A 3-hop topology and its application to in-vehicle WSNs

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Abstract

In [1], a 2-hop topology for in-vehicle wireless sensor networks (WSNs) has been proposed. The 2-hop topology in [1] is only suitable for in-vehicle WSNs with about 30 sensor nodes (SNs) and both of its minimum and average link qualities are low. In this paper, we propose a 3-hop topology. Our 3-hop topology is suitable for in-vehicle WSNs with about 100 SNs, which is the number of SNs in nowadays in-vehicle WSNs. We use the max-min concept and the clustering tree technique to achieve high link qualities for all transmission edges. We also use time-slotted channel hopping (TSCH) scheduling algorithm to schedule the transmission edges while minimizing the latency. Simulation results show that our 3-hop topology is as good as 2-hop topology when end-to-end (E2E) latency is considered. Moreover, our 3-hop topology outperforms the 2-hop topology when data-delivery ratio (DDR) is considered. Simulation results also show that our 3-hop topology is more suitable when the platform size increases. (This is a joint work with Reun Guan Goh.)

[1] R. Tavakoli, M. Nabi, T. Basten, and K. Goossens, Topology management and TSCH scheduling for low-latency convergecast in in-vehicle WSNs, IEEE Transactions on Industrial Informatics, vol. 15, no. 2, pp. 1082–1093, 2019.

Keywords: Wireless sensor network (WSN), in-vehicle network, topology management, link quality, time-slotted channel hopping (TSCH), scheduling, latency.

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