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Data Recording for Remote Monitoring of Autonomous Vehicles

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Abstract : Autonomous vehicles offer the possibility of significant benefits to social welfare. However, fully automated cars might not be going to happen in the near further. To speed the adoption of the self-driving technologies, many governments worldwide are passing laws requiring data recorders for the testing of autonomous vehicles. Currently, the self-driving vehicle, (e.g., shuttle bus) has to be monitored from a remote control center. When an autonomous vehicle encounters an unexpected driving environment, such as road construction or an obstruction, it should request assistance from a remote operator. Nevertheless, large amounts of data, including images, radar and lidar data, etc., have to be transmitted from the vehicle to the remote center. Therefore, this paper proposes a data compression method of in-vehicle networks for remote monitoring of autonomous vehicles. Firstly, the time-series data are rearranged into a multi-dimensional signal space. Upon the arrival, for controller area networks (CAN), the new data are mapped onto a time-data two-dimensional space associated with the specific CAN identity. Secondly, the data are sampled based on differential sampling. Finally, the whole set of data are encoded using existing algorithms such as Huffman, arithmetic and codebook encoding methods. To evaluate system performance, the proposed method was deployed on an in-house built autonomous vehicle. The testing results show that the amount of data can be reduced as much as 1/7 compared to the raw data.

Keywords : autonomous vehicle, data compression, remote monitoring, controller area networks (CAN), Lidar
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