Poster Abstract: A Survey of Obstacle Detection using Vision Sensor for Autonomous Vehicles

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***Abstract*—Obstacle detection is one of the key requirements for autonomous vehicles. Many researchers have developed the techniques for obstacle detection for the safety of the drivers. Vision-based technique is one of popular obstacle detection techniques. We survey vision-based obstacle detection approaches, and present two approaches. In future work, we intend to implement a dynamic obstacle detection technique using vision sensors in urban road.**

Keywords —computer vision; obstacle detection; real-time technique; autonomous vehicle

I. INTRODUCTION

There are many researches for the obstacle detection using various sensors in intelligent vehicle systems, since the obstacle detection is an important issue in vehicle field. Especially, the vision-based approaches have been used for the obstacle detection. In this paper, we survey the approaches using vision sensors that have several benefits. The vision sensors can distinguish obstacles and they are inexpensive compared to other sensors such as LIDAR and radar. In future work, we plan to implement a dynamic obstacle detection technique that is adaptable in urban road.

II. VISION BASED OBSTACLE DETECTION

As the hardware and the vision algorithm have been rapidly developed, the computer vision techniques are mainly used in intelligent vehicle. We survey vision-based obstacle detection approaches using vision sensors [1-3].

A. Monocular Vision Approaches

In the monocular vision approaches, the obstacles can be detected by means of the features which are extracted from many images. Monocular vision-based approaches well distinguish obstacles by obtaining the appearances of the obstacles. However, the approaches lack direct depth measurements of the obstacle. Therefore, the performance of the approaches can be improved by fusing the depth sensors.

B. Stereo Vision Approaches

Stereo vision approaches can generate 3D depth map. Fig. 1 shows an example of a depth map generated for obstacle detection [2]. As stereo vision-based approaches provide depth of obstacles, they guarantee high accuracy of obstacle detection. However, detection algorithms using 3D depth map have high complexity and expensive computation cost. Therefore, stereo vision approaches use the hardware such as FPGA (Field Programmable Gate Array) for reducing computation cost.

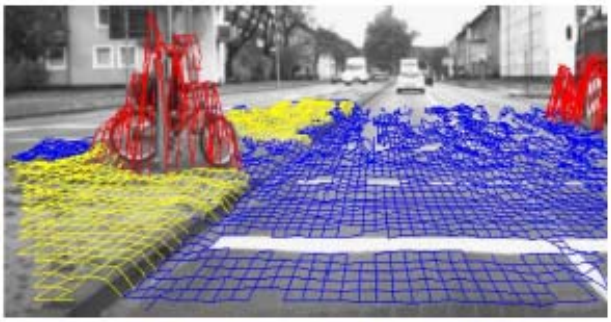

Figure 1. An example of stereo vision-based obstacle detection

III. CONCLUSION AND FUTURE WORK

In this paper, we present a brief overview of vision-based obstacle detection approaches. The previous works deal with the obstacle detection considering only general condition without unexpected situation that can occur in real-world. In future work, we plan to implement a dynamic obstacle detection model by combining monocular and stereo vision for urban autonomous vehicle. Furthermore, we will fuse vision sensors and other sensors such as LIDAR and radar in order to apply our model in bad weather condition and to enhance its robustness.

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