Rain Classification for Autonomous Vehicle Navigation Using Machine Learning

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ABSTRACT

Autonomous vehicles (AV) has gained popularity in research and development in many countries due to the advancement of sensor technology that is used in the AV system. Despite that, sensing and perceiving in harsh weather conditions has been an issue in this modern sensor technology as it needs the ability to adapt to human behaviour in various situations. This paper aims to classify clear and rainy weather using a physical-based simulator to imitate the real-world environment which consists of roads, vehicles, and buildings. The real-world environment was constructed in a physical-based simulator to publish the data logging and testing using the ROS network. Point cloud data generated from LiDAR with a different frame of different weather are to be coupled with three machine learning models namely Naïve Bayes (NB), Random Forest (RF), and k-Nearest Neighbour (kNN) as classifiers. The preliminary analysis demonstrated that with the proposed methodology, the RF machine learning model attained a test classification accuracy (CA) of 99.9% on the test dataset, followed by kNN with a test CA of 99.4% and NB at 92.4%. Therefore, the proposed strategy has the potential to classify clear and rainy weather that provides objective-based judgement.

KEYWORDS

Rain modelling; Autonomous vehicle; Random forest; K-nearest neighbor; Naïve Bayes; Machine learning

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