Deliverable D1.5

Use Cases and Requirements

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Adapt!Ve

Automated Driving Applications and Technologies for Intelligent Vehicles

Document information //

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Summary

This report sets the basis for the development of automated driving applications within AdaptIVe. The purposes of this document are to identify the functions, to describe their behaviour in a set of use cases and to define a first set of requirements.

The first chapter presents a short overview of the state-of-the-art in automated driving, considering market products and recent research activities. This overview is complemented by considerations on key topics, like driver-vehicle integration, evaluation methods and legal aspects. The analysis clearly shows the need for further research in several important areas. Some relevant fields are: sensor strategies, vehicle-to-infrastructure communication, transitions between automation levels, shared driver-system control, driver monitoring, legal issues and new evaluation criteria.

The second chapter highlights the intended levels of automation to be achieved in the project. After a study of different approaches, AdaptIVe decided to endorse the classification of automation levels proposed by SAE. Compared to previous work, the project aims to a further significant move towards higher degrees of automation, offered for different speeds (low, mid, high) and different domains (parking places, cities, highways). Partial, conditional and high automation levels will be confronted.

The following chapter 3 describes the sequence of steps followed in the process of requirement definition. This task starts from an analysis of driving and environmental scenarios, and derives the needed functionalities. These are deployed into detailed use cases, showing the flow of events which represents the interaction between driver and system in several driving situations. The use cases are the groundwork for understanding the system characteristics and for specifying functional and operational requirements.

Chapter 4 illustrates the three scenarios addressed by the project: close distance manoeuvres, urban roads and highways. For each of them, the key challenges to be faced are presented.

The AdaptIVe functions, and their use cases are described in chapter 5. Overall, 30 functions will be developed, implemented in the following demonstrator vehicles: five large passenger cars, a compact car, a city car and a heavy truck. In addition, a test vehicle will be developed to investigate advanced sensor configurations and some close distance manoeuvres. Examples of functions are: park assistant, city cruise, enter or exit a motorway. In the present phase, 23 use cases are defined. Their representation includes primarily a verbal description of the flow of events, a description of possible alternatives, and graphical sequence diagrams, coupled to a sketch of the surrounding traffic situation. Typically, a use case shows how the system and the driver will handle a particular driving task, like e.g. keeping the lane, approaching an intersection or merging into traffic. Details for each use case can be found in the parallel deliverable D3.1 – Use case catalogue.

The next chapter 6 deals with the definition of functional requirements, as a first step towards the system specification and design. First, the report considers some constraints and preferred approaches which can affect the development work, like safety issues and the use of production

vehicles as a development platform. Then, it outlines some naming conventions and terminologies, with the purpose to ensure a common understanding and coordinated approaches. Finally, requirements are given in a tabular form, one per demonstrator vehicle. These requirements are indicated for each function and are categorised into: general, operational, driver-interaction, perception and actuation. For the definition of requirements, key aspects regarding automated driving have been considered, like for instance: automation level, procedures for activation or de-activation, presence of driver monitoring, cooperative functionalities, and cases when a minimum-risk manoeuvre is initiated. Some basic performances of sensors and actuators are also outlined.