Optimization Scheme for Power Transmission in Wireless Sensor Network

Publisher: IEEE

Anshul Kumar Yadav ; Akshita Sharma ; Anurag Yadav ; Ankit Vijayvargiya ; Aakash Saxena ; Rajesh Kumar **All Authors**

Abstract:
Wireless Sensor Networks (WSNs) are networks of sensors that can sense a dynamic process and send the measured data over a common channel to a central base station. As th... **View more**

Metadata

Abstract:
Wireless Sensor Networks (WSNs) are networks of sensors that can sense a dynamic process and send the measured data over a common channel to a central base station. As the number of devices increases exponentially, the energy efficiency of WSN clusters needs to be considered. The transmission power refers to the total allowable output power of the sensors to send information packets. Consider the power transmission problem for a fully connected cluster, with the goal of finding the minimum transmission power for each node in a given cluster without disrupting the network. In order to obtain a more effective optimal solution for the mentioned problem, ten different cases are studied using five optimization algorithms. The optimization algorithm is repeatedly tested to find the global minima of the fitness function. The study emphasises that the artificial ecosystem optimizer is the best fit for the mentioned model in all 10 cases. The average energy saved in transmission by the best performing algorithm is about 6.4 dBm.

Published in: 2023 International Conference on Power, Instrumentation, Energy and Control (PIECON)

Date of Conference: 10-12 February 2023

DOI: 10.1109/PIECON56912.2023.10085758

Date Added to IEEE *Xplore*: 04 April 2023

Publisher: IEEE

ISBN Information:

Conference Location: Aligarh, India

Contents

The ability to interact with an environment makes wireless sensor networks (WSNs) distinct from wired networks. Contrary to conventionally networked systems, WSNs are a new kind of real-time embedded systems with diverse communication requirements. It is demarcated as an auto-configured, foundation-less wireless network that inspects the environmental and physical conditions [1]. Data aggregation techniques are employed in WSNs to gather the sensor node-generated data sample at the sink through multiple cluster heads. To make an interface between the network and the user, the sink comes in handy for data analysis. A sink is a massive information centre from which required data or data-related information, such as hop numbers, can be traced. An astronomical number of sensor nodes can be present in clustered WSNs. Sensor nodes are fabricated with computing and sensing devices and power components. Sensor nodes use radio signals to communicate with each other. WSN has gained attention in many domains that include military, transport, health, agriculture, industry, and the environment [2]. The term “Internet of Things” (IoT) refers to any device linked to the internet. These connected gadgets can control or gather data regarding the tasks assigned. Sensors and actuators frequently exchange data using the same Internet Protocol (IP) that connects the internet. For the purpose of continuous monitoring and data accumulation, IoT sensors and actuators are deployed into various objects or locations. All devices are interconnected and “speak” with one another, from one’s home to the entire city. As a result of this interconnection, a highly connected environment is created that will aid in better planning and adaptation by the gadgets that surround us. The recent advancements in the IoT field will make our lives more comfortable. IoT, considered only a concept a few years ago, has quickly evolved into a practical application that already has an impact in the present scenario. IoT has a broader use than just homes and cities, including consumer equipment, supply chain management, inventory tracking, production, and food supply chain management [3]. The main limitation in the research progress of WSNs is their limited energy capacity. The field of research on the energy savings of a fully connected cluster network is more than a decade old. Different methods have been proposed to improve energy efficiency. Sensor nodes are still evolving and maturing by acquiring new technology, so a lot of research is required in this field. The primary causes of energy waste are packet overhead, idle listening, overhearing, over-emitting, collisions, and state transitions [4]. Duc Chinh Hoang [5] presented a framework to use Harmony Search Algorithm for construction of centralised cluster-based protocol to save energy by reducing distances within a cluster, between its members and its cluster heads (CHs). In another research by Duc Chinh Hoang [6] utilized Fuzzy C-means (FCM) to obtain better energy efficient routing than K-Means clustering. Similar way, FCM was used to balance energy usage of each sensor nodes within each cluster [7]. Sandeep [8] proposed the use of hybrid algorithm containing particle swarm optimization and K-Means algorithm for data clustering. The hybrid algorithm was able to provide better solution by overcome local minima, improving clustering of the network.

Authors
Figures
References
Citations
Keywords
Metrics

More Like This

A Survey on Clustering Algorithms in Wireless Sensor Networks: Challenges, Research, and Trends
2020 International Computer Symposium (ICS)
Published: 2020

Inductive power transmission for wireless sensor networks supply

2014 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems Proceedings
Published: 2014

Show More