New method: More timely and reliable transmission of wireless sensor networks

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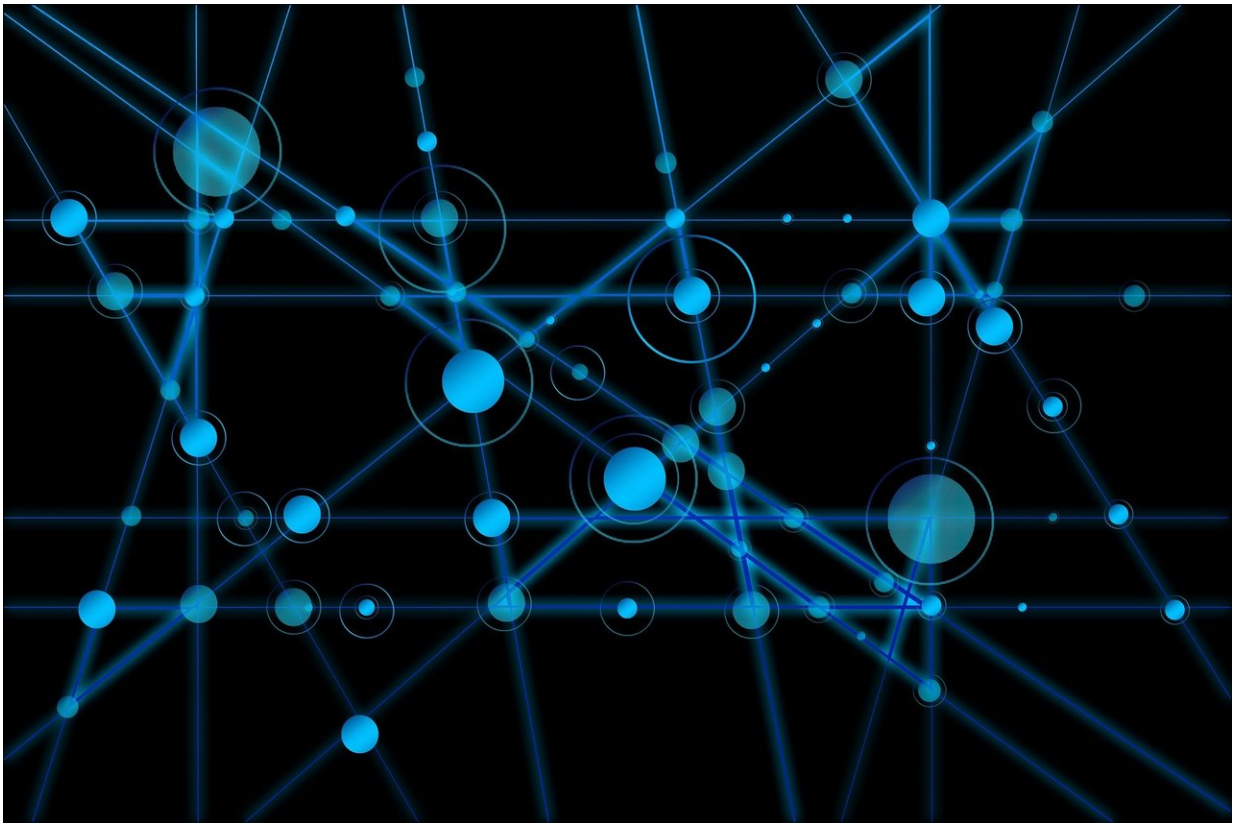

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Since sensor nodes in wireless sensor networks (WSNs) are cheap and powered by batteries, their capabilities in communication and energy supply are relatively weak and limited. The deployment of relay nodes in

constructing robust network topology can significantly enhance connectivity and reduce energy consumption of WSNs.

However, relay nodes are usually very expensive, thus conventional placement methods only optimize the deployment cost subject to the connectivity constraint. With a mounting of WSNs application in the field of industrial automation and smart grid, timeliness and reliability must be considered.

A research group led by Prof. LIANG Wei and Prof. ZHENG Meng from Shenyang Institute of Automation (SIA) of the Chinese Academy of Sciences proposed a novel relay node placement method for WSNs which serves as a solid foundation to guarantee the real-time and reliable transmission of WSNs. They proposed for the first time a relay deployment method for WSNs in practical environment. This study was published on IEEE Transactions on Mobile Computing.

In this study, the large-scale relay deployment problems are decomposed into sub-problems by levels, and shortest path tree is employed to eliminate the deployment locations that cannot fulfill the timeliness constraint. In doing so, the deployment in each level is reformulated as an unconstrained set covering problem.

Based on extensive experiments in practical environment, the researchers then proposed a relay location adjustment (RLA) algorithm that can adjust relay location according to link reliability measurements. By combining RLA and a classical set covering algorithm, the proposed method yields obvious performance advantage in terms of timeliness, reliability and deployment cost over conventional methods.

Over the past few years, SIA has made significant progress in the research on industrial wireless networks, including network deployment, reliable networking methods, resource allocation, heterogeneous wireless

coexistence, and analysis and modeling of international standards.

More information: Wei Liang et al. Relay Node Placement in Wireless Sensor Networks: from Theory to Practice, *IEEE Transactions on Mobile Computing* (2019). DOI: 10.1109/TMC.2019.2962674