Reliable Multi-Sensor Fusion for Lane Estimation

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Abstract. Lane estimation is a key issue in the context of automated driving. Since roads are built for visual perception, camera-based approaches (e.g., detected road markings) are a common choice. However, different approaches using other sources (e.g., lidar, radar, digital maps, etc.) are possible and needed in situations with unclear or missing lane markings. Due to various road types (e.g., rural, highway, etc.) and environmental conditions, the sources' reliabilities change. Therefore, no single source can continuously outperform the others. Hence, an appropriate combination of different sources is crucial to obtain correct road estimations under various conditions. In this work, an information fusion concept incorporating reliability for lane detection is indroduced. Using different sensor types, several independent lane hypotheses are exploited. Following, we propose methods for evaluating their reliability, which can be applied to different information sources. Several classification models on recorded sensor data are trained, and the past performance reliability for each source is predicted. These reliabilities are then used to select the group of the most reliable hypotheses. The evaluation on real world data shows that this approach leads to a significant increase in performance compared to a simple average fusion of all sources.

Rudolf Kruse is Professor at the Otto-von-Guericke University of Magdeburg (Germany), where he is a member of the Computational Intelligence Group. His current research interests include data science and intelligent systems. His group is successful in various industrial applications in cooperation with companies such as Volkswagen, Daimler, SAP, and British Telecom. He obtained his Ph.D. and his Habilitation in Mathematics from the Technical University of Braunschweig in 1980 and 1984 respectively. Following a stay at the Fraunhofer Gesellschaft, he joined the Technical University of Braunschweig as a professor of computer science in 1986. In 1996 he joined the Faculty of Computer Science of the Otto-von-Guericke University of Magdeburg in Germany as a full professor of computer science. Since 2017 he has the position of an (active) Emeritus Professor at this faculty.

Rudolf Kruse has coauthored 15 monographs and 25 books as well as more than 370 refereed technical papers in various scientific areas. Among his awards are the 1999 IEEE Transactions on Fuzzy Systems Outstanding Paper Award and the Fuzzy Systems Pioneer Award (2018) from the IEEE Computational Intelligence Society. He is a Fellow of the International Fuzzy Systems Association (IFSA), Fellow of the European Coordinating Committee for Artificial Intelligence (ECCAI) and Fellow of the Institute of Electrical and Electronics Engineers (IEEE).