Energy Efficient and Secured Clustering Algorithm using Fuzzy Logic with K-means Method in MANET

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Abstract

**Background/Objective:** To identify and survey more suitable routing protocol for MANET. **Methods/Finding:** In this study, we present a fuzzy bunching calculation which improves the vitality proficiency of LEACH convention by utilizing a superior group head determination arrangement. For this proposes, we apply the quantity of live neighboring nodes and remaining vitality of system nodes to choose better nodes for grouping. **Application:** By making progressively symmetric groups, our plan decreases the vitality utilization of the sensors and this at long last builds the lifetime of the sensor arrange.

**Keywords:** Alive Nodes, Energy Consumption, Fuzzy Logic, LEACH, Lifetime of Network, MANET

1. Introduction

Numerous elements influence the bunching calculations in MANET, for instance the rest of the vitality in the sensor nodes and the separations from their BS. In any case, if the issue is cautiously broke down, different variables can be considered. Acquiring an ideal bunching arrangement requires scaling every parameter by a weight relating to its effect on the disseminated vitality and system lifetime. In this way, if the bunching calculation abuses more vitality influencing factors, the grouping will be progressively proficient. The Fuzzy Inference System (FIS) is an effective displaying device to consolidate parameters for better parameter coordination results.

We present a fuzzy based incorporated bunching system for vitality productive steering conventions in MANET. The proposed bunching procedure utilizes fuzzy rationale to choose CHs and implements a partition separate between them for even CH dispersion through the secured zone. Partition separate is determined adaptively dependent on the quantity of staying live nodes, the elements of the territory secured by these nodes and the level of the ideal CHs.

The proposed fuzzy model uses five parameters to organize chances of sensor nodes’ CH decision. These variables are: The rest of the vitality of the sensor node, separation to the BS, thickness of encompassing sensor nodes (which are plausible group individuals for the present sensor node whenever chose as a CH), compacting of encompassing sensor nodes, lastly, the area appropriateness determined by means of the normal of the neighborhood expended vitality for the encompassing nodes. A remote sensor organize (MANET) comprises of countless sensor nodes which gather information structure condition and send them to the base station through radio transmitter\(^1\). To keep the expense and size of these sensors little, they are outfitted with little batteries, which confine them to have restricted power and computational limit. This puts noteworthy limitations on the power accessible for correspondences and influences the information rate just as transmission range\(^2\). Notwithstanding, against such confinements, MANETs can be utilized in different applications, for example, military, biomedical and ecological applications\(^3\).

Bunching gives an effective method to spare vitality inside MANETs and empowers productive asset allotment and it likewise improves the MANET’s adaptability. By and large, bunching in MANETs is characterized as the way toward isolating the system nodes into gatherings, where each gathering concurs on a focal node, called
the group head\(^4\). The group head or CH goes about as a scaffold between other sensor nodes and base station and now and then between one bunch head and other group head in multi-jump cases\(^5\). Group heads have duty of territory protecting, including or leaving of nodes, planning schedule openings for every node, information accumulation and the executives of messages among nodes and base station\(^6,7\). Sensors conveyed in various areas work together to assemble information and send to bunch head which is additionally exchanged to base station or another group head in the wake of preparing LEACH is one of the set up grouping based directing conventions in MANET\(^8\). The determination of bunch head in LEACH is done haphazardly and the information that transmit between the group head and the base station is done specifically which will in general fumes the sensor battery quickly\(^9,10\).

In this study, we propose another fuzzy rationale based grouping calculation which gives a progressively proper bunch head determination technique by utilizing the quantity of live neighboring nodes and remaining vitality of system nodes as shown in Figure 1.

### 2. Literature Survey

AODV-efficient and Dynamic Probabilistic Broadcasting (EDPB) approach which is very effective and dynamic in nature and takes care of the communicate storm issue in AODV. The recreation was finished utilizing Global Mobile Simulator (GloMoSim). Normal start to finish delay and steering overhead are considered as principle execution assessment measurements. The outcomes demonstrate that the proposed calculation has better execution over the customary AODV convention and AODV actualized with visually impaired flooding and with fixed probabilistic flooding.

