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CHAOS SYNCHRONIZATION-BASED DATA TRANSMISSION SCHEME IN MULTIPLE SINK WIRELESS SENSOR NETWORKS

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Abstract. *This paper studies chaos synchronization-based data transmission scheme in multiple sink wireless sensor networks. In the proposed scheme, each wireless sensor node has a simple chaotic oscillator. The oscillators generate impulsive signals with chaotic interspike intervals, and are impulsively coupled by the signals via wireless communication. Each wireless sensor node transmits and receives sensor information only in the timing of the couplings. The proposed scheme can exhibit various synchronization and quasi-synchronization of chaos, and can effectively gather sensor information with low energy consumption. Also, the proposed scheme can flexibly adapt various wireless sensor networks not only with a single sink node but also with multiple sink nodes. We evaluate the proposed scheme using computer simulations. Through simulation experiments, we show effectiveness of the proposed scheme and discuss its development potential.*
Keywords: Wireless sensor networks, Data gathering, Chaos, Synchronization, Pulse-coupled neural networks

1. **Introduction.** Wireless sensor networks (WSNs) have attracted a significant amount of interest from many researchers because they have great potential as a means of obtaining information of various environments remotely. WSNs have a wide range of applications, such as natural environmental monitoring in forest regions and environmental control in office buildings. In WSNs, hundreds or thousands of micro-sensor nodes with such resource limitation as battery capacity, memory, CPU and communication capacity are deployed without control in a region and used to monitor and gather sensor information of environments. Therefore, scalable and efficient network control and/or data gathering scheme for saving energy consumption of each sensor node is needed to prolong WSN lifetime. The sensor-to-sensor authenticated path-key establishment scheme [1] and the GA-based key-management scheme [2] can realize efficient secure communication in WSNs, considering WSN lifetime. The sink node allocation scheme [3,4] can find effective sink node allocation patterns to reduce total hop counts of all wireless sensor nodes, by using a particle swarm optimization which is a kind of meta-heuristics algorithms. As a result, this scheme can prolong WSN lifetime. Ant-based algorithms [5-8] have attracted attention as routing algorithms for energy consumption savings because they are more scalable, efficient and robust than other conventional routing algorithms [9-12]. [13,14], which are composed of cluster-based mechanisms, are energy-efficient data gathering scheme. However, these routing algorithms are not applicable when network topology changes.

On the other hand, there has been a synchronization-based data gathering scheme (SDGS) that synchronizes wireless sensor nodes in the timing of gathering sensor information and that transmits sensor information of each wireless sensor node to sink nodes.