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A Theoretical Study on "Technological Interface in Controlling over Speeding"

Y. Sai Krishna Vaideek[1], Dr. B. Srinivasu[2], Dr. K. L. Vasundhara[3]

UG Student, Department of ECE, CBIT, Hyderabad, India[1]

Professor, Department of CSE, Stanley College of Engg and Tech for Women, Hyderabad, India[2]

Associate Professor, Department of S&H, Stanley College of Engg and Tech for Women, Hyderabad, India[3]

Abstract: Over 1, 37,000 people were killed in road accidents in 2016 alone, that is more than the number of people killed in all our wars put together. Daily 16 children die due to road accidents in India. On an average for every four minutes, a death is recorded out of 1214 road crashes every day. The objective of this paper is to save human lives by empowering the existing model of the video cameras present in the motor ways with Speed-guns in order to track vehicles accurately and control Speed.

Keywords: speed control, speed gun, number plate identification, ocr.

I. INTRODUCTION

Most of the fatal accidents occur due to over speeding. It is a natural psyche of humans to excel. If given a chance man is sure to achieve infinity in speed. But when we are sharing the road with other users we will always remain behind some or other vehicle. Increase in speed multiplies the risk of accident and severity of injury during accident. Faster vehicles are more prone to accident than the slower one and the severity of accident will also be more in case of faster the severity of accident will also be more in case of faster vehicles. Higher the speed, greater the risk. At high speed the vehicle needs greater distance to stop i.e. braking distance. A slower vehicle comes to halt immediately while faster one takes long way to stop and also skids a long distance due to law of notion. A vehicle moving on high speed will have greater impact during the crash and hence will cause more injuries. The ability to judge the forthcoming events also gets reduced while driving at faster speed which causes error in judgement and finally a crash.

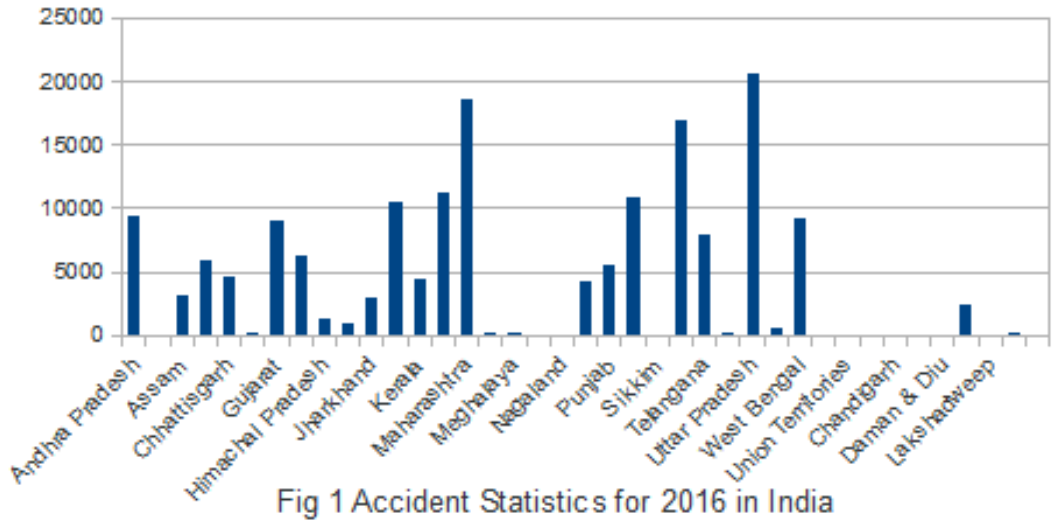

Fig 1 Accident Statistics for 2016 in India

II. LITERATURE SURVEY

The main motive behind this paper is to reduce these reckless accidents for which we propose a system that governs LITERATURE SURVEY The main motive behind this paper is to reduce these reckless accidents for which we propose a system that governs and controls the speed of the vehicle without any direct inconvenience to the driver. There are instances where the speed of the automobile is beyond the expected speed limit or the driver does not obey the traffic signals.

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TruCAM Laser Speed Gun with Video: TruCAM has integrated a laser with a digital video camera, making TruCAM the most sophisticated speed enforcement tool. The TruCAM collects and stores a complete chain of video evidence for both speeding and tailgating violations, along with a high-resolution image that identifies vehicle make, model and license plate number.

III. PROPOSED SYSTEM

The hidden motive behind this model is to save mankind from road accidents which are caused due to over speeding. As far as global facts are concerned nearly 30% of accidents are caused due to over speeding. This progressive increase in death rate can be controlled by this Light Detection and Ranging (LIDAR) – Automatic License Plate Detection (ALPD) model.

