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A novel approach for active safety system

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ABSTRACT

In this modern day automotive world, the occurrence of accidents is much more due to several factors. This can be avoided when the driver is alert. So a system has to be developed which gives the driver the information about the nearby vehicles whether it is a danger, no danger, and potential danger. This paper presents you how to classify the vehicles in its ROI and categorize their stage of danger. Specifically, stereo cameras and Millimeter Wave (MMW)-radar are fused to help the driving ego-vehicle. Cameras are used to identify near lateral dynamic objects and MMW radar to detect far longitudinal objects. This process is simulated using python using CV2 library, numpy library.

Keywords— *Camera, MMW-Radar, Python, OpenCV*

1. INTRODUCTION

In our day-to-day life, most of the road users are quite well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes. The collision of vehicles occurs with another vehicle, or pedestrian, or animals, or other stationary obstructions is increasing on roads and it includes human errors. Due to that, it leads to the death and disability as well as financial costs to both individuals and society involved. So, the Collision safety system is becoming more and more important in our daily life to reduce accidents while driving cars. When the collision becomes imminent, they take action autonomously. Without any driver input the (NHTSA) and the Insurance Institute of Highway safety announced the manufacturers of 99% of U.S. automobiles had agreed to include automatic emergency braking systems as a standard on all new cars. On the other hand, plenty of new technologies are developing by some automobile companies like Bosch, Mercedes- Benz with forwarding collision warning system on the structured road environment. So, we are implementing this method based on Real-time obstacles detection and status of ego vehicle through stereo cameras and mmw-radar to detect the dynamic and relative dynamic objects and these are widely used in the last few years. Considering that most accidents always occur when the ego-vehicle is driving, we are concentrated on the dynamic or relative dynamic objects. Stereo cameras mainly detecting the dynamic objects that move relative to the ground and we-radar detecting the relative dynamic objects that move relatively to the ego- the vehicle can work together efficiently when the ego- vehicle is driving normally by utilizing motion compensation and information fusion so that this function becomes more accurate. In general, dynamic objects detection by cameras can be divided into two categories i.e: static background and dynamic background we are experimenting several cases including obstacles in front of the vehicle, tunnels and speed bump on the road and these methods are more simple and efficient in real-time performance. To detect dynamic background much more difficult why because the background moves fast with the ego- vehicles while driving. Researchers are also doing experiments on cameras movement through stereo visual odometry, recognized the pedestrian, tracked them and predicted their trajectories along with the ego-vehicle's driving. In general, a vehicle safety system usually pays more attention in two aspects: obstacles area and state of the dynamic or relative dynamic objects.

1.1 Forward Collision System (FCS)

Forward collision warning (FCW) system to realize the collision warning function through detecting the traffic lane and the car in the lanes UV disparity, ROI map, danger, Image segmentation, visual odometry algorithm, obstacle area, SMG, iSMG, rSMG, optical flow of dynamic objects (sparse optical flow).

2. DESIGN OF PROTOTYPE

2.1 Python

Python is a programming and scripting language. It is useful in areas such as web applications, websites, GUI applications, desktop applications. Python, focus on the core functionality of the application by taking care of common programming tasks which made it as a high-level programming language.

2.2 Open CV-library

It helps users for image processing applications in python and consists of two versions cv1 and cv2. It mainly aims at computer vision applications such as camera output can be processed in these programming applications library. It is also used for applications such as gesture recognition, 2D and 3D feature toolkits, Ego-motion estimation, segmentation and

recognition, mobile robotics, motion recognition Augmented reality.

2.3 Numpy library

It is a package in python which used for higher mathematical applications and high computing applications such as adding support for large, multi-dimensional arrays and matrices. It is quite a powerful tool for numerical operations in Python.

3. METHODOLOGY

In this paper, we are using a stationary vehicle with camera fused to the dashboard which detects the moving vehicles nearby the ego vehicle. This ROI consists of three regions i.e.: potential danger, danger, no danger, and the vehicles in that ROI fall under any of this category. If a vehicle is in potential danger the driver will get the alert message in a mobile phone or through my speaker sound.

4. SIMULATION AND RESULTS

4.1 Input

Fig. 1: Input

4.2 Outputs

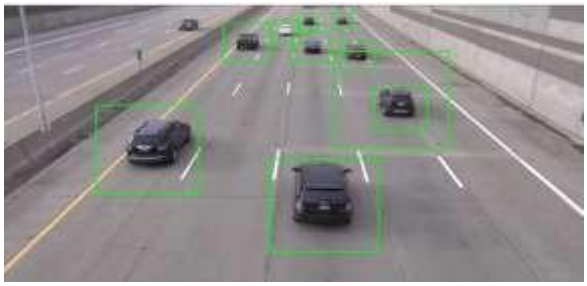

Fig. 2: Image shows detecting vehicles

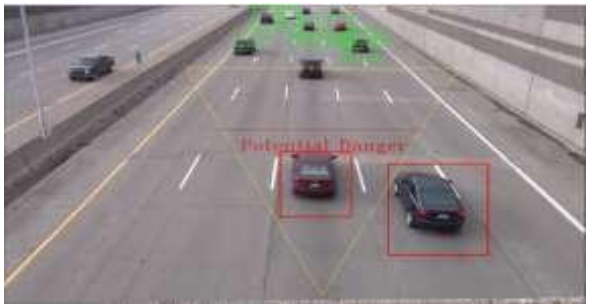

Fig. 3: Image shows vehicles in potential danger

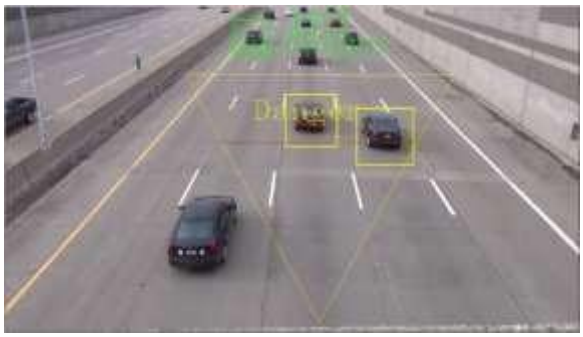

Fig. 4: Image shows vehicles in danger region

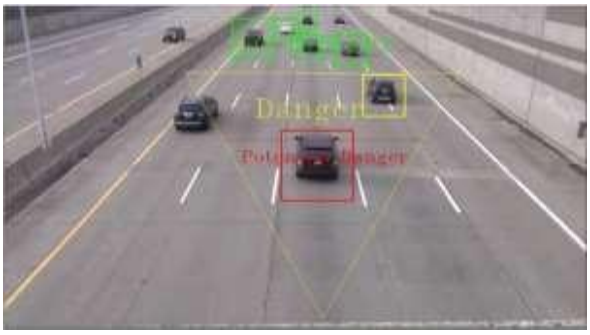

Fig. 5: Image shows vehicles in danger, potential danger, and no danger region

5. FUTURE SCOPE

This paper shows the output when the camera is static. So, future work can be inclusive with camera dynamic motion.

6. CONCLUSION

Here we have simulated vehicle detection and status classification such as potential danger, danger, no danger regions using python which includes OpenCV and Numpy libraries. The input is taken using a camera which is static motion. The status classification is done using ROI constructed using a camera as the reference point.

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