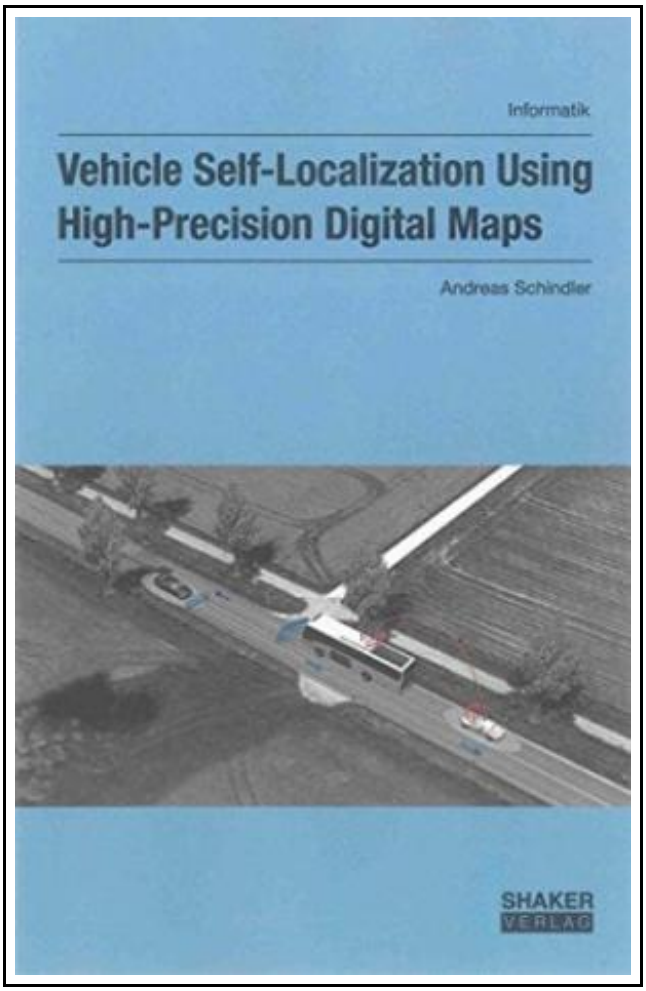
Vehicle Self-Localization Using High-Precision Digital Maps



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(Alec Langosh)

VEHICLE SELF-LOCALIZATION USING HIGH-PRECISION DIGITAL MAPS

Shaker Verlag Nov 2013, 2013. Buch. Book Condition: Neu. Neuware - In recent years, driver assistance systems have contributed significantly to the reduction of traffic accidents and the mitigation of crash consequences. Wireless communication technologies as well as sensor data fusion methods across vehicles enable cooperative assistance functions. However, the consistent integration of environment models and the subsequent interpretation of traffic situations impose high requirements on the self-localization accuracy of vehicles. State of the art technologies are often not effective enough for these purposes or they are too expensive for a series application. This thesis presents methods and models for a landmark-based vehicle self-localization approach. The basic idea is to associate information from the vehicular environment perception with data of a high-precision digital map in order to deduce the vehicle's position. Since no digital map with the required precision and level of detail is available at present, a new concept for the generation of high-precision maps is proposed. The probabilistic self-localization strategy, which fuses data from a video camera, laser scanner, GPS and intrinsic vehicular measurements in a particle filter framework, satisfies the accuracy requirements defined by the applications. It is shown that a global localization accuracy significantly below one meter and an orientation accuracy below one degree can be reached even at a speed up to 100 km/h in real-time using the methods presented. The map model is based on smooth arc splines, which are curves composed by smoothly joint circular arcs and line segments. For any given maximal tolerance, the applied curve approximation method generates a smooth arc spline with a minimum number of segments. These properties are most valuable for digital maps since they imply the checkability of accuracy of map elements as well as the minimization of data volume required for storing the map. Also, the...

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