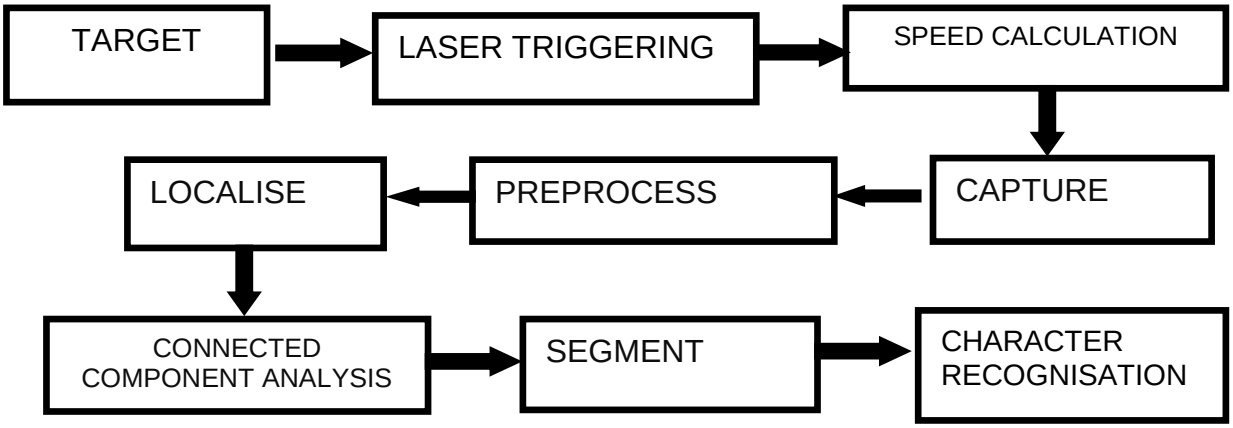

Fig 2. System Block Diagram

ABOUT LIDAR & ALPD:
Light Detection and Ranging (LIDAR) – Automatic License Plate Detection (ALPD) is a well integrated and real time embedded system which automatically recognizes the license plate of over speeding vehicles. This system has complex characteristics due to diverse effect of light and speed. Most of the Light Detection and Ranging (LIDAR) systems are supplemented with video recorders. This paper presents an improvised model of implementing Light Detection and Ranging (LIDAR) system with Automatic License Plate Detection (ALPD) using free licensed software such as python and open computer vision library. It is basically a part of our theoretical study which can be proved as an exemplary model in near future.

SPEED GUN: speed gun is a device used to measure the speed of moving objects. It is used in law-enforcement to measure the speed of moving vehicles and is often used in professional spectator sport, for things such as the measurement of bowling speeds in cricket, speed of pitched baseballs, athletes and tennis serves.

Fig 3. Sample speed gun

TARGET: A Light Detection and Ranging (LIDAR) gun is appropriately focused on to the road which has a clean view of around 0.7 mile. It has sensors embedded in it which detects the approaching vehicles so called target. It can act unidirectional which primarily focuses on the single lane of a motor way which is generally fitted on the streetlight in the motor ways.

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LASER TRIGGERING: As mentioned earlier, it gets activated if the vehicle is there within its vicinity that is 0.7 miles. It then triggers laser waves which get reflected from the moving vehicle. The transmission and reflection of laser waves takes less than Nano seconds. Laser waves are more feasible to generate than radar waves as they interfere with the useful communication waves and cause distortion in receptors spectrum.

SPEED CALCULATION: The reflected wave frequency is mixed with transmitted frequency and is made to pass through the electrical circuit which is connected to digital counter and checked with the legal limit. If it is greater than that limit then automatic license plate recognition is triggered to one state [1].

RASPBERRY PI ENABLED CAMERA: he camera board attaches to the Raspberry Pi via a 15-way ribbon cable. There are only two connections to make: the ribbon cable needs to be attached to the camera PCB, and to the Raspberry Pi itself. You need to get the cable the right way round, or the camera will not work. On the camera PCB, the blue backing on the cable should face away from the PCB, and on the Raspberry Pi it should face towards the Ethernet connection

Fig 4. Conversion device

CAPTURE: The image of the vehicle is captured using a high resolution photographic camera. A better choice is an Infrared (IR) camera which is raspberry pi enabled. The camera may be rolled and pitched with respect to the license plates. Captured Image (Original image) Character recognition is generally very sensitive to the skew. The readable characters can be distorted due to the obliqueness of the camera. Using a better camera with more definition and resolution will increase the success ratio of the system. Raspberry pi can be used as an interface between camera and preprocessing machine [2].

