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A HYBRIDFITNESS-BASED ROUTING AND ENERGY CONSERVATION TECHNIQUE FOR WSN

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Abstract

Biological systems present remarkable adaptation, reliability, and robustness in various environments, even under hostility. Most of them are controlled by the individuals in a distributed and self-organized way. These biological mechanisms provide useful resources for designing the dynamical and adaptive routing schemes of wireless mobile sensor networks, in which the individual nodes should ideally operate without central control. Many energy-efficient routing algorithms were inspired by the development of Ant Colony Optimization (ACO). However, due to the inborn defects, ACO-based routing algorithms have a slow convergence behavior and are prone to premature, stagnation phenomenon, which hinders further route discovery, especially in a large-scale network. This proposal proposes a hybrid routing algorithm by combining the Artificial Fish Swarm Algorithm (AFSA) and ACO to address these issues. We utilize AFSA to perform the initial route discovery in order to find feasible routes quickly. In the route discovery algorithm, we present a hybrid algorithm by combining the crowd factor in AFSA and the pseudo-random route select strategy in ACO. Furthermore, this proposal presents an improved pheromone update method by considering energy levels and path length.

Introduction

Diabetic retinopathy (DR) is an eye disease that is caused due to high sugar level or diabetics. DR affects retina and leads to sight loss or vision loss. DR blocks the blood vessels that carry blood to retina that cause damages to diabetic's patients. DR detection process is complication task to perform in an application. Image segmentation is a process that segments the digital images into multiple images. Image segmentation is also known as image objects or an

image region that is mainly used for detection and recognition process. Image segmentation is used in DR detection process that increases accuracy rate in detection process. Contrast limited adaptive histogram equalization (CLAHE) method is used in DR detection process. CLAHE is mainly used to reduce the unnecessary region rates from an image that reduces the time consumption rate of detection process. CLAHE increases the accuracy rate in detection process that provide necessary information for diagnosis process. Convolutional neural network (CNN) algorithm is also used in DR detection process that implements image segmentation process. Feature extraction method is used in CNN that identifies the important features that are extracted from image segmentation process.

Machine learning (ML) techniques are widely used in various applications for detection and recognition process. ML techniques maximize the accuracy rate in detection process that enhance the efficiency and feasibility of the system. ML techniques are commonly used of diabetic retinopathy (DR) detection and segmentation process. Artificial neural network (ANN) algorithm is mostly used for DR image segmentation process. ANN reduces the complexity and error rate in detection process that improves the effectiveness of the DR detection process. Classification and optimization methods are used in ANN to find out the important and actual regions from given set of images. Classification process classifies the data based on certain set of features and patterns. Support vector machine (SVM) approach is also used in segmentation processes that find out the exact segments of an image. DR detection need appropriate details about certain things such as symptoms, conditions and medications. SVM reduce error rate in identification process that maximizes the accuracy rate in DR detection process.

Related Works

Ma et al. [6] introduced an energy-saving clustering protocol using Voronoi adaptive clustering (ESCVAD) technique for wireless sensor network (WSN). Adaptive clustering algorithm is used in ESCVAD to perform optimization process. The proposed method reduces clustering frequency that minimizes the time consumption rate of the system. The proposed ESCVAD method reduces energy consumption rate in computation process that enhance the performance of the WSN system.

Xu et al. [7] proposed an energy-efficient region source routing (ER-SR) protocol for

wireless sensor network (WSN). Energy region algorithm is used in ER-SR that identifies high residual energy consumption nodes in WSN system. Colony optimization algorithm is also used here to reduce the energy consumption rate in wireless sensor nodes. ER-SR find out the actual nodes and produce feasible set of data for further process. The proposed ER-SR method achieves high feasibility and efficiency rate of the system.

El-Fouly et al. [8] introduced an energy efficient environment-aware fusion-based routing protocol (E3AF) for wireless sensor network (WSN). Fusion-based algorithm eliminates unwanted errors and problems that are presented in optimization process. E3AF protocol plays a major role in improving performance and feasibility of WSN system. The proposed method maximizes the effectiveness and efficiency of the system. Experimental results show that the proposed E3AF protocol reduces both time and energy consumption rate of WSN system.

