4th International Conference on Science, Technology and Management
India International Centre, New Delhi (ICSTM-16)
15th May 2016, www.conferenceworld.in ISBN: 978-81-932074-8-2

EFFICIENT NODE SELECTION SCHEMES FOR WSNs USING ARTIFICIAL INTELLIGENCE

Keshav Kaushik[1], Ravi Arora[2], Atul Kumar[3]

[1]B.tech Student, [2]Assistant Professor, Dept. of Computer Science and Engineering,
[3]Assistant Professor, Dept. of Information Technology,
HMRITM, Hamidpur, New Delhi, (India)

ABSTRACT

For the most recent decade, many researchers are paying attention their investigations on WSN's (Wireless Sensor Networks). Different investigating issues have been extensively developed: Media Access Control protocol, Power consumption, Data-aggregation schemes, Quality of Service management and routing protocols etc. To perform distinctive tasks like detecting path is performed by Artificial intelligence / neural networks in some special cases. In this paper we travel around the performance of some path detecting algorithms & use of Artificial Intelligence (AI) in WSN's (Wireless Sensor Networks). The performance metrices of the following algorithms are also discussed in this paper Directed diffusion, Energy aware routing and SIR. Extensive simulators over WSN OLIMPO have been carried out to study the efficiency of the neural network.

Keywords: AI, SIR, EAR, PDA

I. INTRODUCTION

The objective of Artificial intelligence is to build up system that matches the intellectual and interaction abilities of human in the distributed Artificial Intelligence Pursues the same purpose but focusing on human societies. A paradigm in current use for development of DAI is based on the notion of multi-agent systems. An multi-agent system is formed by a no. of interaction intelligent system called agents and are implemented as software program as a robot. These agents are known as Intelligent agents in a multi-agent system act together among each other to organize their structure.

These days technological advances have made the manufacturing of low cost and small sensors economically and technically possible. These sensors are used to compute conditions in the environment surrounding them. An WSN system consist of thousand of sensor nodes. The sensor nodes feature low power consumption, low radio range, low processing capacity, self organizing is best support architecture to support application. Goals like high reliability, efficient energy management, availability, communication security and robustness have become very important issues to be considered while opting nodes for path.

Concepts related to multi agent systems, artificial societies, simulated org. create a new example in computation which involves issues as cooperation and competition, coordination, collaboration, communication and language protocols. Distributed intelligent sensor network can see by the perspective of a system composed by sensor nodes / multi agent. With some sensors working on themselves and form a collective system whose purpose is to collect data from physical variable.

Now the big question arises how to implement artificial intelligence mechanisms within WSN? There are two possible approach for these are The first technique is for designers that the global objective to be the designed the interaction between the agent & multi-agent system. In other approach the designer conceives and construct self interested agent whose then evolves and able to interact in a stable manner.

II. LITERATURE SURVEY

Sensor Placement

When monitoring areas of interest, it is important to deal out sensors in such a way that they capture the phenomena of interest without being redundant. In addition, sensors must be placed so that the network is capable of reporting measurements from regions of interest without prematurely fatiguing the battery power of sensor or intermediate nodes. We propose to address the question of sensor redundancy by using random forests to predict a sensor's time series based on the time series data from other sensors of the same type. If a sensor's measurements can be accurately predicted by the other sensors, it may be judged as potentially redundant. If they are poorly predicted, another sensor may need to be placed nearby to accurately capture the spatial in homogeneity of the field being measured. In addition, sensors that are triggered to report or relay data more frequently may require the addition of other sensors or network nodes in the same region to ensure that the data can be reliably communicated without exhausting any sensor node's battery power

