Adasens Advanced Driver Assistance Systems Live Demo

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Abstract. Computer Vision is starting to play a major role in Automotive Industry. FICOSA-Adasens Automotive is developing Advanced Driver Assistance Systems (ADAS). ADAS are systems that help the driver with the aim to increase car and road safety. In this context, Adasens is proposing a live show consisting of a fully operational stereo vision obstacle detector on-board of an Adasens demo car.

1 Introduction

Advanced Driver Assistance Systems (ADAS) make use of computer vision techniques to increase safety on roads. ADAS are used to identify lanes, recognise traffic signs or detect obstacles, among many other functionalities. The aim of these functionalities is to help drivers and increase vulnerable road users (VRU) safety.

Adasens Automotive is developing integral ADAS solutions. Adasens solutions do not only involve software, but also hardware design. The scope of this paper is to present significant results of Adasens ADAS solutions by the means of a live demo. Adasens vision team is designing, prototyping and implementing real time computer vision solutions, which are then optimized by Adasens embedded team. At this stage, Adasens is presenting a demo car, with fully installed and operational ADAS solutions.

More precisely, the proposal for this demo is to show the functionalities of the stereo system on-board of the demo car. These functionalities consist of 3D obstacle detection and tracking. These functions are part of passive safety systems, which means that these are only used as systems that inform the driver. Notice that no active control systems will be presented during this demo, such as automatic breaking systems or obstacle avoidance systems.

This demo proposal is structured as follows: Section 2 presents a brief summary on state-of-the-art ADAS solutions, focusing on stereo based obstacle detection systems. Section 3 describes Adasens system and solution. Section 4 summarizes what the demo will consist of.

2 State of the Art ADAS Solutions

The evolution of digital cameras in the last ten to twenty years has boosted research on camera based ADAS solutions. Several important examples are already

A. Fusiello et al. (Eds.): ECCV 2012 Ws/Demos, Part III, LNCS 7585, pp. 659–662, 2012.

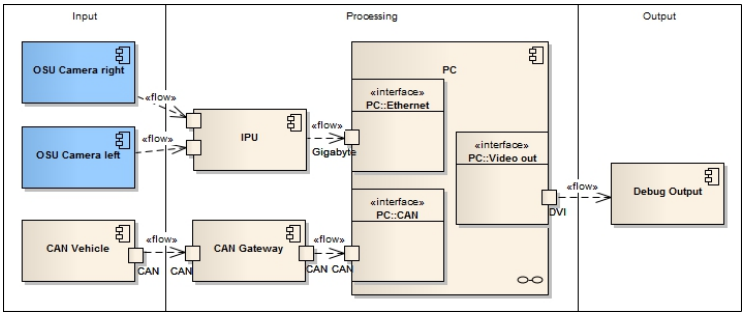

Fig. 1. Adasens system schematics

present in the market, for instance, Mobileye [1]and Continental systems [2]. Most of this systems use a single camera, but the use of stereo systems is becoming more popular. One can find in the literature stereo based ADAS proposals. The solution presented in [3] for heavy vehicles is aimed to detect obstacles from the top of a VOLVO truck. More recently, Daimler R&D team presented the so called 6D vision system [4,5], which consists of a stereo system capable of conveying 3D perception to perceive and identify potential risks. Mobileye has its own stereo approach, called stereo-assist [6] and Continental is developing stereo vision ADAS solutions [7]. In addition, several automakers are already presenting stereo solutions which will be coming soon in the market. For instance, Subaru recently presented its EyeSight driver assistance system [8], which is expected to be in the marked in 2013.

3 Adasens System

In this demo, Adasens is presenting a system composed of:

- Adasens Optical Sensor Unit (OSU) in charge of capturing the scene.
- Adasens Image Processing Unit (IPU) in charge of synchronizing left and right image of the stereo rig.
- On-board Personal Computer (PC) in charge of the high level computer vision computations.
- Adasens Debug Visualization Interface (DVI) in charge of presenting the results in a comprehensible manner.

These components are interconnected as depicted in Figure 1. The two OSUs that form a stereo rig are located in the frontal wind shield. This stereo rig acquires the data which is then pre-processed in the IPU and sent via Ethernet to the PC. The PC performs high level computer vision algorithms such as:

- Image rectification
- Stereo matching
- Stereo triangulation

- Ground segmentation
- 3D segmentation
- Tracking

The conjunction of these algorithms produces significant results. These results are used by functionalities nowadays highly demanded, for instance:

- Lane Departure Warning System (LDW).
- Adaptive Cruise Control (ACC).
- Forward Collision Warning (FCW).
- Pedestrian Protection System.
- Parking Assistance System (PAS)
- Traffic sign recognition (TSR)

4 The Demo

Adasens aims to show the features of its forward looking stereo vision system, with special focus on the obstacle detection functionality. The system is installed and operational on-board of Adasens demo car. The proposed demo consists of a on-site test of the demo car at low speed, where the audience will have the chance to understand Adasens algorithms. In order to give an extensive comprehension of the real time stereo based obstacle detector, Adasens visualization tool will allow the audience to observe the performance of the functionalities under different settings. Figure 2 shows the output of the system at a given frame. This figure presents four sub-windows:

- Top-left image shows the disparity map.
- Bottom-left image shows the 3D clusters.
- Middle image shows a top view of the scene. Every cluster estimated position is plotted with respect to the vehicle.
- Right image is the rectified left image of the stereo rig. Bounding boxes are drawn on top of detected obstacles.

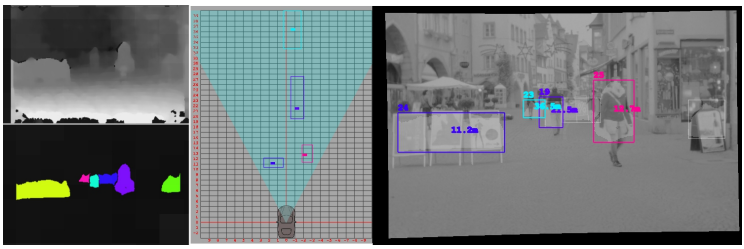

Fig. 2. Example of the Adasens debug visualization

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