Research and Application of a Dual-controller Strategy on CAN Bus Scheduling

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ABSTRACT

Controller area network (CAN) is a common-bus network structure with many desirable properties for embedded and real-time systems. It is a priority-based mechanism where collisions are avoided by using priorities for bus arbitration. However, the sharing of communication bandwidth compels devices to wait for some amount of time before they can send out messages. This will induce unavoidable data latency and might degrade the system performance dramatically. In order to satisfy timeliness of messages and improve system ’ s flexibility in CAN, a controller-plant model was proposed in [1] to dispatch CAN messages in a dynamic scheduling strategy. In this method, a message scheduling controller (MSC) was designed and realized by radial basis function networks (RBFN). In most of the case, timeliness of messages can be guaranteed. However, the problem of transient responses always exist whenever the structure of RBFN changes. This is mainly due to the ineffective initialization for the newly added radial basis function. To overcome this problem, the Minimal Resource Allocation algorithm is utilized to initialize the network more efficiently. Regrettably, the MSC modifies their parameters or topology only after time constrained can ’ t be guaranteed. In this research, we propose a dual-controller strategy, which integrates bandwidth allocation controller (BAC) with message scheduling controller. The BAC can allocate bandwidth for different types of messages in response to the network traffic. The experimental results clearly show the effectiveness of the proposed dual-controller technique in solving the message scheduling problems in CAN.

Keywords : Controller area network ; Message Scheduling Controller ; Minimal Resource Allocation ; Bandwidth Allocation Controller

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