Modelling and Performance Analysis of a New Time-Triggered CAN FD Protocol for Real-time Distributed Control Systems

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Abstract

Controller Area Network (CAN) is a widely accepted and implemented real-time communication bus in automotive and industrial applications. The CAN protocol applies a priority based medium access method which provides fast access to the bus for the highest priority messages. However, lower priority messages may face extensive access delays especially under heavy bus load and low transmission bit-rate conditions. As a solution, the CAN with flexible data-rate (CAN FD) protocol provides higher transmission speeds. However, it still applies the same medium access method as the traditional CAN protocol. The application of time-triggered access feature of TTCAN with the fast transmission feature of CAN FD results in the Time-Triggered CAN FD (TTCAN FD) protocol. As the main contribution of the study, this paper introduces a new method by modifying the periodic CAN FD frames to achieve higher transmission bit-rates with the arbitration-free feature of the time-triggered access. The simulation results show that the new method with time-triggered access provides considerable performance improvements compared to existing approaches.
References


Index Terms

Computer Science  Distributed Systems

Keywords

Controller Area Network, Autobus, CAN FD, Real-time.