Artificial Intelligence Approach To Improve Lifespan Of Wireless Sensor Network : A Survey

[1] Mr. Ranjit V. Bobate , [2] Dr. G.M. Asutkar, [3] Prof. Harsha Ramawat
[1] Astt. Professor , E & C Engg, [2] Professor, E & C Engg
[1][2][3] PIET, Nagpur, India.

Abstract— Wireless sensor network is a set of specialized transducer with a communication infrastructure meant to monitor and record the condition at diverse region . Sensor node can be imagine as a small computer , extremely basic in terms of their interfaces and their component .therefore resource management in the wireless sensor network is one of the significant research issue in the improvement of lifespan of of wireless sensor network with intelligence . Hence in this research, we find the survey on artificial intelligence techniques like Neural Network , Fuzzy Logic to improve the lifespan of wireless sensor network along with the optimization techniques to conserve the limited resources in a large collection of sensor nodes .

Index Terms— Artificial Intelligence , Optimization Techniques, Wireless sensor Network etc

I.INTRODUCTION

A Sensor network (SN) is a device that includes thousands of very small stations referred to as sensor nodes. the primary characteristic of sensor nodes it's far to reveal, record and notify a particular situation at diverse places to different stations. also, a Sensor Node is a set of specialized transducers with a communications infrastructure supposed to screen and document conditions at numerous locations. generally monitored parameters are temperature, humidity, pressure, wind route and velocity, illumination depth, vibration intensity, sound depth, power-line voltage, chemical concentrations, pollutant degrees and critical frame functions. Sensor nodes can be imagined as small computer systems, extraordinarily simple in phrases in their interfaces and their components. even though those gadgets have a totally little capability on their very own they have widespread processing competencies while they're running as an aggregate. every node in a sensor community is usually ready with a radio transceiver or other wireless communications device, a small micro controller, and an energy supply, normally a battery.

An clever sensor is one that modifies its inner conduct to optimize its capacity to collect statistics from the physical global and communicates it in a responsive manner, to a base station or to a bunch machine. The functionality of intelligent sensor consists of: self-calibration, self-validation, and reimbursement. The self-calibration means that the sensor can display the measuring situation to decide whether a brand new calibration is wanted or not. Self-validation applies mathematical modeling errors propagation and mistakes isolation or information-based techniques. The self-repayment uses repayment strategies to attain

a high accuracy. The styles of artificial intelligence strategies extensively used in industries are: synthetic Neural community (ANN), Fuzzy logic and Neuro-Fuzzy. intelligent sensor systems embedded in Wi-Fi Sensor Networks bring about Wi-Fi clever sensors. using artificial intelligence strategies plays a key role in building clever sensor systems. primary studies issues of the WSNs are centered at the coverage, connectivity network lifetime, and data constancy. Inside the latest years, there was an increasing hobby in the area of the synthetic Intelligence and allotted synthetic Intelligence and their methods for solving WSNs constrains, create new algorithms and new packages for WSNs. aid management is an   vital ingredient of a middle-ware solution for WSN. useful resource management includes preliminary sensor-selection and project allocation in addition to runtime version of allocated assignment/assets. The parameters to be optimized include power, bandwidth, and network lifetime .

II. WAYS FOR EFFICIENT ENERGY CONSUMPTION TO IMPROVE THE LIFESPAN OF WSN

A. Clustering

In terms of computer clustering, the term clustering is used for connecting or greater computer to acts like a single laptop and is used for parallel processing, fault tolerance and load balancing. In wireless sensor networks clustering define as centralize based grouping or clustering of sensor nodes with cluster head (CH) for his or her control. each node inside the cluster collects facts and forwards it to the CH. The CH then communicates with the other CH or without delay communicating with base station. In wireless sensor networks   there can be loads or heaps of

sensing nodes speaking with each different and the bottom station, which consuming extra energy in replacing records, and have issues of load balance, fault tolerance and so forth. with the aid of clustering, these problems can be intercepted, so in Wireless sensor networks nodes may be divided into agencies or clusters. Ever cluster has cluster head; non cluster members inside the cluster forward the amassed records to the CH. The CH paintings as a gateway between nodes and the base station. the choice of CH modifications at normal c language for the long life time of the network.

Clustering supply many benefits like scalability, reduce the size of routing desk for every node, saves bandwidth, stabilize the community topology, management techniques. With those blessings there are also a few troubles in clustering techniques. In clustering sensor community all nodes send information to the cluster head which motive over loading for CH and devour extra electricity and someday in extra. Clustering has principal problem which include latency, facts accuracy etc.

Clustering era has many benefits as follows:
1. minimizes communication overhead
2. enhances aid use.

