

A Review on Fuzzy Based Techniques for Energy Efficient Cluster Head Selection

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Abstract: WSN is isolated into various groups, bunching characterizes the system as well as parity our system and along these lines trouble out the lifetime of the framework. In each bunch based WSN, each sensor hub sends the expected data to the group leader of each bunch. The bunch head in charge of the total of the gathered data and send it to the sink of the sent system. In this paper a Fuzzy based upgraded CH determination calculation is proposed which watch the rest of the vitality, thickness of the hub and separation of the sink as contribution to Fuzzy derivation system. Eligibility list is determined for every hub for the choice of group head. This calculation picks the best contender for the character of the coordinator of the bunch by considering the likelihood doled out to every sensor hub.

Index Terms–Cluster head, Fuzzy, Energy Efficiency, WSN, Network Lifetime

1. INTRODUCTION

WSN[1] is playing a important role in distant or unattended continuous applications, for example, observing the ecological condition, checking the traffic, reconnaissance in war zone, natural disaster prevention, medical care, Health monitoring, weather monitoring, Industrial monitoring etc. Such network collects highly harmonize data where the end user required high level information sensed by the establish Sensor node(SN). The Sensor Node[2] in WSN Network is made from Sensor, Microcontroller, Power Unit and Communication Unit. The Communication Cost in Wireless Sensor Network is more than the Sensing and Computational Cost. Energy Efficiency is Major Issue in WSN which influence the overall performance of the Network.[3] Different clustering and Routing Protocols have been made to Form Efficient WSN. Different parameters should be kept in mind before deciding the CH OF THE Clusters. Nodes in WSN are periodically transmitting data to Base station. The Architecture of Wireless Sensor Network can be shown by Fig. 1.

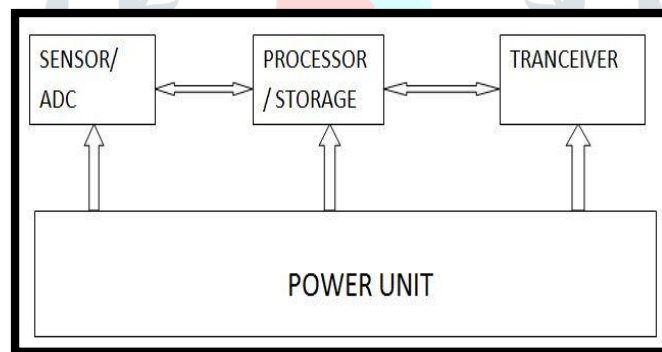


Fig. 1 Architecture of sensor node

In cluster base Routing we make small groups which we call clusters which help to minimize the Energy consumption by conveying data through cluster head. In Fuzzy based Routing, we use Fuzzy Techniques for the selection of Cluster head. Routing [4] in WSN is very Difficult Task, WSN need highly improvised Routing which not only need path selection but also need data collection. Clustering have many advantages like increase resource availability this anticipate the loss of significant time and data if a server falls, you can likewise appropriate activities crosswise over hubs in whatever setup you like, this diminishes the overhead. WSN have more prominent adaptability as your client base develops and report unpredictability expands, your assets can develop. The basic definition of Fuzzy is “not clear, distinct, or precise; blurred”. In other words, it is a form of knowledge representation suitable for notions that cannot be defined precisely, but which depend upon their contexts. In the recent days, fuzzy logic gains more interest in the design of cluster-based routing approaches in WSN. Many protocols use fuzzy logic in situations where the network is unstable and uncertainties are high. As fuzzy logic is flexible, fault tolerant, less complex and requires less computational resources, various fuzzy logic-based protocols have been developed to address clustering problem. Fuzzy logic analyses information using fuzzy sets. Each set is represented by a linguistic term such as “Far”, “Warm”, “High”, etc. A fuzzy set is used to describe the input and output fuzzy variable and is characterized by a membership function. The membership function represents degree of belongingness of each crisp input x to fuzzy set F . It provides mapping of each input value to a membership value in the interval $[0, 1]$, where a membership value close to 1 indicates that the input belongs to the fuzzy set with a high degree, while small membership values mean that this fuzzy set does not suit this input very well.

