VEHICULAR ACCIDENT ALERT SYSTEM

USING COMPUTER VISION

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Abstract:

Intelligent traffic monitoring systems are budding now a days. Traffic monitoring using computer vision has been seen as faster approach to alert the drivers. The parameters that I have considered to approach this problem are speed of the vehicles, Speed of people crossing the road and their trajectory, Lane changing vehicles, Trajectory of vehicles, size comparison between closely moving vehicles, traffic density. Using these data, the computer will alert the drivers in case of any abnormalities and will alert the drivers through a device which will be placed near the driver, so that he is given warning by a pre-recorded voice.

Introduction:

The reason behind every accident is stated as a human error but what It had costed is the lives of few. If there is some way with which that human error can be avoided then it could be the involvement of another passenger in the vehicle giving an alert or the warning given by Traffic police. But this is a very difficult task in the real time. We can't always expect the traffic police to observe all the vehicles on the road all time or also expect the passengers to know when things can go wrong. It need not be the error of one driver but can also be the error caused by another vehicle driver which causes accidents.

With improvements in the field of Technology, the approach to solve a problem is also changing day by day. A problem can be solved either by a human only interface, human-computer interface, computer only interface. The future is moving towards a computer only interface. This involves the computer learning to sense the world around it like a human does. One of the most important sense that the human uses to solve the problems around him/her is the sense of sight. The analogous term to human sight in computers is computer vision. Here in this project I am using the power of computer vision to overcome one of the life-ending occasions, vehicular accidents.

Methodology:

My method to tackle the following problem starts with detecting the vehicles in the roads using the traffic surveillance cameras. This is done using the concept of object detection using Haar feature-based Cascade classifiers in opencv. After this the following parameters are measured:

- Speed of vehicles:

    This can be easily found by finding the difference in positions of the vehicle between 2 consecutive frames and dividing it by the frame rate and then multiplying it by the pixel to width ratio.

- Trajectory of vehicles:

    This can be found using the vehicle tracking technique. At every instant, for every single frame the velocity and direction of the car are detected and the trajectory of the vehicles are calculated assuming that the vehicle moves with the same velocity and direction for next few moments.

- Whether a vehicle changes lane or not:

    The positions of lane can be detected by the cameras and once the camera detects vehicles changing lanes, data is sent to the computer.

- Speed of people crossing the road and their trajectory:

    Using the same technique as the vehicle speed detection, the speed of people crossing the road and their trajectory is also calculated.

- Size comparison between closely moving vehicles:

    If two or more vehicles are detected to be moving close to each other then their sizes are measured and the data is given back to the computer.

- Traffic density:

    By counting the number of cars present in a particular area of the road we can find the traffic density.

Using the above data, following scenarios leading to vehicular accidents in day to day life can be detected:

- The velocities of different vehicles in a standard road are measured for a period of time and are averaged for every vehicle type (car, bus, bike, truck, etc…). Then this data is fed to the computer. Now if in case the particular vehicle goes way beyond the average speed then there are chances for accidents to happen.
- Using the trajectory calculations of various vehicles and people if they are found to be intersecting at the same time then it is a sign of accident to occur.
- The purpose of lanes in road is to segregate vehicles of different speeds. If a fast moving and a slow-moving vehicle are in the same lane then there are chances for the fast-moving vehicle to change to other lanes to overtake and this might cause confusions for other vehicle drivers and can lead to accidents.
- Many accidents tend to happen when a large sized vehicle goes out of control.
- Vehicles are driven at high speeds without even knowing the traffic density of the further roads, this can lead to accidents.
- People crossing roads might face with an accident if they do at the wrong time, this is checked by seeing whether the trajectories of the vehicle and the person intersect at the same time.

So, we have seen various scenarios which can lead to accidents. Whenever these scenarios tend to occur the vehicle drivers are alerted through a device which gives a voice command.

Comparison with the pre-existing solutions:

There are few researches previously done on this topic. Those solutions include the usage of ML/DL models, GPS/GSM positioning, accelerometers for accident prediction. But using these methods involve complex calculations and give better accuracy, but the accidents happen in fraction of a second. So, a faster means of alert is always preferred.

Conclusion:

This project uses basic functions of opencv to make a system that detects the possibility of accident and alerts the driver. This method of vehicular accident alert system need not be a solution to every accident happening in the world. The are still some accidents which are unavoidable even after giving alerts due to human errors. So, it is the responsibility of every citizen to focus well while they are driving.

References:

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