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ROAD TRAFFIC SIGN RECOGNITION AND VEHICLE ACCIDENT AVOIDANCE SYSTEM

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ABSTRACT: ***Traffic sign recognition and vehicle accident avoidance system gets a lot of interest late by huge scale associations, e.g., Apple, Google and Volkswagen and so on driven by the market requirements for smart applications, e.g. Automatic Driving and Driver Assistance Systems , Mobile Eye, Mobile Mapping and many more. In this paper, traffic sign recognition and vehicle accident avoidance system is utilized to keep up traffic and maintain a strategic distance from vehicle, caution the occupied drivers, and avoid activities that can lead a vehicle. An on-going programmed sign recognition and detection can support the driver with safety. System propose automated real time system which will capture the traffic sign and show it at driver dashboard with front obstacle exact distance on screen. In this system PiCam is connected with Raspberry Pi and it is used to capture pictures of traffic sings. Screen is utilized to show the system output .This framework is configuration to maintain a strategic distance from vehicle happening on street.***

Keywords- *PiCAM, Raspberry Pi, Ultrasonic sensors, Traffic Sign recognition*

I INTRODUCTION

A huge number of traffic sign affirmation structures have been made since the 1980's. First courses of action were focusing on optical based little scale redid hardware in order to keep up a vital good ways from computational multifaceted nature and other contemporary adaptable enrolling related requirements. As demonstrated by the world vehicle road mishap report, India has the top most nations for vehicle road mishap inside the world. Framework should make vehicle driver progressively careful about breaking separation and traffic signs. In this paper, framework propose using raspberry pi and PiCam with ultrasonic sensor, which will caution driver about traffic signs proceeding road and at the same time keep up a vital good ways from front accident using programmed breaking after vehicle enters in breaking separation zone.

II BACKGROUND

Road and traffic signs considered in this thesis are those that use a visual/symbolic language about the road(s) ahead that can be interpreted by drivers. The terms are used interchangeably in this thesis, and elsewhere might also appear in combination, as “road traffic signs”. They provide the driver with pieces of information that make driving safe and convenient. A type of sign that is NOT considered in this thesis is the direction sign, in which the upcoming directions for getting to named towns or on numbered routes are shown not symbolically but essentially by text. Road and traffic signs must be properly installed in the necessary locations and an inventory of them is ideally needed to help ensure adequate updating and maintenance.

Meetings with the highway authorities in both Scotland and Sweden revealed the absence of but a need for an inventory of traffic signs. An automatic means of detecting and recognizing traffic signs can make a significant contribution to this goal by providing a fast method of detecting, classifying and logging signs. This method helps to develop the inventory accurately and consistently. Once this is done, the detection of disfigured or obscured signs becomes easier for human operator.

III RELATED WORK

EnisBilgin, et al. [1] depict the characteristics of speed signs, necessities and inconveniences behind executing a consistent base structure with embedded system, and how to oversee numbers using picture taking care of techniques subject to shape and estimation examination. The paper moreover exhibits the techniques used for game plan and affirmation. Concealing examination moreover accept an unequivocally noteworthy activity in various different applications for road sign acknowledgment, this paper centers to various issues concerning reliability of concealing recognizable proof due to light conditions, so nonappearance of concealing model can drove an unrivaled game plan. In

this errand lightweight systems were chiefly used on account of confinement of persistent based application and Raspberry Pi capacities. Raspberry Pi is the standard concentration for the use, as it gives an interface between sensors, database, and picture getting ready outcomes, while also performing abilities to control periphery units (USB dongle, reassure, etc.).

Yi Yang, et al. [2] depict traffic sign affirmation expect a critical activity in driver accomplice systems and sagacious free vehicles. Its continuous introduction is appealing despite its affirmation execution. This paper intends to oversee progressing traffic sign affirmation, i.e., confining what kind of traffic sign appears in which area of an information picture at a fast dealing with time. To achieve this goal, we at first propose a brisk revelation module, which is on various occasions speedier than the present best recognizable proof module. Our acknowledgment module relies upon traffic sign suggestion extraction and request dependent on a concealing probability model and a concealing HOG. By then, we gather from a convolution neural framework to further gathering the recognized signs into their sub classes inside each super class. Preliminary outcomes on both German and Chinese boulevards show that both our acknowledgment and plan methodologies achieve comparable execution with the front line procedures, with essentially improved computational viability.

