IOT Based Accident Detection and Image processing based Animal Detection and Traffic Sign Detection

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Abstract: *Thousands lose their valuable life in vehicle accidents everyday due to the traffic, road condition and speed. By using GPS antenna and latest technological concept of IoT , accident can be immediately reported, reduced and human life can be saved; by connecting different kinds of sensors to different parts or position of vehicle .We proposed system tilt sensor is used to detect the accident caused due to tilting, vibration sensor to detects the accident if there is a hard vibration of vehicle due to road condition and IR sensor is used for notifying if vehicle is too close to some other vehicle or obstacles. The collision of an animal with the vehicle on the highway is one such big issue which leads to such road accidents. In this system, a simple and a low-cost approach for automatic animal detection on highways for preventing animal-vehicle collision using computer vision techniques are proposed. This presents an overview of the road and traffic sign detection and recognition. It describes the characteristics of the road signs, the requirements and difficulties behind road signs detection and recognition.*
Keywords: *Accident detection, Image Processing, Arduino, Vehicle, Traffic Sign.*

I. Introduction

Quick treatment to the one who has met with accident is very much necessary to save the life. But the lack of in time accident reporting, accurate location reporting has made it difficult to provide the emergency treatment at right time. This requires an automated system which can notify the family members, friends and Hospital Ambulance about the accident along with the accurate location. Considering the above scenario, by using ever-evolving IoT technology, advent of mobile phones and by embedding sensors to the vehicles to provide quick treatment or for reducing the accidents. By embedding road condition sensor, vehicle distance sensor, forward obstacle sensor, side obstacle sensor, air pressure sensor, rear obstacle sensor, GPS sensor, Driver monitoring sensor, fire detection sensor, vehicle speed, acceleration sensor etc. to the different parts of vehicle and by designing vehicle-to-vehicle communication system. These embedded sensors are made to communicate with people through the mobile by sending the messages when some incident happens; which increases people safety which in-tern helps to avoid and controls many accidents. Now a days Global positioning System is a very popular technology used in many applications such as vehicle tracking, navigation etc. This paper focuses on utilizing GPS for finding the vehicle accident location detection and few sensors for safety measure and to know the road condition and reason for accident. Even injured passengers medical history like blood types and allergy details will also be sent, which helps for the quick treatment.The identification of the road signs is achieved by two main stages: detection, and recognition. In the detection phase, the image is pre-processed, enhanced, and segmented according to the sign properties such as color or shape. The output is a segmented image containing potential regions which could be recognized as possible road signs. The efficiency and speed of the detection are important factors which play a strong role in the whole process, because it reduces the search space and indicate only potential regions. In the recognition stage, each of the candidates is tested against a certain set of features (a pattern) to decide whether it is in the group of road signs or not, and then according to these features they are classified into different groups. These features are chosen so as to emphasize the differences among the classes. The shape of the sign plays a central role in this stage and the signs are classified into different classes such as triangles, circles, octagons, etc. Pictogram analysis allows a further stage of classification. By analyzing pictogram shapes together with the text available in the interior of the sign, it is easy to decide the individual class of the sign under consideration.

II. Literature Survey

[1] In this paper a pressure sensor along with the GPS module it is integrated into the car which send the location to the cloud. This rescue vehicle with GPS and GSM ; with the provided location proceeds to the accident spot .The cloud sends the information about the rescue vehicle to the traffic signal which turnon the RF

receiver which turns the traffic signal green whenever emergency vehicle approaches the signal this reducing the delay.

[2] This system is based on the computational intelligence techniques and is installed based on the study. But the false alarm rates are very high in this system and can be used by traffic departments.

[3] The ASAD system that is installed in a vehicle and a smartphone sends text messages to the authorities about the accident occurs but the system is not compact and also does not provide the facility to send simultaneous messages to multiple contacts.

[4] Lexus Inform uses a force sensor to detect the accident in the rear end and send the information to the service center but this costs about $260/year for the service .

[5] Considering the fact that the vehicle is bound to the road this system this system utilizes the MM to monitor the vehicle and the accident caused.

[6] The accident is confirmed if the vehicle is off the road and the signal is sent to the rescue team.

[7] The System detects the speed of the vehicle using a GPS receiver which analysis the speed of the vehicle with comparison to previous values by using HI-204III Ultra High Sensitive GPS receiver. If detected it sends GPS alert to the service center .If no GPS is not available then a sms and a voice message is sent to the service center .

[8] Researcher proposed a system which uses GPS to monitor the speed of a vehicle and detects the accident and sends location information. Author used Accident detection algorithm in which braking distance is proportional to the square of speed. So only speed is considered as a reason for the accident. Other than speed , some other parameters like distance between the two vehicles, road conditions are not considered in this paper.

[9]A vibration sense or Micro electro mechanical system (MEMS) sensor detects the accident and will send a message along with the GPS to the rescue team.

[10] SOSMART by SO Smart SPA is an automatic car crash detection app that detects the accident and sends the alarm along with the location to the contacts previously saved and waits for them to send the help According to the report given by the Society for Prevention of Cruelty to Animals (SPCA), around 270 cattle had been brought to their hospital-cum-animal-shelter in the year 2013, most of whom were accident victims [9]. In one of the article (report) published by a leading newspaper (Indian Express) on 26th August 2012, it is mentioned and notified that stray animal menace turns deadly on city roads and animals on the road create many difficulties for the drivers in Odessa state [10]. In another article published by Arrive Safe on 15th May 2008 (an organization working on road safety motive), it is mentioned that though no information is available on the cost of road accidents but the number of deaths due to road accidents are increasing, and one of the leading causes of road accidents is stray animals apart from over-speeding.