2. Related Work

In this paper We studied few routing protocols based on Fuzzy based Routing[5] for thick wireless sensor Network, That utilizes Fuzzy rationale to decide, improve the existing routing approaches, NORA, boost with the Insertion of a fuzzy-logic-based system to be the basis of The decision making procedure, but this protocol not focused on observant on the incorporation of Other parameters to the decision system, as well as the incur-Portion to the standard ZigBee of the systems genius Posed in this. Than

we study MOFCA calculation considers remaining vitality levels, separation to the sink, and Density parameters in count of the bunch head rivalry span while utilizing fluffy rationale for beating the vulnerabilities happening, but expected (willful, purposeful) hub area changes and vitality utilization because of this deliberate portability Can likewise be considered for algorithmic assessment in future work. After that we study vitality effective bunching calculation has been proposed for Wireless Sensor Network utilizing fluffy rationale idea. By choosing appropriate fluffy descriptors one Super Cluster Head is chosen among the bunch heads who is the agent for conveying the message to a portable base station. Than Swarm intelligence based SIF bunching convention regarding limiting the intra-group separations, delaying the system lifetime, and amplifying the complete number of information bundles got in the sink, The SIF convention can be stretched out for the systems with versatile sensor hubs and portable sink by thinking of some as topology changes, extend the SIF protocol to multihop routing. Fuzzy Based Unequal Clustering[7] and ACO Based Hybrid Routing Protocol Eliminate problem area Problem and expand the system lifetime, center around the plan of fluffy rationale with extra parameters, for example, interface quality, inclusion Redundancy and related parameters. Vitality productive lattice based steering calculation utilizing clever fluffy guidelines for remote sensor systems proposed calculation is that it saves more vitality and it grows the lifetime of the systems administration framework, Future works in this matrix based directing methodology is that it is conceivable to broaden this calculation for sensor systems with versatile hubs so as to suit the portable applications.

Table 1 Literature review of various fuzzy based techniques

YEAR	PROPOSED WORK	TARGETTED ATTRIBUTES	WORK DONE	PITFALLS
2013	Fuzzy-logic based routing for dense wireless sensor networks	Productive directing methodologies give system burden parity to broaden organize lifetime, Efficiency improvements and data loss avoidance	NORIA is a novel role-based routing protocol that makes use of Fuzzy logic to make decisions, improve the existing routing approaches, NORA, improved with the addition of a fuzzy-logic-based system to be the basis of	focused on the incorporation of other parameters to the decision system, as well as the incorporation to the standard ZigBee of the techniques pro-Posed herein.
2015	Multi objective fuzzy clustering algorithm for wireless sensor network	Multi objective fuzzy clustering algorithm that addresses both hot spot and energy hole problem in evolving network	Proposed MOFCA calculation considers remaining vitality levels, separation to the sink, and thickness parameters in figuring of the bunch head rivalry range while utilizing fluffy rationale for conquering the vulnerabilities happening	Intended (voluntary, deliberate) node location changes and energy consumption due to this intentional mobility Can also be considered for algorithmic evaluation.
2016	A Fuzzy Logic based Clustering Algorithm for WSN to extend the Network Lifetime	Super group head (SCH) is chosen among the CHs who can just send the data to the portable BS by picking appropriate fluffy descriptors, for example, remaining battery control (RBP), Mobility of BS and Centrality of the bunches	A vitality effective grouping calculation has been proposed for Wireless Sensor Network utilizing fluffy rationale idea. By choosing reasonable fluffy descriptors one Super Cluster Head is chosen among the bunch heads who is the agent for conveying the message to a versatile base station	Hot spot problem
2016	Swarm intelligence based fuzzy routing protocol for clustered wireless sensor networks	We propose a swarm intelligence based fuzzy routing protocol (named SIF), in order to overcome the mentioned drawbacks, of generating unbalanced clusters	Proposed SIF grouping convention as far as limiting the intra-bunch separations, dragging out the system lifetime, and augmenting the all out number of information bundles got in the sink.	The SIF protocol can be extended for the networks with mobile sensor nodes and mobile sink by considering some topology changes, extend the SIF protocol to multihop routing
2017	An Adaptive Multi-Clustering Algorithm using Fuzzy Logic in Wireless Sensor	Selecting the most eligible nodes as cluster heads	Reduction of energy consumption and saving more energy within the network	Hot spot problem
2017	Fuzzy based leach protocol in WSN	Cluster head selection and energy efficient protocol to extend the lifetime of network	The modified function gives better election of CH among the nodes , the node which elect as CH effective in reduction of energy	Hot spot problem