Priyanka D. et al. [3] portray this work hopes to complete traffic light and sign area using Image planning strategy for a self-decision and vehicle. Traffic Sign Recognition system is used to direct traffic signs, alert a driver and request certain exercises. Snappy healthy and ceaseless customized traffic sign revelation and affirmation can support the driver and in a general sense augmentation driving security. Customized affirmation of traffic signs is in like manner critical for a robotized shrewd driving vehicle or for a driver help system. This is a visual based endeavor i.e., the commitment to the structure is video data which is continually gotten from the web cam is interfaced to the Rasp-berry Pi. Pictures are pre-arranged with a couple of picture taking care of strategies, for instance, Hue, Saturation and Value (HSV) concealing space model system is used for traffic light area, for sign disclosure again HSV concealing space model and Contour Algorithm has been used. The signs are recognized reliant on Region of Interest (ROI). The ROI is recognized reliant on the features like geometric shape and shade of the article in the image containing the traffic signs.

Wang Canyong et al. [4] delineate the quick improvement of society and economy; vehicles have ended up being practically one of the invaluable strategies for vehicle for each house-hold. This makes the road traffic condition progressively tangled, and people would like to have a savvy Vision-helped application that outfit drivers with traffic sign information, direct driver exercises, or help vehicle control to ensure road prosperity. As one of the more critical limits, traffic sign disclosure and affirmation, has transformed into a hot research course of researchers at home and abroad. It is generally the use of vehicle cameras to get consistent road pictures, and after that to recognize and perceive the traffic signs experienced all over the place, in this way giving exact information to the driving system. Regardless, the road conditions in the genuine scene are jumbled. After various significant lots of persistent work, examiners have not yet made the affirmation structure sensible, and further research and improvement are so far required. Generally, traffic signage has been perceived and arranged using standard PC vision systems, yet it in like manner puts aside amazing exertion to physically process noteworthy features of the image. With the headway and progression of science and development, a consistently expanding number of analysts use significant learning advancement to deal with this issue. The rule reason that the significant learning technique is comprehensively recognized is that the model can get acquainted with the significant features in-side the image autonomously from the planning tests, especially for certain cases that don't have the foggiest thought how to design the part extractor, for instance, explanation affirmation, target acknowledgment Wait. In light of the utilization of road traffic sign disclosure and affirmation, this article fixates on the exactness and high capability of distinguishing proof and affirmation.

Meng-Yin Fu et al. [5] Advanced Driver Assistance Systems (ADAS) refer to various high-tech in-vehicle systems that are designed to increase road traffic safety by helping drivers gain better awareness of the road and its potential hazards as well as other drivers around them. The design of traffic sign recognition, one important subsystem of ADAS, has been a challenge problem for many years and hence become an important and active research topic in the area of intelligent transport systems. The realization of a real-time traffic sign recognition system is usually divided into three stages: detection, tracking and classification. This paper introduces the main difficulties in road sign recognition and briefly surveys the state-of-the-art technologies in this field with further discussions on the potential trend of development of road sign recognition.

Amol Jayant Kale et al. [6] explores the effective approach of road sign detection and recognition for Driver Assistance Systems (DAS). In today's world road conditions drastically improved as compared with past decade. Express highways equipped with increased lane size made up with cement concrete. Obviously speed of the vehicle increased. So on driver point of view there might be chances of neglecting mandatory road sign while driving. This paper illustrates proposed system to help driver about the road sign detection to avoid road accidents. The automatic road-signs recognition is an important part of Driver Assisting Systems which helps driver to increase safety and driving comfort. In this paper an efficient approach for the detection and recognition of the road sign in the road and acquiring the traffic scene images from a moving vehicle is present. In this paper the road sign recognition system is to be divided into two parts, the first part is detection stage which is used to detect the signs from a whole image, and the second part is classification stage that classifies the detected sign in the first part into one of the reference signs which are presents in the dataset. In the detection module segments, the input image in an YCBCR colour space, and then it detects road signs by using the shape filtering method. The classification module present determines the type of detected road signs by using an artificial neural network (ANN). The extensive

experimentation has shown that the proposed system approach is robust enough to detect and the recognize road signs under varying lighting, rotation and translation conditions.

Klaus Zimmermann et al. [7] describe robust system architecture for the reliable recognition of circular traffic signs. Our system employs complementing approaches for the different stages of current TSR systems. This introduces the application of local SIFT features for content-based traffic sign detection along with widely applied shape-based approaches. We further add a technique called contracting curve density (CCO) to refine the localization of the detected traffic sign candidates and therefore increase the performance of the subsequent classification module. Finally, the recognition stage based on SIFT and SURF descriptions of the candidates executed by a neural net provides a robust classification of structured image content like traffic signs. By applying these steps we compensate the weaknesses of the utilized approaches, and thus, improve the system's performance.