Elsmany et al. [9] proposed a new routing algorithm for wireless sensor network (WSN), named an energy efficiency scalable routing algorithm (EESRA). Low energy adaptive clustering hierarchy is used in EESRA to reduce the cluster heads that are presented in computation process. Cluster heads identifies the exact features and patters of nodes that provide actual information for computation process. The proposed EESRA protocol reduces the energy consumption rate that maximizes the efficiency of the system.

Mohamed et al. [10] introduced a collaborative distributed antenna (CDA) routing protocol for wireless sensor network (WSN). The proposed protocol is mainly used to improve the energy efficient rate of the system that provides necessary services to the users. Dree constrained tree (DCT) algorithm is used in CDA that identify the degrees of nodes and produce optimal set of data for further process. The proposed CDA protocol achieves high lifetime and efficiency rate by reducing the energy consumption rate in computation process.

Proposed Scheme

Distributed Energy-efficiency usingAnt Colony Optimization (ACO) and Swarm Optimization Process

The design goal of distributed energy efficiency is observed from open environment through wireless sensors is to improve energy conservation.The energy availability and requirement is identified using ACO and SWARM processat different time intervals in open

infrastructures. The energy conservation identification of the WSN observation for energy availability and its requirements analysisdepends on the energy distribution intervals serving the input for making a decision. In this proposed work, the open environment sensing through WSN of the different applications observing energy efficiency and conservation are considered to improve the energy utilization. With the balance in energy availability and requirements for the aforementioned processes observingfailures, controlling energy utilization, decision rate and delays are unavailable.

The Flow process for the proposed method is presented in Fig. 1

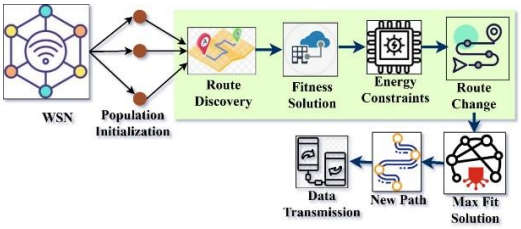

Fig. 1 Proposed Method Process Flow

The Wireless Sensor Network (WSN) contains lots of sensor networks, which are distinguished in the openenvironment to sense, estimate, receive and transmit data through sensor networks. These sensor networks are inexpensive and high capacity in sensing, processing, and transmitting energy. WSN is used in several real-time applications like transportation, weather forecasting, agriculture, medical field and other various industrial and commercial applications. The sensors are compact and useenergy availability and requirements as their power source based on energy utilization and distribution. The sensor collects data using the previous knowledge transfer and it processes the energy distribution for generating the power and transmitting to the main location that is called as Base Station (BS). At Base Station, the received energies are analyzed to make decision for transmitting energy to the various applications. The sensor networksbased on energy efficiency,it is an iterative process of transmit energy to other transmitting lines until identify any errors. However, to retain the energy efficiency from the WSN, the proposed work provides energy availability and requirements for environment sensing. The energy observed from the open environment through WSN is observed and stored in knowledge base. Open environment observation for various real-time applications through energy availability and requirement are administered to prevent errors and failures in further conditions.

Let $\{1,2,3,\dots,e\} \in E$ represent the sequence of energy efficiency observation at different time intervals $Er \in Er^{SN}$ where f^{SN} is the error occurrence addressed in wireless sensing networks, respectively. For fluctuating time instances of open environment sensing

observation OP_S, and the energy distributionE_D must be less under observed energyfor further conditions,error is addressed in sensed networks that is given as

$$\forall\,(Er^{SN}), argmin\ \sum_{t=1}^{Er}(OP_S - E_D)_t, Er \in [Er^{SN}+1] \quad (1)$$

Therefore,

$$argmin\ \sum_{t=1}^{E_D}\left(e_{Eff}\right)_t, \forall\,\{1,2,3,\dots,e\} \in E, Er \le Er^{SN} \quad (2)$$

From the equation (1) and (2), the variable t and e_{Eff} represents the energy efficiency observation at different time instance. Then the condition $(OP_S - E_D)$ in the energy distribution output based on different energy transmissionintervals $Er \in [Er^{SN}+1]$. This improves the energy conservation and availability, reducing the errors and delaysingenerating, processing and transmitting the energy.