B. Routing

Routing as one key technology of wireless sensor community has now become a warm studies because the applications of WSN is everywhere , it's miles not possible that there may be a routing protocol suitable for all applications. The developing interest in WSN and the chronic emergence of new architectural techniques inspired surveying the characteristics, applications and communication protocols. Routing protocol for sensor networks where an end-user wants to remotely monitor the surroundings. In this kind of situation, the data from the character nodes should be sent to a primary base station, frequently positioned a ways from the sensor network, through which the stop-user can get entry to the statistics. There are numerous acceptable homes for protocols on these networks are :
  i)   Use one hundred's - thousands of nodes
  ii) Maximize machine lifetime
  iii) Maximize community insurance
  iv) Use uniform, battery-operated nodes

III. ARTIFICIAL INTELLIGENCE APPROACH FOR WSN

Artificial Intelligence is a technique which stimulated from nature. Artificial Intelligence is used to make systems that could work in real time. In artificial intelligence like robots, they may be used to do predefined things like they are able to place things from one place to another, commencing or shutting of the door and so forth. All such things are already fed into the memory of the robot to perform all those obligations. cause of AI is to introduce such intelligence in the system that it could take decisions like human beings do, like they could choose pleasant answer

from a set of available options. Artificial intelligence is an clever computational technique that uses heuristic algorithms to attain approximate solutions to NP tough problems efficiently. AI paradigms are supposed to evolve to the dynamic nature of WSN. The AIS mimic the equal precept solving strategies of AI are designed to version the components of organic intelligence. AI surrounds paradigms inclusive of neural networks, swarm intelligence, fuzzy logic and artificial immune structures. these paradigms are in short delivered inside the following subsections. those paradigms, which include Neuro-fuzzy structures, fuzzy-immune structures and so on. clearly there exist more . Fuzzy logic that is stimulated by the shades of human decisions. The Ants communicate through stigmatic information. Optimization problems because of its adaptive nature and distributive device properties. WSN nodes primarily based on AIS the usage of Antigen expressions, antibody expressions and the initialization of antibody optimizes the issues. The concept of genetic evolution of nature has immensely inspired the human beings to use the ideology behind them in unique disciplines of lifestyles and this gave birth to the electricity recognition. SI is a computational technique, which is originality from ant colonies, fowl flocking, animal herding, and fish schoolings. A collective conduct in each BI system shows that unmarried agent isn't always green and so their collective collaboration makes device sensible. Decentralized and self-prepared conduct of SI enables to solve the numerous optimization issues SI are Ant colony Optimization (ACO).

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 3, March 2017

A. NEURAL NETWORKS

The human brain, which possesses an high-quality potential to study, don't forget and generalize, is a dense community vicinity of over 10 billion neurons, each neuron related on common to about 10,000 different Neurons. each neuron gets the alerts through synapses, and feature the strength to control the outcomes of the indicators at the neuron. these synaptic connections play major function inside the behavior of the brain. these findings have inspired modeling of organic neural structures by using Neural networks .

B. FUZZY LOGIC

Fuzzy method vague, indistinct or difficult to perceive. not like Boolean wherein values are integer i.e. '1' or 'zero', where'1'   represents proper and 'zero' represents fake, it (fuzzy) takes   ongoing values between '0' and '1'. In fuzzy structures '0'represents absolute wrong and '1' represents correct and supply non-stop values for other conditions. let us take an instance of fan, if we're the usage of Boolean system then it would either turn on or transfer OFF the fan, if it is bloodless or warm. but if we use fuzzy gadget then it will give the rate of fan from stop to gradual, gradual to medium and so on, relying on the price of temperature. Applications that are used in Fuzzy structures are in control systems, gear transmission in vehicles, home appliances, controlling traffic signals and so forth. Fuzzy logic is utilized in optimization, clustering heuristic and routing.

C. ARTIFICIAL IMMUNE SYSTEM

Artificial immune system is inspired from natural immune system and it models some aspects of artificial immune system. Natural immune system (NIS) is having a great pattern matching ability. It is used to differentiate between foreign cells entering the body (antigen or non-self) and the cells belonging to the body (self). NIS fights with the antigens and memorizes their structure for faster future response if they try again to enter the body. The four models of natural immune system are Classic view, clonal selection theory, danger theory and network theory. Applications of AIS are in   pattern recognition problems, classification, clustering, anomaly detection, computer virus detection etc. .Artificial

immune system is used to provide security, fault detection, and optimization and abnormality detection .The biological immune system protects the body from foreign pathogens.

