

# Ghosthunter III – Detection of Wrong-way Drivers

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## SUMMARY

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Ghost driver detection is one of many safety-of-life application areas where precise and integrity-checked position determination is essential. In the first "Ghosthunter" project, a corresponding investigation based on GNSS and digital road maps was carried out with the aim of defining conditions under which it is possible with today's technology to reliably detect wrong-way drivers on highway exits. The detection should be carried out with the most cost-effective hardware possible. Based on the data of this overall system, a detection algorithm automatically detected and warned of wrong-way drivers. Since map data is an input variable for map-matching, an evaluation of the maps available on the market was carried out at the beginning of the project. With the results, a demonstrator system was further planned to test the quality of the wrong-way driver detection with the individual and cooperative warning based on different scenarios. This demonstrator system was developed in the Ghosthunter II project. Here, the main focus was on porting and optimizing the existing algorithms for ghost driver detection on a commercially available, application-oriented and freely programmable target platform. An Android system on a Xiaomi Mi 8 was selected as the target platform.

Firmly connected with the concept of wrong-way driver detection was also the development and realization of a server system. On the one hand, this is to emulate cooperative warning such as Car2Infrastructure and evaluate it in this context. On the other hand, it enables the storage of raw sensor data, so that later implemented improvements of the system can be explicitly played through in a simulator and quantified evaluated.

In addition to the aforementioned porting of the detection system from the previous project, an

iterative optimization of the algorithms and map data is also taking place. For example, the latest lane-accurate maps (HD –Maps – High definition – Maps) were analyzed and a map-matching algorithm based on them was developed.

Based on the two previous projects, further investigations and adaptations of the software with regard to integrity, also for later operation, are now beginning in a further project.

The goals of the project Ghosthunter III can be summarized as follows:

1. integration of Open Street Map (OSM) as the map basis of the app and adaptation of the map-matching algorithms to it.
2. Investigation and implementation of a positioning method including protection level Calculation in a form that is harmless under licensing law
3. development of a holistic integrity model including models to guarantee but also improve the integrity of the overall system.
4. creation of a certification scheme as well as execution of the prototypical certification with the result of a validation of the procedure carried out by a concrete test and certification with the corresponding prototypical test, inspection and / or audit reports.
5. search of a potential later operator of the system.