Flow Chart for Proposed Hybrid Method Represented in Fig. 2

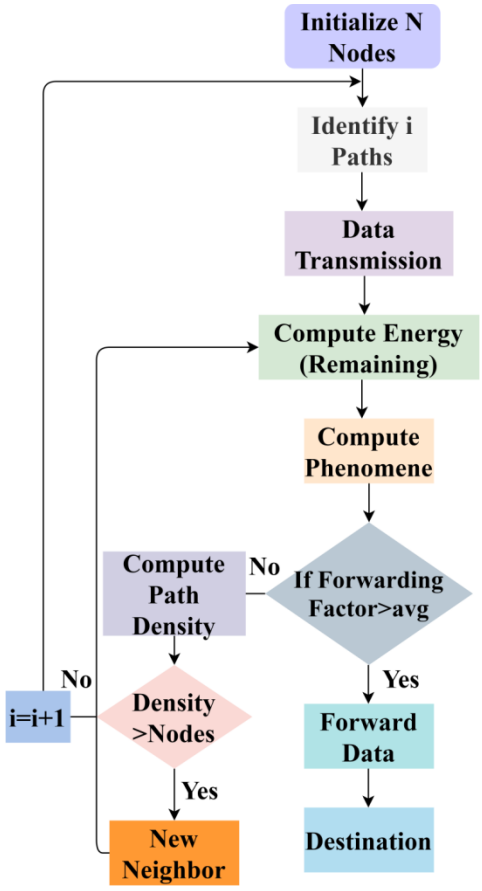

Fig. 2 Hybrid Representation

This ACO and Swarm process is used for updating the energy efficiency based on availability and requirements for preventing an unnecessary failure and energy distribution in open environment. From the above condition, the WSN sensing environment based energy distribution overflows the available energy *e* and thus requiring errors and failures. However, this error does not transmit the available energy requirements to the Base Station.Therefore, a new energy transmission is defined. The new energy transmission admitting knowledge base through

WSN must satisfy the condition $Er \leq Er^{SN}$ to prevent additional energy distribution. The considering factor (C_F) is computed for this$Er \leq Er^{SN}$condition based on energy utilization and availability is estimated as

$$E^a = \left(1 - \frac{Er^{SN}}{t}\right) + \left(\frac{OP_S}{E_D}\right) - \left(\frac{e_{Eff}}{S}\right)$$

(3)

Where,

$$E^u = \left(1 - \frac{e_{Eff}}{E^a}\right) + \left(\frac{OP_S}{E_D + S + 1 - 4}\right) (4)$$

The considering factor updates energy availability and utilization at varioustime intervals. In the last estimation ofE^u, if the condition $E_D + S + 1$ is continuously validates the energy distribution and efficiency in WSN and identifies exceeding Er, then the chances of energy distribution is observed.Therefore, the energy transmission from one terminal to other is observed fromopen environment through wireless sensor networks to updating sequences for distributing energy in the real-time applications.

Conclusion

Biological systems demonstrate excellent adaptability, reliability and resilience in a wide range of environments, even under adverse conditions. Most of them are distributed independently and controlled by individuals. These biological mechanisms provide a valuable resource for developing dynamic and adaptive routing schemes for wireless cellular sensor networks, in which individual nodes ideally operate without centralized control. Many energy efficient routing algorithms are based on the development of Ant Colony Optimization (ACO). However, due to inherent flaws, ACO-based routing algorithms converge slowly and are prone to premature congestion, which hiders further route discovery, especially on large networks. To solve this problem, this proposal proposes a hybrid routing algorithm combining AFSA (artificial fish algorithm) and ACO. Perform an initial route search to quickly find available routes using AFSA. In the path discovery algorithm, we present a hybrid algorithm that combines the AFSA crowd factor and the ACO pseudo-random path selection strategy. In addition, this proposal presents an improved method for regenerating pheromones, taking into account energy levels and path length.

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