International Journal of Information Security and Privacy
Volume 17 • Issue 1

Energy, Reliability, and Trust-Based Security Framework for Clustering-Based Routing Model in WSN

Mallanagouda Biradar, Department of Computer Science & Engineering, Kalaburagi, Sharnbasva University, India*
Basavaraj Mathapathi, Sharnbasva University, India

ABSTRACT

Currently, analysts in a variety of countries have developed various protocols for WSN clustering. Among them, the significant one is LEACH (low-energy adaptive cluster hierarchical) that accomplishes the objective of energy balancing by occasionally varying the CHs in the region. Nevertheless, since it implements a random number method, the appropriateness of the CH is full of suspicions. As a result, this work intends to discover the optimal cluster head selection (CHS) model for maximizing energy aware and secured routing in WSN. Here, optimal CH is chosen based upon constraints such as "trust evaluation (direct and indirect trust), distance, security (risk level evaluation), distance, energy and delay". In addition, the routing model considers the path quality determination of cluster (reliability). For choosing the best CH in WSN, slime wrap food update with cat and mouse optimization (SWFU-CMO) is deployed. Finally, the simulated outcomes verify the efficacy of presented approach related to residual energy, throughput, delay, etc.

KEYWORDS

Cluster Head, Path quality, Security, Trust, WSN clustering

1. INTRODUCTION

A WSN contains varied sensors linked to the wireless medium. In WSN, the sensed data from SNs is typically forwarded to the BS, in which it is composed, evaluated, and specific actions are taken (Alagumuthukrishnan & Geetha, 2016; Yuvaraja & Sabrigiriraj, 2016; Ni et al. 2017). The WSN is used in a wide range of appliances, including meteorological data collection, weather forecasting and field observation, transportation, as well as health-care (Kang & Nguyen, 2012; Leu et al. 2015; Ajay & Verma, 2020). Even so, the SNs in WSN lack a rechargeable storage device as well as the capacity of researchable batteries. As a result, it is difficult to support any system with proficient power consumption (Wang et al. 2017; Kumar et al. 2018; Jia et al. 2016).

Clustering is a popular technique for making data transmission more efficient in terms of energy and power consumption (Mehra et al. 2018). Every cluster in the network has its own CH that is

DOI: 10.4018/IJISP.315817 *Corresponding Author

responsible for communicating information to the other SN in its cluster. The main task in such scenarios is to determine the optimal CH under a variety of constraints such as less energy utilization, delay, and so on (Al-Sodairi and Ouni, 2018; Nigam and Dabas, 2018; Priyadarshini and Sivakumar, 2018; Bhardwajm and Kumar, 2019). Thus, by forming clusters using data fusion and aggregation systems, there is EE in the network because the amount of data conveyed to BS is significantly reduced (Mahajan et al. 2014; Muthukumaran et al. 2018; Ni et al. 2017).

As a result, cluster-oriented schemes were also involved in extending network lifetime (Darabkh et al. 2019; Kannan & Raja, 2015; Mann & Singh, 2017). Furthermore, "APTEEN, TEEN, LEACH, PEGASIS, and FCM" are the most commonly used schemes (Kaur & Mahajan, 2018; Tianshu et al. 2018; Bhardwajm & Kumar, 2019; Dehghani et al. 2021). So far, a set of centralized cluster-oriented schemes based on meta-heuristic algorithms has been established. PSO, HSA, and other general algorithms are examples. However, the most demanding factors in modeling the routing protocol are EE, QoS, and network lifetime (Li et al. 2020).

Main contribution of the research study;

- Introduces optimal CHS approach via concerning distance, trust, delay, path quality, energy as well as security.
- Establishes SWFU-CMO algorithm for electing the optimal clusters in WSN.

Organization of the study: Section 2 reviews the related studies. Section 3 represents network architecture. Section 4 discusses the varied constraints considered for optimal selection of cluster heads. Section 5 portrays the suggested SWFU-CMO approach. Section 6 presents the outcomes as well as the study is ends in section 7.

2. LITERATURE REVIEW

In Daneshvar et al. (2019) introduced a novel clustering work with finest CHS through taking into account of 4 chief criterions like security, energy, distance, and delay. Furthermore, a novel approach known as FPU-DA is established to choosing the best CH. At last, the efficiency of developed approach was proven in terms of various measures.

In Ajay and Verma, (2020) proposed a DMEERP for balancing the energy utilization as well as path reliability ratio. The path reliability ratio was estimated in order to route the packets rapidly as well as without packet loss. Lastly the improvements in overhead, energy utilization, and so on were demonstrated.

In Bhardwajm and Kumar (2019) modeled a multi objective scheme as well as a developed MOFPL. This scheme selected the best CH from a large number of CH in WSN. Following that, the optimal routing path was established using the utilized multi objective functions. The adopted scheme resulted in best CHS with greater EE.

In Augustine and Ananth (2020) provided a more advantageous plan for CHS employing Taylor KFCM. The "acceptability factor" was determined through energy, distance, and trust, to select the best CH. The effectiveness of this model has been validated in terms of greater energy and trust.

Toenhance EE and lower the cost function, Goswami et al. (2019) developed a cluster formation strategy in the OWSN using the FF as well as the HML technique. The final results have demonstrated that this work was better in terms of EE and cost function.

In Toor and Jain, (2019) deployed MEACBM routing model. The CHs were determined to be the best options based on the updated probability calculation; usually, the SNs were selected as CHs due to their more energy than other SNs. In terms of many measures, the outcomes demonstrated improvements over the existing system.

In Alghamdi, (2020) provided a clustering method that selected CHs using GWO. On the basis of the expected energy utilization as well as the amount of energy left in each node, the solutions were