Chapter V

Smart Cars: The Next Frontier

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ABSTRACT

This chapter gives an overview of driver assistance systems (DAS) in general and the Smart Cars project in particular. In the Driver Assistance Systems Section, a set of key competencies for an effective DAS are identified by comparing with a human co-pilot, namely, traffic situation monitoring, driver’s state monitoring, vehicle state monitoring, communication with the driver, vehicle control, and a reasoning system. It is also recognised that such a system must be intuitive, non-intrusive and override-able. A few of the currently available commercial systems are mentioned in the following section. The Smart Cars project, which is a joint project between the Australian National University and National ICT Australia, is then introduced. A number of different research directions within the project are then presented in detail: obstacle detection and tracking, speed sign detection and recognition, pedestrian detection, and blind spot monitoring.

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INTRODUCTION

The number of cars in use on our roads increases every year, and with that, the number of accidents. However, by introducing systems and technologies that help the driver in difficult or dangerous situations, the car industry has been able to keep the number of fatal accidents down. Examples of such systems are ABS-brakes and smart air bag deployment. New, more advanced technologies that can help the driver have, in recent years, started to be deployed in production vehicles. Examples of such systems are parking aids, lane departure warning systems, and emergency brake systems. The research in the Smart Cars project is particularly concerned with such advanced driver assistance systems, namely, that assist the driver in controlling the car, but keep the driver in the loop. Impressive work in this and related areas has been performed by Dickmanns and Zapp (1987), Dickmanns (1999, 2000), Broggi, Bertozzi, and Fascioli (2001), Mertz, McNeil, and Thorpe (2000), Zhao and Thorpe (2000), Aufere, Gowdy, Mertz, Thorpe, Wang, and Yata (2003), and Bertozzi, Broggi, Carletti, Fascioli, Graf, Grisleri, and Meinecke (2003). Their work deals to a large extent with the sensing aspect of driver assistance, which is essential to create robust and reliable systems. An interesting research area is, however, how to handle the information flow generated. Depending on the context, information has different significance. For example, how are warnings most efficiently conveyed?

DRIVER ASSISTANCE SYSTEMS

A driver assistance system (DAS) may perform activities like relieving the driver of distracting routine activities, warn about upcoming situations, and possibly take control of the car if an accident is imminent. Depending on the task to be performed, a DAS must have appropriate levels of competencies in a number of areas. If we consider the DAS from the perspective of a human co-pilot, it is easier to pick out the important aspects.
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