

IoT Based Vehicle Accident Detection, Tracking and License Plate Recognition using Deep Learning– A Survey

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Abstract— The number of increasing cars have resulted in the street mishaps. Road accidents is cause of global burden of public health in a country like India. One of the reason for the death of victim is that the ambulance reaching to the accident spot late. To save the life of the person or to rescue him from any further more damage a system is necessary. In order to put it into force we design a GPS model which send the location coordinates using IoT to the respective registered numbers and nearest hospital within the accident spot. The proposed system is designed using deep supervised Machine learning model. It has three models 1. Accident detection and alerting system 2. License plate recognition 3. Character segmentation and recognition of the characters of the License Plate and alerting. Deep learning techniques are used for License plate recognition. A camera which is present in the car will capture the image of the car or vehicle which caused accident. Pre-processing, conversion of image to binary image and contour detection is carried out. The main propaganda is to design an app which is installed in user's mobile with registered numbers. The app will be connected to the sensors for detecting the accident.

Keywords: Convolutional neural networks, Deep learning, Image Processing, Character segmentation

I. INTRODUCTION

Increase in usage of vehicle will result in increase in cause of accidents due to lack of traffic awareness. Speed is one of the reasons of occurrence of accidents. In case of such times it is important to provide emergency assistance to the victim. GPS model is being a vital piece of a vehicle. GPS can be useful to direct a user to the saved address or to a location when the input is location coordinates. This can also be used in this proposed system for sending the location coordinates to the registered numbers and nearest hospital. This is done with the help of a switch in order to avoid unnecessary information being passed to hospitals when no loss has occurred.

With this there's an addition to the proposed system which will capture the image of the nearest vehicles to detect the culprit who caused the accident. The main aim of this is to recognize the license number plate of the vehicle and send it to the registered numbers along with location coordinates using the pre- installed application installed in user's mobile.

The next thing is cropping out only the required information from the captured image. This step involves pre-processing of the image and cropping it out for license plate only. Once the detection of license number plate is done, character segmentation is carried out along with conversion of image into binary data.

All these information together will be sent to those registered numbers. Once the accident has been occurred

there will be alarm which will be turned on, failing to switch it off will trigger to send the message to those numbers.

II. METHODOLOGY

In order to train the model a well performing and good machine learning algorithm is required for the dataset of this model. After going through a lot of trial and error methods SVM algorithm and Random forest classifier were able to provide better result. This project is mainly based on Naïve Bayes algorithms.

The below figure shows the system architecture of the model.

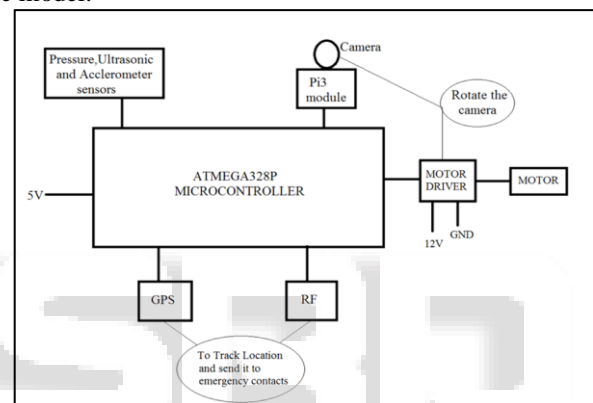


Fig. 1: System architecture

When the accident occurs the sensors attached to the vehicle will be activated. In this model we are using pressure sensors, When the sensors are activated the signal is passed on to the controller. After receiving the signal the buzzing alarm is turned on. This will indicate the GPS model for fetching the location coordinates. The location coordinates will be directed through SMS to the ambulance and registered numbers in the application which is built-in the user's mobile.

