
Chapter 12

Cooperative system integration

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12.1 Introduction

Previous researches have dealt with vehicle automation or infrastructure equipment independent of each other. Since communication is able to establish a link between both, it gets more important to discover the potential of the complete system, with a maximum of cooperation between all entities to foster high comfort, safety and environment friendliness. This cooperation can be much more than just providing advices at the infrastructure and letting vehicles follow them. It is about exchanging plans, reacting to each other and finding the optimal solution for all.

While cooperation offers a lot of benefits, the development of such cooperative systems raises the complexity much. Not only the entity's behaviour but also the behaviour of the whole system needs to be developed separately from each other. Key for such developments is a very precise definition of interfaces between the components and the entities. The interdependency of the behaviour is much more critical. As it is not really simple to forecast the result of a given action of one entity to the others (e.g. the effects of one sharp braking of a single car on highways which sometimes is the starting point of shockwaves in the system), testing of such systems is very important. Since testing of vehicle automation functions itself is still a topic under investigation (see e.g. Enable-S3 and Pegasus), it is clear that special system tests including several cars on an intersection need new methods of testing. In this research, the complete system had to be developed within roughly 2 years from getting the idea of having a real prototype on public roads and further putting even more pressure on the development.

This chapter shows how the integration and testing was done, starting from simple simulation runs, doing Hardware-in-the-Loop (HiL) tests, preparing on test tracks with augmented reality and finally testing on the public road. First, the target system is briefly described, followed by the descriptions of the individual

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