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Energy Efficient Clustering using Modified Multi-Hop Clustering

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ABSTRACT

In recent years, WSN has been widely used for building the decision support system (DSS) for solving the real-world problem. Moreover, out of several fields, one of the interesting fields that requires DSS is the monitoring of agriculture environment. Nowadays, monitoring an agricultural environment has become one of the essential fields. IoT has been one of the eminent technologies in recent years and WSN model has played the parallel role into it. These sensors have a limited power supply and this affects the efficiency of the algorithm. In the past, several methods have been proposed for efficient clustering, however, these methods fail to provide satisfactory accuracy. Hence, this article proposes an energy efficient methodology named modified multi-hop clustering (MMHC). This methodology takes three steps. The first step is assembling the nodes where the nodes are assembled, the second step couples the nodes, and the third step detects the redundant nodes and discard them. The main advantage of MMHC is that it can select multiple redundant nodes at one time and discard, and this makes the algorithm more fast and efficient. Moreover, in order to evaluate the algorithm several parameters have been considered, such as energy consumption, number of failed nodes, number of active nodes, and communication overhead.

KEYWORDS

Clustering, MMHC, Shared Algorithm, Wireless Networks

1 INTRODUCTION

India has been always considered as the agricultural-oriented country;70% of people in India is independent on the agriculture. Moreover, in recent days various technology is adopted for farming and efficient agriculture environment, these technologies focus on the collecting the environmental factor data and this helps in reducing the manual work (Fernando et al., 2016).

In recent years, the term IoT has been widely popular in the network technology, IoT is a technology that helps in integrating the things and network to connect, interact and exchange the data as well. IoT helps in extending the internet connectivity that exist beyond the SD (Standard Devices) such as tablets, smartphones laptops etc. When embedded with the IOT technology these standard devices can easily interact and communicate over the internet hence in terms it can also be controlled as well as Monitored (Prathibha et al., 2017). Meanwhile, IoT has played one of the prominent roles in agriculture in order to empower farmers, this is done by using the automation technologies and decision tools (Lazarescu 2013; Nukala et al., 2016). Recent studies in IoT has more focused on the constraints as well as challenges for the large-scale pilots in given agriculture and

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food sector, other issued that are discussed such as data governance, privacy and security. However, the communication technology was only limited to the conventional method that applies the low bit range communication technologies.

Figure 1 depicts a typical diagram of IoT. At first the given WSN senses the data and sensed data is sent to the BS (Base Station or Sink). Later the data is sent to the IoT Cloud and whenever the user requests the data is retrieved or it can be retrieved by using the automate application.

In recent years WSN (Wireless Sensor Network) is widely used for the food production and smart agriculture with more focused on the precision agriculture, environmental monitoring (Quesada et al., 2014). Main properties of WSN is that it is self-configure, self-diagnosis self -heal and self-organize, this properties of WSN has made it obvious for the food industry and smart agriculture. In generals WSNs are nothing but the integration of power sources, microcontrollers, sensors, and RFT (Radio Frequency Transceiver). Moreover, IOT is capable of integrating several technologies such as RFI (Radio Frequency Identification), WSN, Cloud Computing, middleware system.

Moreover, sensor network is used for the various applications and day by day, the implementation in the agricultural environment has been increased. In agriculture, the main application is to monitor the crops in order to detect the environmental conditions; this plays an essential role in cultivation (Kassim & Harun 2016). Wireless sensing network helps in reducing the data collection and the time required to monitor the agriculture environment.

However, there are few constraints in applying the IoT –WSN based technology in the agriculture field, constraints such as battery of the WSN has the limited amount of energy and it has huge impact on the WSN lifetime. Apart from battery life, several constraints such as communication range, Communication bandwidth, and this issue can be solved using the clustering process. Clustering is the process of gathering the several nodes to the clusters and these clusters have cluster head, the clustering method is used in wireless sensing network in order to utilize the energy. Several clustering algorithms have been proposed in order to provide an efficient model.

Hence, the basic as well as critical challenge in WSN is to design and develop the energy efficient model that can be efficient as well as cost effective (Naruephiphat & Charnsripinyo 2009). In order to achieve the efficient model several protocol, which is discussed in the next section, is proposed. However, these protocols lack the efficiency. In this paper we have proposed an energy efficient

Figure 1. Typical IoT architecture