[11] Apart from other issues, animal threats on the road, Chandigarh Police advises drivers to wear seat belt, drive slowly and take every safety related precautions to prevent possible collision of drivers with obstacles on the road (including vehicles, animals, and pedestrians).

[12] Below are some of the snapshots of the same with the sources (figure 1.2), which suggests that there are many challenges that the drivers are facing because of animals on the road.Comparing with vehicle number plate, human-face, or traffic sign detection/identification, a lot of problems and difficulties have to be addressed in animal detection. With animal detection (example cow, dog, cat, deer and other animals), too many differences in color, shapes, and other variations are observed.

[13] Real-Time Traffic Sign Detection and Recognition for Intelligent Vehicle by Min Zhang Huawei Liang and Zhiling Wang Jing Yang, China,2014,IEEE.This paper proposes a stable system for the real time traffic sign detection and recognition, especially for the geometric distortions of traffic sign. In detection phase, color based segmentation is applied to remove the background, then in the shape analysis subsection, the Fast Fourier transform (FFT) is used to solve the rotation and scaling problems of the traffic sign. A template database which includes the common projection distortion shapes was established to overcome the effects of the projection distortions. For object occlusions, using the method of contours convex hull to weaken the influence of occlusions. Then the image filtering and the morphological operations are applied for reducing the noise interference and improving the efficiency of the algorithm. The contours of each binary image are used for next shape analysis which is based on the normalized FFT.
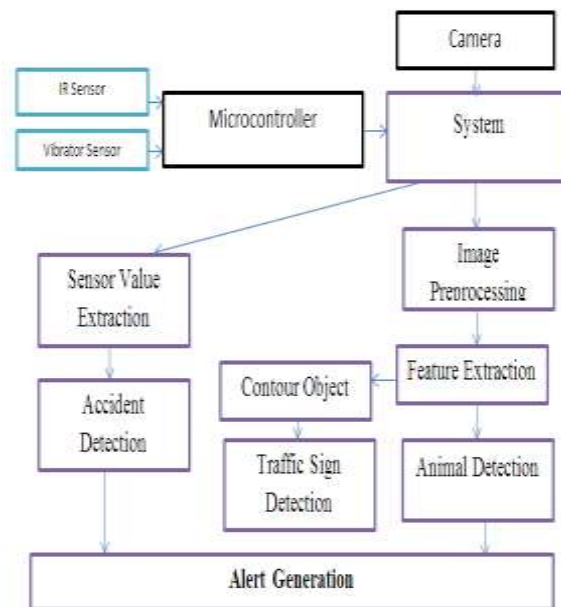
Fig.-Architecture Diagram

ARDUINO Uno (Microcontroller)
It's a microcontroller board with 14 I/O PINS USB connection, power jack, ICSP header and reset button. This allows uploading the code without any external programmer as ATmega328P.

Fig .-Arduino Board

IR SENSOR
This sensor is used to detect the obstacles by transmitting continuous IR rays and receiver receiving the IR light back and later measuring the voltage based on the amount of reflected light received. The wavelength region of 0.75μm to 3 μm is called near infrared, the region from 3 μm to 6 μm is called mid infrared and the region higher than 6 μm is called far infrared. Figure 5 represents the infrared radiation sensor.

Fig.5- IR Sensor

Fig.- IR Sensor

VIBRATION SENSOR
The ADXL103 is a high performance, single-/dual axis accelerometer compatible with Sn/Pb- and Pb-free solder processes. The bandwidth is selected based on the application ranging from 0.5 Hz to 2.5 Capacitor CX and Capacitor CY at the XOUT and YOUT pins.

Fig.-VIBRATION Sensor

III. Feature Extraction

A histogram of oriented gradients (HOG) is used in image processing applications for detecting objects in a video or image, which by definition is a feature descriptor, proposed by Dalal and Triggs who used their method for pedestrian detection.

After gradient computation, the next step is to create the histogram of the cells. Within the cell, each pixel casts a weighted vote for an orientation-based histogram channel based on the values found in the computation of the gradients. The cells are rectangular, and the histogram channels are uniformly spread over 0 to 360 or 0 to 180 degrees, depending on whether the gradient is "signed" or "unsigned". As for the vote weight, pixel contribution can be the gradient magnitude itself, or the square root or square of the gradient magnitude.

Animal Detection

Animal detection in wildlife (forest) videos or underwater videos (controlled areas) have been tried in past but the challenges are much more when detecting animals on highways (uncontrolled areas) as both animal as well as a camera mounted vehicle is moving, apart from that other obstacles on the road, which are also moving or stationary. This situation complicates the animal detection. There is no issue of speed (vehicle speed as well as animal speed) and detecting distance of animal from the vehicle in wildlife videos, which is crucial and critical in animal detection on highways. So dynamism of the object and environment need to take into account for detection of animals on the highway.

Traffic Sign Detection

To deal with real-time traffic sign recognition, i.e. localizing what type of traffic sign appears in which area of an input image at a fast processing time. To achieve this goal, a two-module framework (detection module and classification module) is proposed. In detection module, we firstly transform the input color image to probability maps by using color probability model. Then the traffic sign proposals are extracted by finding maximally stable external regions on these maps. Finally, an SVM classifier which trained with color HOG features is utilized to further filter out the false positives and classify the remaining proposals to their super classes.

IV. Conclusion

we implemented an IoT system for accident detection by considering one of the three cases such as tilt, vibration and distance between the two objects. Since this is an automated system, it sends the message to the registered person quickly so it takes very less time, hence is works efficiently compare to manual notification.

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