SOCIAL IOT INFORMATION DELIVERY BY SWARM

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Abstract—Social Internet of Things (SIoTs) refers to therapidly growing network of connectedobjects and people thatare able to collect and exchange data using embedded sensors. Toguarantee the connectivity among these objects and people, faulttolerance routing has to be significantly considered. In this paper,we propose a bio-inspired particle multi-swarm optimization(PMSO) routing algorithm to construct, recover and select kdisjointpaths that tolerates the failure while satisfying quality ofservice (QoS) parameters. Multi-swarm strategy enables determiningthe optimal directions in selecting the multipath routingwhile exchanging messages from all positions in the network.The validity of the proposed algorithm is assessed and resultsdemonstrate high-quality solutions compared with the canonicalparticle swarm optimization (CPSO), and fully particle multiswarmoptimization (FPMSO).

Keywords: Fault tolerant, Internet of Things, Multi-swarm,Multipath routing.

Introduction

The Internet of Things (IoT) is a novel paradigm that aims at completely changing the shape of modern wireless communications by making it possible for a broad array of devices around us, such as sensors, actuators, ID-tags, smartphones, tablets, etc., to interact and cooperate to achieve common objectives and improve users' everyday life [1]. Social Network (SN) services are basically promoted as a large network of people where the relationships among those in a certain community are modeled and described. Social networks are composed of nodes of people, and the edges between these nodes represent their relationships [2]. Many types of social networks have been built for different goals based on a range of basic information and different methods.

Objects can not only be part of traditional networks, they can also form an SN of smart connected objects that tends to mimic human behavior towards a scalable and effective service discovery and composition, as well as trustworthiness management [3]. In this sense, the three worlds of the Internet, the IoT and SNs are being integrated to bring the physical real world into the virtual one. The resulting paradigm, called the Social Internet of Things (SIoT), has the potential to support novel applications and networking services for the IoT in more effective and efficient ways [4], but it is necessary to find solutions for resource visibility, service discovery, object reputation assessment, crowd-sourcing and service composition [3], [4]. Semantic Web services are an interesting approach to manage SIoT services, since they provide interoperability and automation that can be used by different stakeholders to unambiguously access and interpret data. However, despite the great interest in semantic Web services over the last decade.

This is due to a large extent to the complexity of Semantic Web technologies and the absence of attractive uses cases. It is clear that if service providers do not envisage the use of their services by an automated application, they will not take up the effort to semantically mark-up their services. Moreover, it is necessary to develop user-friendly and intuitive tools that will motivate people without technical skills to use semantic services. Through context-aware and proactive platforms that enable users to create their own services, it will be the users themselves who will bring out with new use cases.

We believe that the emerging needs for SIoT applications, such as in smart homes, smart cities, and healthcare, will further increase the importance of fault tolerance in various aspects, due to its requirement constant mode of operation. Therefore, special effort has been made to develop fault tolerance in routing.

Literature survey

One of the early proposals for establishing social relationships among objects is presented in [7]. This work focused on establishing temporary relationships using wireless devices, specifically wireless sensor nodes, and on how the owners of sensors can control this relationship establishment.

The authors in [8] distinguished the things connected to the Internet with the things involved in social networks, which they termed as the neologism Blogject (i.e., objects that blog). Another concept, Embodied Microblogging (EM), was presented in [9]. EM introduces two new roles that augment daily life objects rather than focusing on people-to-thing or thing-to-thing paradigms. These two roles are mediating people-to-people communication and supporting new procedures for considering the noticing and noticeable activities in daily life. The authors in [10] proposed a concept in which objects are able to participate in conversations previously reserved for humans. These objects are contextaware, and hence are able to create a networking infrastructure based on the dissemination of information, rather than information on the objects themselves. Recently, integrating the two worlds of the IoT and social networks is proposed in the literature [11], [12], [13]. The authors in [11] visualize the future of the Internet as ubiquitous IoT architecture, which is similar to a social organization framework (SOF) model and provides an overview of future IoT network structure. However, this work does not exploit social network features into the IoT . The authors in [12] suggest that as things are involved together with humans in the network, the social network can be more meaningful if it is built on the IoT by investigating the relationships of IoT objects. The main convergence of social networks and the IoT is also introduced in [13], in which the social network is a social network of humans that is used by things as an infrastructure for service discovery, access and advertisement. In this work, a person can share the services offered by his smart objects with his friends as well as sharing their things (or devices). Another work on the SIoT investigates the integration of social networks and the IoT with some sample applications [14]. However, it neither discusses how social relationships can be established by objects nor provides any solution for the required protocols and architectures.

