

Design and Implementation of a Vehicular Controller Area Network Bus System
with an Application of Active Noise Control for Engine Exhaust System

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Abstract

This paper describes the design of a vehicular controller area network (CAN) bus system with an application of active noise control (ANC) for engine exhaust systems. The work includes two parts: the first part is the design and implementation of a CAN bus platform system; the second is an application of ANC to an engine exhaust system which utilizes the CAN network implementation. The proposed ANC uses the adaptive control algorithm with engine speed as a reference. Most of the conventional methods for ANC involve primarily an adaptive filter with the least-mean-square (LMS) error algorithm. Unfortunately, convergence speed is often limited when a sound source or a filtering plant varies, because the learning process of the adaptive algorithm fails to respond quickly to the changing operational conditions. In this study, a variable step-size affine-projection algorithm (VSS-APA) is proposed. The proposed VSS-APA filtering algorithm is a combination of the variable step-size convergence algorithm and the affine-projection algorithm (APA). The controller is implemented on the proposed CAN bus system. Experiments are carried out to evaluate the noise attenuation performance at various engine speeds. The experimental results indicated that the ANC system achieved the noise attenuation in an engine exhaust system by using the proposed CAN bus system.