Adaptive Sensor Reporting

Real environments, however, evolve in time both in terms of the observation system and the process being measured. Learning relationships between data from various sensors "on the fly" will allow the identification of significant events or changes in the dominant regime as they occur. These events may require that additional measurements be taken to adequately capture the transitions. We propose again using random forests for this purpose, preparing new trees in the forest as new data come in and aging off old ones to maintain a robust but adaptive predictive model. If the ability of the random forest to predict or relate the incoming sensor measurement values suddenly falls off, the base station would then signal the sensors to increase their reporting accuracy. We say reporting "accuracy" instead of reporting "rate" for the reason that we envision that the sensor nodes will report in a novel way. Instead of reporting at fixed temporal rates, the sensors will be supplied with a prescribed reporting accuracy, or "tolerance". Recent past measurements will be used to fit a linear or quadratic "trend" to the sensed data, and if a measurement falls outside of the prescribed tolerance from the trend's prediction, a new report will be made. That report will include not the measurement itself, but the time and the parameters of the observed trend. The base station will then be able to provide measurements and error bars for all times based on the reported trends and error tolerances, and will be able to request that a smaller tolerance be used if the situation mandates greater accuracy. The transmission of polynomial fit parameters rather than the data itself have been proposed by Guestrin et al. (2004), and the idea of using tolerances from a trend is akin to standard methods in data compression.

Network Routing Network routing will be optimized by applying strengthening learning techniques, with network parameters being optimized periodically based on the network's recent performance. We envision that the network's routing strategy will be stochastic at each node, an appropriate probability distribution over parent

nodes being selected at each time step based on the sensor's state and its knowledge of the state of the network. A candidate method for learning optimal stochastic policies in the context of partially-observable Markov decision processes is described.

III. CRITERIA & METHODOLOGY

WSN:-

A SN is a system consists of thousands very small stations called sensor nodes. The function of sensor nodes is to monitor, record, and notify a specific condition at various locations to other stations. Sensor Network is a group of specialized with a communication infrastructure intended to monitor & record condition at diverse locations. Parameters that are used to monitor are temperature, humidity pressure, wind direction, speed and sound intensity, power, power line voltage, chemical concentration and pollutants level.

Sensor nodes can be imagined as small computers, in terms of their interfaces and components. These devices have very low capabilities of data processing on their own thus each node is typically equipped with radio transmitter or other wireless communication device, a small microcontroller and an battery to increase the efficiency of sensor nodes. The whole network of sensor nodes is programmed by base stations. The main functionality of the base station is to act gateway to another network.

Artificial Intelligence & Multi-Agent System:-

AI emulate within computers the intellectuals and interaction abilities of a human being. The modern approach to AI is centered around the concept of rational agent. An agent is anything that can perceive its environment through sensors and act upon environment through actuators. An agent that always tries to optimize an appropriate performance measure is called rational agent. By such definition it can be assumed that the rational agent can be human agent, robotic agent, and software agent.

These rational agents are known as stand-alone agents because they operate only a base station at a time. In some circumstances they can interact with other base station. The multi-agent system is called DAI (Distributed Artificial Intelligence).

Wireless Sensor Networks & Artificial Intelligence:-

An intelligent sensor is one which changes its internal behaviour to optimize its ability to collect data from the physical communicative environment and communicates it in a responsive manner to a base station or to a host system. The functionality of These intelligent sensor are:- compensation, self-validation, self-calibration. The Self calibration means the sensor can monitor the measuring state to decide whether a new calibration is required or not. Self-validation applies mathematical modeling error propagation and error isolation or knowledge based techniques. The self-compensation technique makes use of compensation method to achieve high-accuracy. The types of AI used in industry are:- Artificial Neural Networks, Fuzzy Logic, NeuroFuzzy. The use of Artificial Intelligence techniques plays a key role in building wireless intelligent sensors. The use of artificial intelligence techniques plays a key role in building intelligent sensor structures. Main issues of WSN are focused on coverage, connectivity network lifetime and data fidelity.

