Minor Project

Accident detection using computer vision and Machine Learning

B.Tech Computer Engineering

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Abstract

Using computer vision to detect accident is beneficial but daunting task. In our project we would create computer vision and AI based solution to detect accidents. This system canbe used to alert authorities and help them provide timely medical assistance to the victims.This system would use mask-RCNN and centroid based object tracking algorithm. This system would analyze CCTV feed continuously to determine accident. There have been many research in the field and we would try to improve upon those in terms of performance in low light and low resolution video feed, so that solution could feasible for varying weather and lighting conditions.

Introduction

There is a huge impact on the society due to traffic accidents where there is a great costs of fatalities and injuries. Road accidents are one of the major cause of deaths in India. The metropolitan cities such as Chennai, Mumbai and New Delhi have been increasingly highlighted for lack of road safety and rash driving cases. The recent trends show that there has been an increase in the global number of road accidents even in developed countries [1]. However, under-developed and developing countries suffer a more significant impact due to life and economic losses. These accidents occur due to violation of traffic safety rules, careless rash driving, driver drowsiness and lack of good quality roads. The problem becomes more adverse for highways and hilly areas where accidents are unavoidable.The following table summerises GOI report[2] on number of road accident :

year	Total Number of Road accident (in numbers)	%change	Total Number of Persons Killed (in numbers)	%change
2014	4,89,400		1,39,671	
2015	5,01,423	2.46	1,46,133	1.38
2016	4,80,652	-4.14	1,50,785	-1.13
2017	4,64,910	-3.28	1,47,913	-4.78
2018	4,67,044	0.46	1,51,417	-0.33

Also in the same GOI road accident report[1] from 2018 states 78,766 deaths in vehicle to vehicle accidents which 52% of total deaths in road accident. As we can see deaths in these accidents is very high and delay in providing medical attention adds to the number of fatalities. Timely Medical attention is the most important factor in saving lives in road accidents. But considering the large road network of India that goes through varied terrains, information regarding an accidents may not reach the appropriate authority in time. In this project we are trying to automate the process of vehicle to vehicle accident detection. This system that would would detect accidents by analyzing CCTV video feeds. The system would also try to ascertain severity of accident.

Methodology

Key tasks in our project are :
1. Vehicle detection
2. Vehicle tracking and feature extraction
3. Accident detection

Vehicle Detection:

For vehicle detection we would apply masked **R-CNN**(region-based convolution networks)[3] to segment and construct pixel-wise masks for every object in the video frame. After phase this we would have a dictionary containing all the class IDs, detection scores, bounding boxes, and the generated masks for a given video frame.

Vehicle Tracking:

For vehicle tracking we would use **centroid tracking** algorithm which uses distance between centroids of detected vehicle in consecutive frames.

Accident Detection:

To detect accident we look for overlapping bounding boxes and improve the accuracy by determining speed and trajectory of vehicle.

Programming Enviroment and Tools

- python-3.7
- Tensorflow–1.12.0
- Keras
- Ubuntu16.04/Windows10

References

1. The World Health Organization Global Status Report on Road Safety, The World Health Organization; Geneva, Switzerland, 2018
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5. Vipul Gaurav,Sanyam Kumar Singh,Avikant Srivastava,*"Accident Detection, Severity Prediction, Identification of AccidentProne Areas in India and Feasibility Study using Improved Image Segmentation, Machine Learning and Sensors"*,Oct 2019