In [15], the authors investigate the social attributes or relations among mobile nodes by considering two parameters, i.e., an interaction factor and a discount factor, as well as investigating the behavior of mobile nodes by applying social networks. However, their approach assumes a one-to-one relation between objects and humans, whereas in the IoT, many objects are associated with a single human, and hence a large number of objects would not be considered in this work.

The work in [17] does address this issue, but it is specifically designed for task-oriented recommendations in smart homes. Neither of these works considers recommendation services among various IoT applications, developed in a vertical and standalone manner.

in this paper, we proposed a new distributed localization algorithm using SL-PSO for IoT. SL-PSO algorithm is inspired by the social learning mechanism which is widely observed in animals. We showed that the implicit social learning process through any better particles and mean behaviour of all particles in the current swarm helps SL-PSO algorithm in reducing localization error significantly and converge rapidly in finding global optimization solution unlike PSO algorithm where the implicit learning process is only through the Pbest and Gbest vectors. Extensive simulations have been performed to show the effective performance of SL-PSO algorithm over PSO and its variants like BPSO, Modified-BPSO on localization accuracy and computation performance.

In this work, we present an improved Multi agent particle swarm optimization MAPSO2++ architecture to solve FJSP under machine disruptions. The embedded implementation of the method on a distributed embedded system is also presented. Adding sensor in the embedded system enables us to predict the breakdown and to adjust the communication between agents according to the state of control unit.

Objective of our research

The main objective of our research is:

- To construct, recover and select k-disjoint paths that tolerates the failure while satisfying quality of service (QoS) parameters.
- Determining the optimal directions in selecting the multipath routing while exchanging messages from all positions in the network.
- To achieve fast recovery from path failure.
- TO define the objective functions and then optimize the effective values of these objective functions, which are computed at each sensor node that is selected to construct a k-disjoint multipath.
- To provide an alternative learning strategy for particles.

Proposed methodology

In this section, we present the proposed concept of our model.

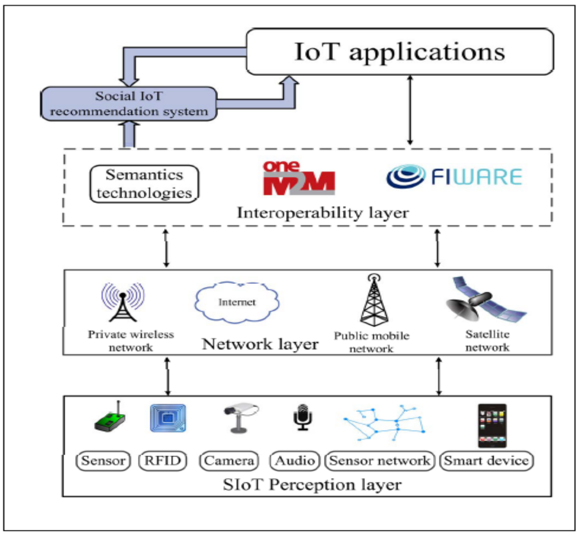

Figure 1 proposed methodology

The SIoT perception layer is responsible for sensing and collecting information from IoT devices. It consists of various heterogeneous devices, such as sensors and actuators, RFIDs, smartphones and cameras. After collecting the information, IoT devices establish social relationships and friendship circles among themselves using SIoT technique. Subsequently, the collected sensing and friendship circles information are forwarded to network layer in order to utilize this information by IoT applications The network layer is composed of various telecommunication networks (e.g., private wireless networks, public mobile networks and satellite networks) and the Internet. It maps IoT devices' data received from the perception layer to the telecommunication protocols, and forwards it to the upper layer for processing and to be converted into useful information for the realization of various IoT applications.

The proposed routing model employs fault-tolerant topology control in two-tiered heterogeneous WSNs consisting of resource-rich super nodes and simple sensor nodes with batteries of limited capacity and unmitigated QoS constraints.