Saurav Agrawal et al. [8] introduce an alarming and response system for moving vehicle using ultrasonic ranging device (URD) which is a combination of a transmitter, a receiver and a single processing device and a microcontroller. The system calculates the minimum safety distance and alarm the driver if distance is low. And if driver doesn't slow down the vehicle then the system will itself apply the brakes and slow the vehicle.

P. Pavithra et al. [9] provides an intelligent system for two wheeler accident prevention and detection for human life safety. The prevention part involves, Smart Helmet, which automatically checks whether the person is wearing the helmet and has non- alcoholic breath while driving. The relay does not ON the engine if these two conditions are not satisfied. The microcontroller controls the function of relay and thus the ignition. The system also enables detection of an accident at any place and reports about the accident to predefined numbers with GSM module. The Microcontroller continuously records all the parameters of automobile for prevention and detection of accident.

D. Shahet al. [10] in this paper, we discussed the necessity of automatic animal detection system and our algorithm for animal detection based on HOG and cascade classifier. The algorithm can detect an animal in different conditions on highways. The proposed system achieves an accuracy of almost 82.5 % regarding animal (cow) detection. Estimation of approximate animal distance from the testing vehicle is also done. Though the proposed work has been focused on automatic animal detection in context to Indian highways, it will work in other countries also. The proposed method can easily be extended for detection of other animals too after proper training and testing. The proposed system can be used with other available, efficient pedestrian and vehicle detection systems and can be offered as a complete solution (package) for preventing collisions and loss of human life on highways.

Vishakha Wankhede and Ramesh M. Kagalakar [11] describes that humans use communication,language either by written or spoken to describe the visual world around them so the study of the text description is increasing. This paper represents the framework that gives an output as a description for any long video using natural language processing.

IV PROPOSED SYSTEM

An ongoing sign recognizable proof and acknowledgment can support to the driver, basically growing driver security. Traffic sign acknowledgment is used to recognize traffic signs, alert the involved drivers, and hinder driver exercises that can lead a mishap.

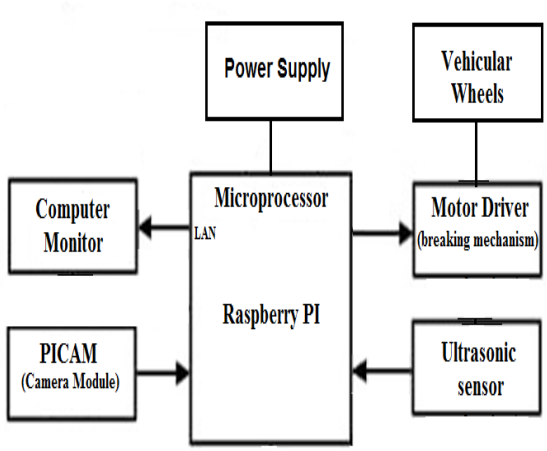


Figure 1: System Architecture

a) Traffic Sign Recognition:

For the purpose of sign recognition the Raspberry Pi Camera is used. The Raspberry Pi Camera Board plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image. This camera will capture images of traffic sign and send it to the raspberry pi controller board. Input image is then analyzed using machine learning algorithm which will able to detect the traffic sign.

b) Accident Avoidance:

For an accident avoidance system, those sensors are used which are able to detect presence of any object or obstacle in front of the vehicle and can able to measure the distance between two. Therefore to achieve this ultrasonic sensor is used in this project. It works by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

This sensor is used to avoid accident of vehicles. This sensor is placed on the front side of the vehicle which measures distance between other vehicles present in the front. If detects that the distance is less than the threshold distance the vehicle will automatically stop.

c) Collision Detection:

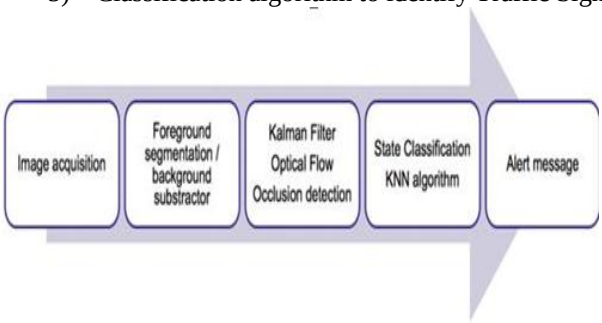
For an effective collision detection system the sensors must have the high accuracy and quick response time to process the data. This will help in quick collision detection. To do so vibration sensor is used. Shear mode accelerometer (vibration sensor) designs feature sensing crystals attached between a center post and a seismic mass under acceleration, the mass causes a shear stress to be applied to the sensing

crystals. This stress results in a proportional electrical output by the piezoelectric material. This result in a quick response from the sensor to the controller which leads to an fast and effective collision detection system.