Network Backbone Formation:-

This problem has been a part of discrete mathematics as a particular discipline called Graph Theory. A directed graph G is an ordered pair G:=(V,A)with V, a set of vertices or nodes, v_i, and A, a set of ordered pairs of vertices called directed edges, arcs, or arrows.

An edge v_xy=(x,y) is considerd to be directed from x to y; where y is called the head and x is called the tail of the edge.

In our Wireless Sensor Network we assume that all the links are symmetrical, in the sense that if node A can reach a node B, then node B can reach the node A. With these kinds of links we can model our network as an undirected Graph G=(V,E).

To form the network backbone the Dijkastra's algorithm was modified, with the minimum cost paths from base station or root, r, to every node in the network. The SIR algorithm is used for the purpose. In Dijkastra's algorithm has arrows and in the modification of SIR they have used edges between nodes v_i and v_j ha sa weight, ω_ij, and it is easy to prove ω_ij=ω_ji. The distance from the base station to a node v_i is named d(v_i). The set of nodes which are successors or predecessors of a node v_i is donated by ⌈_((vi)) can be defined.

Set up phase:

D(r)=0

D(vi)= ωri if vi€⌈r

Do t=t-{vj}

If ti<d(vi) do d(vi)=ti

If T>0 goto step 2

If T=0 stop

Quality of Service in Wireless Sensor Networks

Once the backbone algorithm is designed a way of measuring the edge weight parameter ωij must be defined. On a first approach we can assume that ωij can be modified with number of hops. However imagine that we have another scenario jn in which the sensor node is kept under noicy condition.

IV. CONCLUSION & FUTURE REFERENCES

The algorithms, principles and application of Distributed Artificial Intelligence can be used to optimize a network of distributed wireless network. The Multi-Agent system Approach permits WSN optimization using rational agents to achieve this achievement.

It is possible to implement a solution that enables a sensor network to behave as an intelligent Sensor Node through the model due to it utilizes multi-agent system with layered architecture to facilitate intelligence and simulate any WSN.

From the Perspective of multi-agents, artificial societies and simulated organizations, a distributed sensor network can be installed in efficient manner and achieve the objectives of taking measures of physical variables by itself with different types of rational agents.

When there is a significant percentage of node failure the average delay goes up with number of sensors in directed diffusion and EAR, it maintains a low level delay in SIR. SR elects the intermediate node running an Artificial Intelligence algorithm. Thus the path created by SIR avoids the election of intermediate nodes that

are prone to failure because of battery draining or noisy environment. The average dissipated is less in SIR when the number of nodes is increased.

Nodes failure can be provoked by following reason

Sensor battery draining

Noise originating at industrial environment

Interference in the sensor surroundings

The inclusion of AI techniques in wireless sensor networks has been proved to be an useful tool to improve network performance.

V. SOM CREATION

SOM has first layer formed by four input neurons, corresponding with every metric and second layer formed by twelve output neurons forming 3*4 matrix.

Learning Phase:- to organize the neurons x(t)=(latency(t), throughput(t), error-rate (t), duty-cycle(t)). The sample should consider all the Quality of Service environments in which a communication link between a pair of sensor nodes can work. This sense we have to simulate special pervasive computing environments. These scenarios can implemented by different noise and data traffic simulations. The procedure of measuring every QoS link between two neighbours is detailed as follow: every pair of nodes is exposed to level of noise. The noise is introduced increasing power density No in a radio channel in proximity of selected nodes decreases. In order to measure the QoS metrics with every we runs an ping application between selected pairs of node. Node vi send periodically a ping message to node vj. because ping requires ACK (acknowledgement) the way node vi receives acknowledgement determines a specific Qos environment expressed on the four metrices elected:- latency in seconds, throughput in bits per seconds , error-rate in percentage and duty cycle in percentage.

Execution phase:- the process of writing algorithm is known as winning neuron election algorithm. In this phase of execution A WSN with 250 nodes is created which helps in determining input sample. After a node has collected a set of input samples it runs the winning neuron election algorithm

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