Using the network model, we aim to construct a k-disjoint multipath routing in the fault-tolerant network topology to route the data collected by sensor nodes to the super nodes for two-tiered WSNs. By combining these components into the network model, the sensor nodes become multi-functional depending on their electronic mechanical and communication limitations as well as their application-specific requirements. However, how we can use such resources-constrained sensor nodes to meet certain application requirements, including power transmission, end-to-end delay, and throughput?? WSNs may face several challenges by integrating them within other co-exiting wireless heterogeneous wireless systems. This coexistence and integration may substantially affect the performance of sensor nodes that rely on diverse performance metrics to optimize QoS. Given that these metrics often conflict with one another, the trade-off among sensor nodes must be balanced to optimize the overall performance of WSNs. Network connectivity is closely related to energy efficiency; thus, we need to define the relationship between the number of sensor nodes that remain active and the connectivity with acceptable achieving QoS. Therefore, we model topology control as a transmission range assignment problem for each sensor node in the network. Our objective is to minimize the assigned QoS parameters in terms of transmission power range and average delay for all sensors while maintaining k disjoint multipaths from each sensor to the set of super nodes to determine the optimal multipaths. In this topology, each sensor node in the network must be connected to at least one Super node with k-disjoint multipaths to exchange information with one another. We can define the problem as follows: a k-disjoint multipath constructed by connecting a group of

Super node and energy-constrained sensor nodes that can adjust their transmission range up to a predefined optimal value. The transmission range of each sensor is minimized, and the resulting topology is still k-disjoint multipath to ensure that all QoS application requirements are satisfied.

Delay Model

The definition of delay depends on the optimal hop number that can have different delay guarantees.The increased number of nodes results in more paths becoming available for simultaneously routing packets to their destinations, which benefits the reduction of delay. The number of paths may also increase proportionally to the number of nodes on the invoked path. Therefore, determine the optimal number of hops, which minimizes the delay of the successful transmission of a packet, and then jointly optimize the hops and estimate the delay constraint to derive a scaling for minimizing the delay. Therefore, to solve the optimization problem, all source nodes and intermediate nodes periodically calculate the delay when generated from the one hop neighborhood of each node because the one-hop is easier to acquire . Suppose that one QoS requirement is satisfiedat each hop, and then the end-to-end QoS requirement is also met. Specifically, a node can satisfy the hop requirement by selecting the next hop, which allows the bounded delay to be evenly divided at each hop.

Particle swarm optimization

PSO is a widely used population based stochastic optimization algorithm developed by Kennedy and Eberhart in 1995 [24]. PSO is a bio-inspired algorithm, which takes the inspiration from social behavior of bird flocking or fish schooling. It should be noted that unlike other genetic algorithms, there are no evolution operators such as crossover or mutation, and there are only a few parameters to adjust, which makes PSO algorithm easy to implement. The birds or fishes representing particles in PSO algorithm fly through the problem space by learningfromthecurrentoptimumparticletofindth eoptimum value of the cost or objective function. Here, the cost or objective function represents the food for birds or fishes that needs to be found in search/problem space. PSO is initialized with a group of random particles (solutions) and then searches for optima by updating the generations. In PSO, each particles is able to memorize the best position known as the global best found by the whole swarm in history, and the best position known as the personal best that has been found by each particle. The global optimum solution of the optimization problem is found by particles learning from the global best and positions.

Outline of Proposed algorithm

We devise a canonical particle multi-swarm optimization in order to solve the objective function. In sum, we apply multi-swarm after the construction and then select the paths. Multi-swarm employs a biologically-inspired population-based optimization algorithm to solve the tolerance problem. However, multi swarm is encouraged to explore the search space to maintain the swarm diversity and to learn from the global best particle to refine a promising optimal solution. Taking full advantage of the exchanged information of all personal-best messages will contribute to ignoring the fault tolerance error messages of several nodes that are trapped in the local optimal solution, thereby strengthening ability of nodes to learn from the experience of other nodes and to guide its selection direction.

Therefore, the performance of each algorithm depends on the way the nodes are influenced, select in the search space for the analysis, and achieve the goal objective functions. The pseudo-code of the proposed CPMSO algorithm is shown in algorithm.

Possible outcomes of our research

- Particle multi swarm optimization (PMSO) strategy is constructed;recovered and k-disjoint multipath routes can be selected.
- Performance of routing algorithm can be updated and enhanced.
- Optimize the energy consumption and average delay on the explored paths.

- Failure tolerance is expected while satisfying quality of service (QoS) parameters.
- Connectivity among these objects and people, fault tolerance routingcan be guaranteed.

Summary:

These algorithms are very similar to one another and only differ in a few details of their learning strategies in different situations with respect to convergence, exploitation, exploration, and jumping out of the basins of attraction of optimal solutions. Additionally, increasing the number of paths requires the exchange of more messages and additional communication overhead. Therefore, by looking at the similarity and differences among these algorithms, we employ complex network connectivity to represent the population of swarm topology. We also adopt the multipath routing algorithm to balance the trade-off between fault tolerance and communication overhead by taking advantage of the combination of proactive and reactive routing mechanisms to exchange demanding information of calculation and maintain on every particle and records the objective function value for the selected paths. Afterward, the particles are adaptively increased or decreased and connected with their matching velocity to make a proper selection by considering the optimized objective function.