PREPROCESS: To enhance the quality of image in preprocessing a set of algorithms are applied. It is an important and common phase in any computer vision system. For the present system preprocessing involves two processes: Resize – The image size from the camera might be large and can drive the system slow. It is to be resized to a feasible aspect ratio. Convert Color Space – Images captured using IR or photographic cameras will be either in raw format or encoded into some multimedia standards. Normally, these images will be in RGB mode, with three channels (viz. red, green and blue).

LOCALISATION: Number of Channels defines the amount of color information available on the image. The image has to be converted to grayscale. Localize Rear or front part of the vehicle is captured into an image. The image certainly contains other parts of the vehicle and the environment, which are of no requirement to the system. The area in the image that interests us is the license plate and needs to be localized from the noise. Localization is basically a process of binarizing the image. The image is converted to black and white. There are two motivations for this operation

1. Highlighting characters
2. Suppressing background

Localization is done by an image processing technique called Thresholding. The pixels of the image are truncated to two values depending upon the value of threshold. Threshold requires pre-image analysis for identifying the suitable threshold value. Adaptive thresholding technique determines a local optimal threshold value for each image pixel so as to avoid the problem originating from non-uniform illumination. [3]

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CONNECTED COMPONENT ANALYSIS: Connected component analysis is performed to identify the characters in the image .In order to eliminate undesired image areas, a connected component algorithm is first applied to the binarized image. Basic idea is to traverse through the image and find the connected pixels. Each of the connected components (blobs) is labeled and extracted.

SEGMENTATION: Segmentation is the process of cropping out the labeled blobs. These blobs are expected to be the required portion of the license number. A special algorithm called Image Scissoring is introduced here. In this algorithm, the license plate is vertically scanned and scissor at the row on which there is no white pixel and it is copied into a new matrix. There are unwanted blobs even after segmentation. These are classified using special algorithms.

CHARACTER RECOGNITION: Finally, the selected blobs are sent to an Optical Character Recognition (OCR) Engine, which returns the ASCII of the license number [6].

IV. OPERATIONAL PROCEDURE

Light Detection and Ranging (LIDAR) gun focuses on the target and sends laser incident waves, which directly determines speed of target vehicle with the help of DOPPLER EFFECT. Digital counter enabled speed gun determines its speed and triggers raspberry pi enabled camera if its speed is greater than legal limit. A raspberry pi enabled camera is used because of its flexibility in extracting target license plate image with appropriately programmed rotation and transmitting the acquired data (image) to the base station. Camera captures image and sends data to base station and preprocessing of data using image processing algorithms is done [1].

Preprocessing: The steps that are followed for solving this algorithm are as follows:

Fig 5. speeding vehicle image

1. Image Acquisition.
2. RGB to grayscale conversion.
3. Noise removal by Iterative Bilateral Filtering (this will preserve the edges while removing the noise component in the image)
4. Contrast enhancement by using Histogram Equalization.
5. Morphological opening and image subtraction operation.
6. Image binarization or Image Thresholding.
7. Edge detection by canny operator.
8. Candidate plate area detection by contour detection.

Fig 6. Actual Number Identification

In this step, the total contours in the image are found and sorted in the decreasing order. So definitely the number plate contour will appear in the top 10 or 15 contours in sorted order as number plate will have a contribution of at least 10 percent of the total area of the image [4].

A Actual number plate area extraction by Masking.

B Enhancement of Extracted plate region by Histogram equalization [5].

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V. OBSERVATIONS

Considering the human perspective, in this paper "TECHNOLOGICAL INTERFACE IN CONTROLLING OVERSPEEDING" is a boon because of its versatile application of the newly developed technical devices. This system is high in accuracy due to the image processing technique in the proposed algorithm. To enhance the accuracy, other devices such as LIDAR gun, RASPBERRY PI enabled camera are also used. Thus it sets a prolific platform for controlling over speeding. The exponential increase in loss of human life due to over speeding accidents can be controlled in a precise manner.

VI. CONCLUSION

The proposed system enhances the Safety of human life with its abundant preventive measures in controlling the over speeding. Over speeding is right now ruling the road fatalities. So, saving the human life becomes vital. Though the establishment of proposed system requires integration of a lot of technological devices, but the model is highly accurate and "**when it comes to saving human life, nothing is greater".**

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