On the other hand this model is also concerned with finding the culprit who is responsible for the accident. The model will have a camera attached to it which is linked to Pi3 and motor driver which will be able to make the camera rotate to whichever side the vehicle is hit and the sensor is activated, as all the four sides of the vehicle will be fitted with the sensors. So once the camera is activated and the picture is clicked using

Deep learning the license plate recognition of the other vehicle is done. By using pre-defined building model of neural network we used it to compare the accuracy using TensorFlow and Keras framework

The below figure will show the actual framework

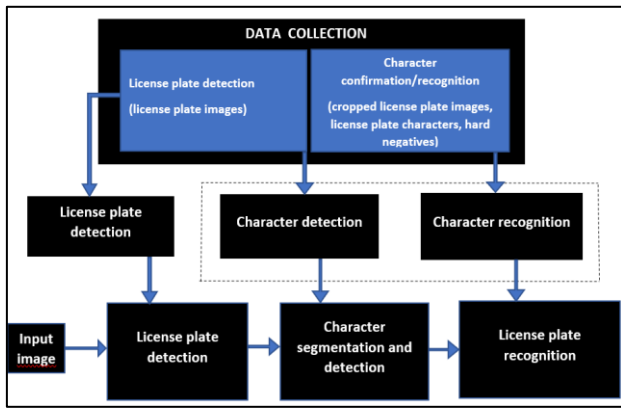


Fig. 2: Flowchart

The image will be converted to binary form by using Otsu’s method by creating a threshold. The components which are connected in the binary image are then located and labelled. These labelled regions have properties which can be iterated through. Again the characters in the license plate are iterated through using maximum and minimum dimension criteria. Once they are procured the image processing will be done.

Preprocessing is mainly resizing and changing the color spaces of the image. Here OpenCV tool is used for processing the image and character segmentation of the license plate.

III. RELATED WORK

Niranjan Kumar et al.,[1] used a crash sensor fitted in vehicle which senses the crash and sends the crash and sends the signal to microcontroller and then through GPS module the victims latitude and longitude’s coordinates are located and sent to the nearest ambulance for help.

Varsha Goud et al.,[3] used a control unit ARM7 LPC2148 , and three accelometer sensor MMA7660FFC and also used an interface module with LCD and a message sending module. When the accident occurs the collision is detected automatically by the vibration sensors and the the

alert signal is sent when the roll angle of the vehicle is greater than the set reference value.

Khushboo Khurana et al.,[5] have shown method for detecting multi object in an image in which different object detectors with individual objects are trained.

Shan Du et al, [6] have shown that for accuracy in automatic license plate recognition the license plate extraction is necessary where extractions can be done using various features. Similarly after extracting the license plate we can use segmentation to overcome problems such as tilt and non-uniform brightness.

C.Anagnostopoulos et al., [7] have shown various techniques that have been developed for recognizing the license plate images and how they can be processed using various processing methods.

Syed Zain Masood et al., [8] have shown a novel pipeline architecture comprising a sequence of deep CNN’s, for detection and recognition.

Fizzah Bhatti et al., [9] have shown that the accident can be detected through the sensors of an android smartphone through which the data can be shared with emergency service providers to help the victim.

Tejas et al., [10] has combined digital image processing with IoT to create a much efficient automatic license plate detection and recognition system.

Shwetha Bergonda et al. [11] used Raspberri Pi with which a system is made along with an LED which will be ON. When there is an accident the GPS receives the location of the vehicle and then it is sent to a mobile number through whatsapp message.

Liang et al.,[12]have shown how blurred license plate can be recognized using natural image matting.

Giannoukos et al., [13] has shown a method called operator context scanning in which each pixels of the image are used as sliding windows and where each pixels are associated with the neighborhood where it possibly belong.

DISADVANTAGES	The ambulance must also be fitted with GPS receivers	Blurry image, uneven image , low resolution image or dirty number plate can be a disadvantage	The disadvantage is that it has to train three separate models.	It doesn’t work well with challenging patterns.	Time required to detect each object is more since there are multiple objects.
ADVANTAGES	The scheme is fully automated and precise location can be found	The algorithms used makes it efficient to use for any dataset	Reduces false positivity with high accuracy	It also extracts cluttered background and makes the system robust	Simultaneous detection is done. Approximation and efficiency is improved.
RESULTS	The location coordinates are displayed on the LED screen .	The proper license plate number in the format of text.	YOLOv2 and SVM can be combined to identify license plate only	The proposed system for LP using CNN extracts the character / number features	All the objects are detected along with boundary and its tag displayed in output image