Reference

[1] Holmquist LE, Mattern F, Schiele B, Alahuhta P, Beigl M, Gellersen HW. “Smart-its friends: A technique for users to easily establish connections between smart artefacts.” In *International conference on Ubiquitous Computing*, Springer Berlin Heidelberg, 2001, pp. 116-122.

[2] Bleecker J. “A Manifesto for networked objects–cohabiting with pigeons, arphids and aibos in the Internet of things–why things matter what’sablogject? What about Spimes.” In *Proceedingsof the 13th International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI),* September 2006.

[3] Nazzi E, Sokoler T. “Walky for embodied microblogging: sharing mundane activities through augmented everyday objects.” In *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services,* 2011, pp. 563-568.

[4] Mendes P. “Social-driven Internet of connected objects.” In *Proceedings of the Interconnected Smart Objects with the Internet Workshop*, March 2011.

[5] Ning H, Wang Z. “Future Internet of things architecture: like mankind neural system or social organization framework?” *IEEE Communications Letters*. 2011, 15(4), pp.461-463.

[6] Ding L, Shi P, Liu B. “The clustering of Internet, Internet of things and social network.” In *3rd International Symposium on Knowledge Acquisition and Modeling (KAM),* Oct 20 2010, pp. 417-420.

[7] Guinard D, Fischer M, Trifa V. “Sharing using social networks in a composable web of things.” In *8th IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops)*, 2010 Mar 29, pp. 702-707.

[8] Kranz M, Roalter L, Michahelles F. “Things that twitter: social networks and the Internet of things.” In *What can the Internet of Things do for the Citizen (CIoT) Workshop at 8th International Conference on Pervasive Computing (Pervasive),* 2010 May, pp. 1-10.

[9] An J, Gui X, Zhang W, Jiang J. “Nodes social relations cognition for mobility-aware in the Internet of things.” In *4th International Conference on Internet of Things and Cyber, Physical and Social Computing(iThings/CPSCom),* 2011, pp. 687-691.

[10] Rasch K. “Smart assistants for smart homes.” (Doctoral dissertation, Institute of Technology, Stockholm, Sweden),2013.

[17] Hussein D, Han SN, Lee GM, Crespi N. “Social Cloud-Based Cognitive Reasoning for Task-Oriented Recommendation." *IEEE Cloud Computing*, 2015, 2(6), pp.10-19.

[11] Younggi Kim, Younghee Lee, “Automatic Generation of Social Relationships between Internet of Things in Smart Home using SDNbased Home Cloud”, IEEE 29th International Conference on Advanced Information Networking and Applications Workshops(WAINA), pp. 662667, Mar. 2015.

[12] A. Rauniyar, P. Engelstad and J. Moen, "A New Distributed Localization Algorithm Using Social Learning Based Particle Swarm

Optimization for Internet of Things," *2018 IEEE 87th Vehicular Technology Conference (VTC Spring)*, Porto, 2018, pp. 1-7.

[13] M. Nouiri, A. Jemai, A. C. Ammari, A. Bekrar, D. Trentesaux and S. Niar, "Using IoT in breakdown tolerance: PSO solving FJSP," *2016 11th International Design & Test Symposium (IDT)*, Hammamet, 2016, pp. 19-24.

[14]. Siddalingaih, Neelambike&Baraki, Parashuram. (2018). Cluster based authentication for VANET for improving the security. Compusoft. 7. 2556-2559. 10.6084/ijact.v7i2.699.

[15]. Siddalingaih, Neelambike& J, Chandrika. (2018). A DECENTRALIZED ADAPTIVE MEDIUM ACCESS CONTROL FOR V2I VANET. ICTACT Journal on Communication Technology. 9. 1696-1701. 10.21917/ijct.2018.0248.

[16]. Siddalingaih, Neelambike&Chandrika, J.. (2018). Anefficent distributed medium access control for V2I VANET. Indonesian Journal of Electrical Engineering and Computer Science. 9. 742-751. 10.11591/ijeecs.v9.i3.pp742-751.

[17]. Siddalingaih, Neelambike&Chandrika, J. (2017). AN EFFICIENT ENVIRONMENTAL channel modelling in 802.11p mac protocol for v2i. ICTACT journal on communication