2018	Fuzzy Base Unequal Clustering And ACO Based Hybrid Routing Protocol	Focus on the outline of soft method of reasoning with additional parameters, for example, association quality, consideration Redundancy and related parameters.	Eliminate hot spot Problem and maximize the network lifetime	Concentrate on the illustration of fluffy rationale with extra parameters such as connection quality, inclusion Redundancy and related parameters.
2018	Vitality productive framework based steering calculation utilizing smart fluffy standards for remote sensor systems	Overcome the hot spot problem, Grid Coordinator selection, enhance the network performance, Mobility of nodes	Proposed calculation is that it preserves more vitality and it grows the lifetime of the systems administration framework	Future works in this lattice based directing methodology is that it is conceivable to broaden this calculation for sensor systems with versatile hubs so as to suit the portable applications

F-MCHEL[7] is homogeneous in nature which grasped the fleecy in case, by then standards to secure the most extraordinary lifetime of the framework. Opportunistic Routing Protocol based Cluster Head Election[9] was proposed., Dominating set and energy optimization step are created for the two phases of CH selection. The nodes which change their behavior dynamically are not considered for CH selection. Zadeh et al. in [10] described a new method to deal with the linguistic variables. It had some remarkable features. The fuzzy was used to overcome the drawbacks of probability approach adopted by the LEACH protocol for CH selection.[11] Three fuzzy descriptors are used namely, energy, concentration and centrality that helps in the CH selection. PFCM produces participation and potential outcomes at the same time, alongside the standard point models or group places for each bunch. PFCM [12] is a hybridization of possibilistic c-implies (PCM) and fluffy c-implies (FCM) that frequently evades different issues of PCM, FCM and FPCM. Clamor affectability imperfection of FCM is illuminated in PFCM, defeats the incidental groups issue of PCM and takes out the line total requirements of FPCM. Fuzzy Energy Aware tree-based Routing (FEAR)[13] protocol that aim to elongate the network lifetime by taking sensor limited energy into account. The cross layer mechanism is used to save the power. Proposed Fuzzy based Master Cluster Head Election Leach (F-MCHEL)[14] making some improvement in CHEF. In this methodology select just one bunch head as an ace CH who has most extreme vitality Instead of transmission from number of group heads to BS.

The DFLCP[15] method is applicable to analyze the desirable of the sensor node for its CH selection. The CH selection is done based on the residual energy and transmission range. The last stage cumulative sensor node for the whole network. a fluffy rationale based bunching approach with an augmentation to the vitality predication has been proposed to draw out the lifetime of WSNs by uniformly disseminating the remaining task at hand. It is seen that the proposed methodology performs route superior to different calculations. Group head determination convention utilizing Fuzzy Logic (CHUFL). It employs node's parameters namely, remaining energy, node density, quality of routing link with its neighborhood and distance from sink as fuzzy input variables for CH selection. Super-CH (SCH) is elected based on some parameters which include residual energy, mobility, centrality of clusters, etc. The selection super-CHs send data to the sink. Fuzzy inference engine (Mamdani's rule)[16] is employed to select the the SCH. T1FL model based on the interval type-2 FL model, The algorithm proposed to acquire the network lifetime and reducing the energy consumption in the network. Energy-Efficient Grid-based Routing algorithm for WSN. In this method, the routing process involves the grid coordinator aims to reduce the number of hops from one node to the other. Balanced cost CH selection algorithm (FBECS)[17] that consider remaining energy, a fuzzy distance and node density for the input variable to the Fuzzy Inference System. It is the Eligibility index that decides for the selection of node as CH. The proposed scheme FBECS is compared with BCSA and LEACH for the better optimal network performance.

3. Conclusion

WSN has been affecting human lives since its invention, as it helps to collect data from the remote areas where human intervention is not possible. In the direction of acquiring energy efficient routing, there have been various techniques; the fuzzy based routing strategies are one among them. In this paper, we have studied and evaluated various state-of-art fuzzy based techniques that have saved energy of the nodes comprehensively. The tabular comparison is given to empirically evaluate the performance of different fuzzy based protocols. After comprehending various techniques, it is observed that these protocols have outperformed the other conventional protocols.

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