IV METHODOLOGY

To perform the analysis for image features extracts using following steps:

1) Capture input images using pi camera Crop the area of Sign board.
2) Extract parameters like arrows by threshold segmentation (remove noises, Morphological operations).
3) Calculate geometrical properties (Area and perimeter) Calculate the roundness value
4) Calculate entropy values.
5) Classification algorithm to identify Traffic Signs.



V ALGORITHMS

1) k-Nearest Neighbor Algorithm (kNN)

- The kNN algorithm is a non-parametric, basic algorithm that does not make assumptions.
- On the underlying data distribution such as Gaussian mixtures etc. For kNN it is assumed.
- That the given data is in a feature space (geometrical metric space).
- And the other points in 2D geometrical space, where they have a notion of distance.
- Each of the training data consists of a set of vectors and classes assigned to each vector. k stands for number of Neighbors that influences the classification and is usually an odd number.

2) k-Means Algorithm

Input Parameters:

Samples: It should be of np.float32 data type, and each feature should be put in a single column.

n clusters (K): Number of clusters required at end

a) Criteria: It is the iteration termination criteria. When this criterion is satisfied, algorithm iteration stops. It should be a tuple of 3 parameters. They are (type, max_iter, epsilon): Type of termination criteria. It has 3 flags as below:

cv.TERM_CRITERIA_EPS - stop the algorithm iteration if specified accuracy, epsilon, is reached.

cv.TERM_CRITERIA_MAX_ITER - stop the algorithm after the specified number of iterations, max_iter.

cv.TERM_CRITERIA_EPS+cv.TERM_CRITERIA_MAX_ITER – stop the iteration when any of the above condition is met.

b) max_iter - An integer specifying maximum number of iterations

c) Epsilon - Required accuracy

Attempts: Flag to specify the number of times the algorithm is executed using different initial labeling. The algorithm returns the labels that yield best compactness. This compactness is returned as output.

Flags: This flag is used to specify how initial centers are taken. Normally two flags are used for this: cv.KMEANS_PP_CENTERS and cv.KMEANS_RANDOM_CENTES.

3) Grayscale Algorithm

Get the red, green, and blue values of a pixel.

Use fancy math to turn those numbers into a single gray value.

Replace the original red, green, and blue values with the new gray value.

ConversionFactor=255/(NumberOfShades-1)

AverageValue=(Red+Green+Blue)/3

Gray=Integer((AverageValue/ConversionFactor) +0.5)*ConversionFactor

4) Hough Circle Transformation

Take a look at the function signature below:

cv2.HoughCircles(image, method, dp, minDist)

image: 8-bit, single channel image. If working with a color image, convert to grayscale first.

method: Defines the method to detect circles in images. Currently, the only implemented method is cv2.HOUGH_GRADIENT, which corresponds to the Yuen et al. paper.

dp: This parameter is the inverse ratio of the accumulator resolution to the image resolution (see Yuen et al. for more details). Essentially, the larger the dp gets, the smaller the accumulator array gets.

minDist: Minimum distance between the center (x, y) coordinates of detected circles. If the minDist is too small, multiple circles in the same neighborhood as the original may be (falsely) detected. If the minDist is too large, then some circles may not be detected at all.

param1: Gradient value used to handle edge detection in the Yuen et al. method.

param2: Accumulator threshold value for the cv2.HOUGH_GRADIENT method. The smaller the threshold is, the more circles will be detected (including false circles). The larger the threshold is, the more circles will potentially be returned.

minRadius: Minimum size of the radius (in pixels).

maxRadius: Maximum size of the radius (in pixels).

VI CONCLUSION

In this paper, PiCAM is recognizing the traffic sign on street and alert to the driver. On the off chance that the driver has disregarded the traffic sign, at that point automatic

braking system will be actuated by Raspberry Pi microcontroller. Then again, framework will consistently track front vehicle distance utilizing ultrasonic sensor, and breaks will be connected by distance. This will keep away from the vehicle accidents because of sign board carelessness, likewise this will drivers to keep up safe distance between the vehicles. This will likewise maintain a strategic distance from the accidents happening because of head-on impact. The alarm on dashboard will make driver constantly mindful of the street status.

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