Abubakr Eltaye *et al.,* 2013) provides an important approach to the emergency vehicle. In this approach, GPS is used to provide the free path for emergency vehicle. By using

GPS an emergency vehicle is detect and as it come closed to the traffic signal a traffic signal is open and provide empty path to emergency vehicle. Jaywant Kamble (Jaywant Kamble *et al.,* 2015), provide and embedded system for traffic light control on density based. This system is based on AVR microcontroller, RF transceiver and Mat-lab. In this all operation are done on microcontroller and Mat-lab. But for large scale the only microcontroller is not feasible because memory and port limitation (Kavya Walad *et al.,* 2014). Explains the drawbacks of existing traffic control system and to overcome it propose various edge detection algorithms to detect the vehicle. In addition to all this work (Vikram *et al.,* 2013), provides a feature detection technique using Mat-lab software. Feature detection is nothing but an edge detection technique use to detect the object like vehicle. Most of the work of density measurement is propose on Mat-lab. But by using Mat-lab the real time density can't be measure properly due to slow processing time, and Mat-lab is not open source software so working with it is may also costly. Roopadevi G Hosur (Roopadevi Hosur, 2016), presents the density baesd traffic management based on matlab code and image processing algoritms. The traffic density is measured by the substracting the background from gray scale image, feature extraction with 78.57%, which is a good accuracy in vehicle detection. This all word is done on matlab codes. Matlab codes can be used for vehicle detection, but can't be used for real time as mention above. This above problem of Mat-lab is overcome by (Vidhya and Bazila Banu, 2014), propose a Raspberry-Pi with Open software. Raspberry-Pi is having fast computing time and very useful in real time concepts. Opencv software is open source software, useful in real time project as it has a quick response (Vidhya and Bazila Banu, 2014). The Raspberry-Pi is using most of the project specially the project related to vehicle monitoring and security. The Aburva Poongundran. A (Aburva Poongundran and Jeevabharathi, 2015), establish an idea about vehical monitoring and tracking using raspbeery-Pi. In this paper proposed the tracking, monitoring and surveillance and spotting the accident and informing to the nearest hospital and police station. Naeem Abbas (Naeem Abbas *et al.,* 2013), gives an easy way to measure the no of vehicle on the road. In this proposed system, the image taken from the live video frames and compare it with reference images i.e. the empty road image.

The propose system work in three steps, Image acquisition, image cropping, object detection, density measurement. The traffic density measurement system has four phases as detection, recognition tracking and information update. For detecting vehicles, the two major problems occurs as object and environment conditions. Rindra Wiska (Rindra Wiska *et al.,* 2016), proposes the comparison of four embedded systems to detect an object in extreme environmental condition i.e. in night. In day the vehicle detection easier than night, as in the night light intensity is very low. These embedded systems are Raspberry Pi B+, Beagleboard Xm, Raspberry Pi 2 and Odroid XU4, and conclude that the Odroid XU4 having 98% accuracy in night. Morteza Jalalat (Morteza Jalalat *et al.,* 2016), proposes an important vehicle detection algorithm using cascade classifier, also speed measurement using stereo. This system is useful for tracking the vehicles and speed. All of the above the systems are proposed for detecting the vehicles and measuring the density. Some of the work is for controlling the traffic signals depending on the density measurement. But it is not only sufficient way to control the traffic. Traffic jamming

problem not only occurs on the traffic signal only, it may come on the road at any point due to any other reason like accident and road damage because of flood, to overcome it some user friendly system may be propose for traveller. Prof. Uma Nagaraj (Uma Nagaraj *et al.,* 2013), introduces a user friendly system for public (i.e. for traveler) in which the android app is proposed for informing the traffic status and traffic jamming status. But the android app needs and internet connection while using. One of such system but without internet connection is proposed in our paper.

Proposed work

The system has two main parts as density measurement and information update. The first part of the system is based on Raspberry –Pi, used for the vehicle detection. As it is cable for performing real time traffic density measurement due to high computational time. All the image processing algorithms can be executed easily on Raspberry-Pi. The second and new concept of the paper is to update the traveler about the traffic density of the road in which they are interested. All the population is well known and familiar with this system in day to day life. For provide this service the vary known and easy system is used called IVRS (Interactive Voice Response System). The Fig 3 shows the block of the proposed system.

The system is divided into five blocks as shown and their explanation as below:

1. Raspberry-Pi:

Raspberry- Pi is the credit card size single board computer, feasible for real time operations and image processing. This powerful board can also work with Open Computer Vision. In this propose system the Raspberry-Pi taking input from camera connected to it. The vehicle detection algorithms are followed by the Raspberry-Pi on the images taken from the video frames of camera. The vehicle detection algorithms that can be used are edge detection and object detection (Sharanya *et al.,* 2015). Edge detection is the process of identifying and recognizing the discontinuity in an image technology (Vikram *et al.,* 2013). In a gray scale image three types of discontinuities observed as points, lines, edge (Kavya and Jyothi Shetty, 2014). It is the widely used technique for detecting the object in the image. Edge of the object is change in the intensity of the image. There are much edge detection algorithms available for example Roberts Cross, Canny, Haar Classifier.

