AVIS DE SOUTENANCE DE THESE

Le Doyen de la Faculté des Sciences Dhar El Mahraz –Fès – annonce que

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Soutiendra : **le Samedi 18/02/2023** à **10H00**
*Lieu : **FSDM – Centre Visioconférence***

Une thèse intitulée :
Adaptive Models for Search and Selection in the Iot Constrained Node Networks Using Clustering Techniques

*En vue d'obtenir le **Doctorat***
*FD : **Sciences et Technologies de l'Information et de la Communication***
*Spécialité : **Informatique***

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ADAPTIVE MODELS FOR SEARCH AND SELECTION IN THE IOT CONSTRAINED NODE NETWORKS USING CLUSTERING TECHNIQUES

Abstract :
The Internet of Things (IoT) is a technology paradigm for a global network of things. It connects and interacts with everything and everyone from everywhere, at any time, and via any pathway and network. The widespread deployment of IoT nodes represents significant financial investment and technical achievement. Furthermore, these nodes produce vast amounts of data, which are then collected and transmitted to the sink through single or multiple hop pathways. Furthermore, this data can be reused by various users and applications inside IoT middleware solutions to perform various analyses, make decisions, or provide efficient and intelligent services.
In this thesis, we addressed three research topics: First, search and select the proper sensors for a given request in an IoT network. This problem relates to satisfying user requests from an enormous variety of available objects in the IoT environment with high solution accuracy and low execution time. Second, sink location and sensor-to-sink routing in WSN. This problem relates to providing a complete model of the different issues (deployment sensors, multiple sink placement, routing data pathways) that affect the data transmission procedure. Third, search and select the best sensors regarding the user's requirements among a large number of similar sensors. This problem relates to introducing an architecture that improves the selected solution.
In this context, we have outlined three contributions. In the first one, we propose a new distributed model based-clustering to efficiently deal with heterogeneous sensors and select accurate ones in a dynamic IoT environment. The model's server uses and manages multiple gateways to respond to the request requirements. Furthermore, available nodes were grouped into three semantic categories and several semantic sensor network types to define the space of interest. The clustering is performed using the Whale-based Sensor Clustering algorithm according to the context properties. The Technique for Order of Preference by Similarity to Ideal Solution was improved to search and select the adequate sensor matching the users' requirements. Experimental results from real data sets demonstrate that our proposal outperforms state-of-the-art approaches in terms of accuracy (96%), execution time, quality of clustering, and scalability. In the second one, we model the problem of multiple sinks deployment and sensor-to-sink routing using the clustering technique to extend the lifetime of wireless sensor networks. The proposed model determines the sink placements and the most effective way to transmit data from sensor nodes to the sink. First, we suggest an improved ant-clustering algorithm to group nodes, and then we select the cluster head based on the chance of picking factor. Second, we assign nodes to sinks that are designated as data collectors. Third, we provide optimal paths for nodes to relay the data to the sink by maximizing network lifetime and improving data flow. Simulation results on a real network data set demonstrate that our proposal outperforms the state-of-the-art approaches in terms of energy consumption, network lifetime, data transmission delay, and scalability. Finally, we provide a new infrastructure based-clustering of all existing sensors into three categories (society, industry, and environment) based on the sensor's context. Moreover, a use case is provided for searching and selecting the most similar sensor to a user's requirement considering the network topology.

Keywords:
IoT, IoT middleware, sink, single pathways, multiple hop pathways, sink location, sensor-to-sink, deployment sensors, data transmission, semantic categories, semantic sensor network types, Whale-based Sensor Clustering, context properties, Technique for Order of Preference by Similarity to Ideal Solution, Improved Ant-Clustering algorithm, Cluster Head, chance of picking factor, network lifetime.