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Editorial

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Special collection on recent advances in sensor-based smart car technology

In developing an innovative vehicle that is fit for the future, it is necessary to take a holistic approach in order to reconcile various conflicting criteria that are in a complex relationship with each other. The car of the future will be part of an intelligent, self-organizing traffic system and thus itself be an active element in traffic management. In the future, cars will be able to communicate with each other and interact with transport infrastructure. This will not only bring about improved road safety but also open up new possibilities for improving traffic flows and optimizing the use of scarce infrastructure. Safety technology in the car of the future will contribute to the realization of "Vision Zero." This is the name given to a campaign aimed at the complete elimination of road fatalities.

To achieve this goal, various kinds of sensors and communication networks have been widely employed in Smart car system. Moreover, new IT technologies such as human sensors (smart phone sensing), car-equipped vision/voice sensors, and visible light communication (VLC) are being merged to assist a driver safely and gather extensive information from the driving environment. Therefore, integration of Smart car with sensors and its networks is a natural choice and henceforth, the sensor-based Smart car technology is emerging as an important field of research.

This Special Collection solicits high-quality contributions with consolidated and thoroughly evaluated research in the area of algorithms and technologies for human and car-equipped sensor-based Smart car technology. We received many submissions and selected seven papers through strict peer review. Each of the papers was peer-reviewed by at least two experts in the field. In the following, we provide a brief introduction to each paper.

The paper "Highly scalable intelligent sensory application and time domain matrix for safety-critical system design," authored by Taikyeong Ted Jeong, presents a study of intelligent sensory application for the Ethernet-based communication architecture and performance of multi-port configuration which is mainly used in safety-enhanced application such as automotive, military, finance, and aerospace, in other words, safety-critical applications. To analyze the performance of classifiers for driver drowsiness detection, the paper "Performance analysis of K-nearest neighbor, support vector machine, and artificial neural network classifiers for driver drowsiness detection with different road geometries" by Zhenlong Li, Qingzhou Zhang, and Xiaohua Zhao describes comparative experiments of K-nearest neighbor, support vector machine, and artificial neural network classifiers for driver drowsiness detection with different road geometries (straight segments and curve segments) based on a driving simulator. The analysis is based on data obtained from a study that involved 22 subjects in the driving simulator located in the Traffic Research Center, Beijing University of Technology.

In the paper "A new direction-of-arrival estimation method using automotive radar sensor arrays" by Seunghoon Cho, Heemang Song, Kyung-Jin You, and Hyun-Chool Shin, they presents a new signal processing method of estimation of direction of arrival using the phase difference between sensors. The new method predicts the ideal phase value and the phase value of the input signal. Also, the point that minimizes the phase error for every sensor is estimated as direction of arrival.

The paper "Secure protection of video recorder video in smart car," authored by Cheonshik Kim, Dongkyoo Shin, Dongil Shin, and Chin-Nung Yang, proposes a new watermark method to authenticate in-vehicle video. The proposed scheme manipulates the quantization table of the I-frames in car surveillance videos and embeds watermarks in the I-frames. Experimental verification was done to confirm the authentication and tamper detection of the proposed watermark image method for in-vehicle video. To investigate the feasibility of prognostics and health management under different driving circumstances, the paper "An empirical study on real-time data analytics for connected cars: Sensor-based applications for smart

cars" by Jonghyuk Kim, Hyunwoo Hwangbo, and Soyean Kim, conducts a field experiment to understand vehicle maintenance mechanisms of a connected car platform. In particular, they investigate the feasibility of prognostics and health management under different driving circumstances, with varying vehicle models, vehicle conditions, drivers' propensity for speeding, and road conditions.

In the paper "Harmonic clutter recognition and suppression for automotive radar sensors," Jae-Jun Lee et al. propose a novel harmonic clutter recognition and suppression method to overcome the deterioration of a target- or vehicle-detection performance due to harmonic clutters. The proposed method measures the periodicity of harmonic clutters by analyzing the spectral characteristics of the received radar signal with various road conditions. The proposed method can successfully recognize harmonic clutters. Also the paper "Reception power quantization–based emergency message vehicle-to-vehicle multihop broadcast transmission scheme for vehicle accident prevention" by Taejun Lee and Jong-Moon Chung proposes an emergency message reception power quantization–based time-slot broadcast scheme for vehicle-to-vehicle multihop communications. The mathematical and simulation performance analysis demonstrates that the proposed power quantization–based time-slot broadcast protocol can reduce the average time delay when compared to the infrastructure-less framework, binary-partition-assisted broadcast, and the trinary-partitioned black-burst-based broadcast schemes.

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