A. Roberts Cross:

The Roberts cross calculates an easy, efficient, 2-D spatial gradient measurement on an image highlighting regions corresponding to edges. It is very easy and simple to understand. It has a small kernel with highly noise sensitivity, so it is not compatible with today's technology (Vikram *et al.,* 2013).

B. Canny:

Canny Edge Detection is a popular edge detection algorithm. It was developed by John F. Canny. Canny edge detector is widely considered to be the standard edge detection algorithm in the industry (Vikram *et al.,* 2013). It's used to enhance the

edge detection process (Kavya and Jyothi Shetty, 2014). It is a multi-stage algorithm, having steps as noise reduction, finding intensity gradient of the image, non-maximum suppression, hysteresis thresholding .

C. Haar Classifier:

Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones (Paul Viola *et al.,* 2001). It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

2. IVR System:

The IVR system is a technology that allows a computer to interact with humans through the use of voice and Dual-tone Multi-frequency signaling (DTMF) tones input via keypad. IVR systems can respond with prerecorded or dynamically generated audio to further directs a user on how to proceed. IVR systems deployed in the network are sized to handle the large call volumes, as IVR systems are more intelligent than many predictive dialer systems.

3. Camera:

Cameras area fixed on a sufficient height to capture a video of image. The captured video or image is an input to the Raspberry-Pi.
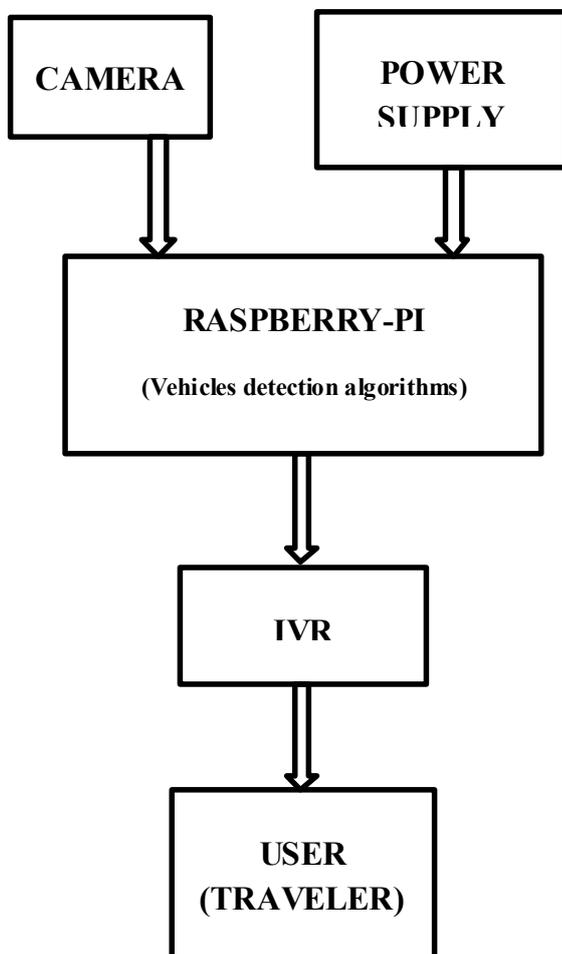

Fig. 1. System Block Diagram

4. Power Supply:

Raspberry-Pi is low power consumption system and needed 5V – 2.5Amp DC supply for operating.

5. User:

The user i.e. the traveler or any person who is interested to know the traffic density on road, which is monitoring by this system, can call to the given IVRS number.

Applications

- This project can be implementing at any traffic signal and at whole road.
- By using this project and accents can be detect and emergency service can be provide.
- Detecting the emergency like medical emergency the traffic can be control.
- The cameras are fixed on whole road also help to monitor the other issue likes vehicle theft.

Conclusion

This paper proposed a system for monitoring the traffic density and update for traveller, also some popular and well known traffic density monitoring and auto traffic light control technics are described. The traffic density monitoring has been employed in different application such a people aware about the traffic jams, accident. On this basis the Embedded system for Traffic Density Monitoring and update service for travellers will implemented using technique mentioned above. Vehicle tracking and Traffic density monitoring is being challenging for many researchers with real time image processing. With advancement to this the real time traffic monitoring and update ting help for building much traffic control application. The future scope of this is to improve the convention traffic control system and make safe travelling.

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