D. GENETIC ALGORITHM

GA is characterized by heuristic search algorithm that models biological genetic evolution. It demonstrate to be a robust optimizer that searches among a population of solutions, and showed easy going in solving dynamic problems. It has been successfully applied to many NP-hard problems. The main challenge we are facing in solving a problem with GA is the encoding of the problem into a set of chromosomes; each representing a solution to the problem. Each chromosome is evaluated with the help of a fitness function. Based on fitness value, crossover 3 and mutation processes are applied on selected chromosomes. The crossover process produces new solutions, called offspring, by concatenating the parts of two selected chromosomes. Mutation changes one or more genetic element in the produced offspring to prevent being trapped in local minima. Binary representation is used in which each bit corresponds to one sensor node. "1"means that corresponding sensor is a cluster head and a "0" means that it is a regular node.

E. SWARM INTELLIGENCE

Swarm intelligence is based on the study of swarms that how they live, communicate, forage for food etc. They have no   central control, no direct communication but still they manage to find shortest paths to reach their goal, find foods and manage their resources as well. Swarm refers that large number of insects or other small organized entities, esp. when they are in motion. Global intelligent behavior in which the   individuals are entirely unknown is emerged due to the local, self-organized and decentralized interaction of swarm's agents. Swarm intelligence (SI) is one of the best solutions from bio inspired computing for such heuristic optimization problems e.g. routing. Natural examples of SI include ant colony, bird flocking, animal herding, bacterial growth, fish schooling, drop water, fireflies etc. Examples algorithms under the head of SI are Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), Gravitational Search Algorithm

(GSA), Intelligent Water Drop (IWD), Charged System Search (CSS) and Stochastic Diffusion Search (SDS) etc. Applications of SI are, function approximation, clustering, routing optimization, graph coloring etc. .

IV. SOFTWARE TOOLS

Wireless Sensor Networks (WSNs), which consist of spatially distributed self-configurable sensors, perfectly meet the requirement. Since running real experiments is costly and time consuming, simulation is essential to study WSNs, being the common way to test new applications and protocols in the field. This survey illustrates some main-stream WSNs simulators including MATLAB/ Simulink, NS-2, TOSSIM, PiccSIM, EmStar, OMNeT++, J-Sim, ATEMU, and Avrora.

V. CONCLUSION

Efficient energy consumption and conservation is a key problem in the sensor networks, lots of work lies in the algorithms for energy efficiency, less attention has been paid in area of alternative intelligent sensors. This research is trying to conduct a survey of intelligent approaches which could be applied in wireless sensor networks considering the capabilities and collaborating of mobile sensors to aggregate information and make decisions.

VI. REFERENCES

[1] "Artificial Intelligence and Synchronization in wireless sensor networks", JOURNAL OF NETWORKS, VOL. 4, NO. 6, AUGUST 2009.

[2] "Life Time Maximization of Wireless Sensor Node by Event Based Detection: An Experimental Approach" ,Mr G M. Asutkar, Dr.Kishore Kulat , IJCSNS International Journal of Computer Science and Network Security, VOL.10 No.3, March 2010 .

[3] Manisha S. Masurkar ,Dr. G.M. Asutkar , Dr. K.D.Kulat "Lifetime Maximization In Wireless Sensor Network Using Cross Layer Design: A Design Review" ,International Conference on Emerging Trends in Engineering and Technology

[4] " Use of Neural Network in WSNs: A survey" International Journal of advancement in electronics and computer engineering (IJAECE) Volume 1, Issue 3, June 2012, pp.93-98, ISSN 2278 -1412

[5] "A Survey of Intelligent Approaches in Wireless Sensor Networks for Efficient Energy Consumption" ,2012 International Conference on Software and Computer Applications (ICSCA 2012)

[6] Pallavi D. Joshi,DrG. M. Asutkar , "Lifetime Enhancement of WSN by Heterogeneous Power Distributions to Nodes: A Design Approach", International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868 Foundation of Computer Science FCS, New York, USA Volume 3– No.6, July 2012

[7] "Optimization Techniques to Improve Lifetime of Wireless Sensor Networks: A Review" ,International Conference on Energy Systems and Applications (ICESA 2015)

[8] "Computational Intelligence Techniques for Wireless Sensor Network: Review" ,International Journal of Computer Applications (0975 – 8887) Volume 118 – No.14, May 2015

[9] "Power Consumption Reduction for Wireless Sensor Networks Using A Fuzzy Approach" , International Journal of Engineering and Technology Innovation, vol. 6, no. 1, 2016

[10] "Artificial Intelligence for Wireless Sensor Networks, Enhancement" National University of Colombia - Campus Medellin Colombia .

[11] Pankaj Rangaree , Gajendra Asutkar, "Analysis of Supporting Cluster Head Routing Protocol in Dynamic Wireless Sensor Network" In Science and Engineering Research Journal ISSN 2347-6680 (E)