METHOD USED	Crash sensors to detect accident and microcontroller to send the GPS	Morphological algorithms, and connected components analysis	Technique of LPRCNN is used. LP location, segmentation of character and recognition of character	Generic algorithms, CNN, RNN, CCA are all used to recognize the LP and the extract the image	Template matching, Color based matching, Window sliding and part based matching, Shape based matching.
DATA SET AND PARAMETERS	Location coordinates are the parameters	Vehicle image which undergoes image binarization, image enhancement, smoothing process and character segmentation.	Coco 2017 data set to train model YOLOv2, 1779 positive samples of plate and 5401 negative samples of plate	ReLU determines the text/ number	Object images with different lighting, orientation, occluded images and grey scale images.
APPROACH	Automatic detection of accident	Automatic license plate recognition	Conventional license plate recognition	LPR using cloud and deep learning	Multi Object Detection In images.
REF NO.	#1	#2	#3	#4	#5

DISADVANTAGES	If quality of images is not up-to-mark, the classification will not be appropriate.	Examples of the number and quality of tests are ignored.	Some images with blurriness, illumination and size, it is extremely hard to find the license number	If there is no cellular data connection then the accident information will not be sent	Some images taken in different weather conditions are hard to process
ADVANTAGES	They are considering minute details about a license plate the accuracy of expected output is more.	Improved processing time, computational power, and rate of recognition.	This is a robust method to different conditions like light changes, different angles	Decreases overall cost because there is no much hardware requirements	Digital image processing is combined with IoT which creates a much efficient license plate detection and recognition
RESULTS	Accurate Character recognition is performed.	In spite of different physical barriers, we can expect certain amount of approximation in the output.	License plate number is obtained	The location of the accident will be detected and the nearest hospital will be located, and the accident requesting assistance will be sent to emergency contacts	Characters of the license plate are detected
METHOD USED	Boundary featuring, global image featuring, texture based featuring, character based featuring..	Binary images processing, grey level image processing, color scale processing, And classifiers.	The license plate detector crops the license plate and then character segmentation are done and non-character elements are removed.	The accident is identified via an android smartphone's sensors, through which data can be exchanged with emergency service providers to help the victim	The license plate images are pre-processed, extracted, character segmentation is done and character recognition is done.

DATA SET AND PARAMETERS	Different images of car plates based on color, language, fonts, background and location.	Diverse images, fixed illumination images, optical character related images.	Real world license plate images	The speed variation factors detected by the sensors detect accidents via advanced smartphone specifications	Various license plate images with different exposures like variation in angle, blurred images
APPROACH	Automatic Plate Recognition- A state-of-the-art review	License plate Acknowledgement from still images and video sequences.	Deeply learned convolution neural networks	Enabled accident detection and reporting system for smart city environments	Unique edge detection algorithms and smarter interpretation through IoT
REF NO.	#6	#7	#8	#9	#10

DISADVANTAGES	If the sensors are not working properly then there will be a problem during accident detection.	The CLPR system's reliability and its based solely on the photos that comply with the Dutch LP registration rules.
ADVANTAGES	This system provides the emergency responders with the information of accident with the earliest possible time	Very low error rate, at an acceptable rate of recognition.
RESULTS	GPS, GSM, MEMS (Micro Electro Mechanical System) which detects accidents and informs the location to emergency service providers	Clear character classification into 24 inputs: 15 hidden layers and 36 output layers.
METHOD USED	Collision is detected using accelerometer and through GSM the information is given to emergency service providers	Preprocessing, Segmentation Unit, Recognizer, Syntactic Analyzer using Discrete Neural Time (DTCNN) and Multi-Layer Perceptron (MLP) Network.
DATA SET AND PARAMETERS	Microcontroller is used which receives the accident information and alerts the entire system	Images of the car plates which satisfy the Dutch LP regulation rules.
APPROACH	Intelligent Automatic accident detection of vehicles using wireless communication	Car license plate recognition with Fuzzy Logic and Neural Networks.
REF NO.	#11	#12

IV. CONCLUSION

In this proposed system we will be able to perform two tasks i.e accident detection and license plate recognition. Since this system works with a switch it will avoid unwanted buzzing of false accident report to the ambulance or registered numbers which is an advantage. The accident detection and alarm is done by using IoT technology. License plate recognition and character segmentation using deep learning and neural networks.

Further tests can be done in the future to increase the recognition of different unique characters in the number plate. That will make the system more robust.

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