Cluster-based Routing Protocol (CBRP) and it was contrasted and Ad hoc on-demand Distance Vector (AODV) and Dynamic Source Routing (DSR). It was thought about based on parameters, for example, parcel conveyance portion, standardized steering overhead and normal deferral with contrasting respite time and shifting number of sources. The reproduction tests are performed utilizing GLOMOSIM by assessing measurements like Packet Delivery Ratio (PDR), Average start to finish deferral and normalized steering overhead. The proposed strategy accomplished a low Routing Overhead than AODV.

AODV Accessibility Prediction (AODV-AP), a framework where the AODV nodes are made mindful of the openness of the neighbor nodes. The openness data of the neighboring nodes is gained through routine directing activities. The data is then refreshed in their directing tables. Afterward, this data can be utilized to improve directing tasks. The availability data is valuable to limit the course revelations to maintain a strategic distance from blocked off nodes. NS-2 (discharge 2.28) is utilized for the reproduction purposes.

Fuzzy Ant Colony based steering convention (FACO) in light of fuzzy rationale and swarm insight. The proposed convention chose ideal way by improvement of numerous targets dependent on the swarm based knowledge calculation. They directed analyses looking at the execution of the FACO, Ant-settlement based Routing Algorithm (ARA), Ant-AODV conventions. In these tests, the creators utilized the discrete time organize test system, NS-2. Fifty versatile nodes are spread inside a 1500 m by 300 m zone and moves as indicated by the arbitrary waypoint portability demonstrate. Every node had 250 m of radio scope of and 2 Mb/s channel limit. Recreation results demonstrate that the proposed convention performs superior to anything the current swarm insight based steering conventions utilized in MANET.

Tomar (2008) defeated flooding issue in the system by exhibiting a calculation, which utilized particular flooding instead of broadcasting. It is proposed to diminish the quantity of bundles inside the system. This lessens the directing Packet overhead. The conventions have been recreated utilizing NS-2 as a test system. The conventions DSDV, DSR and AODV are reenacted on NS-2 with a system with fifty versatile nodes which are moving and speaking with each other. The ideal objective of the examination was to gauge the capacity of the directing conventions for example effectively conveys information bundles to goals.

![Figure 1. Network clustering.](image-url)
3. Problem Statement

We have center around building up a calculation utilizes the Fuzzy cost created by enrollment work and scaled components can choose to advance the course bundle for next jump to diminish radiation (Energy Efficient) and furthermore can fuse Security for bunting (participation) in MANET.

Utilizing fuzzy rationale control, one is the setting of a reasonable standard base for the application, while the other is the choice of scale factors before fuzzification and after defuzzification. Presently utilizing the cost measurements of MANET can build up the scale factor and the standard based participation work. The improvement of groups and course finding for most limited way should be possible utilizing the scaled factor and part work.

Security in MANET is a fundamental part for essential system capacities like bundle sending and directing. A specially appointed system is a gathering of remote portable hosts shaping an impermanent system without the guide of any settled foundation or unified organization. In such a domain, it might be fundamental for one portable host to enroll the guide of different has in sending a bundle to its goal, because of the restricted scope of every versatile host’s remote transmissions. Portable impromptu systems (MANET) don’t depend on any fixed foundation yet impart in a self-composed.

3.1 Objectives

The fundamental target of this work is to build up the system to do utilizing fuzzy rationale control, to getting of a reasonable standard base for the application, while the other is the choice of scale factors preceding fuzzification and after defuzzification.

- To examine the existence time of the system.
- To decrease the vitality utilization of the node.
- To improve the execution of the system.
- Capability to deal with both portable and static nodes.
- Developed a calculation that finds the ideal synchronization time frame to spare vitality in numerous nodes.
- The proposed look into improves best in class by investigating better approaches to spare vitality while guaranteeing high adaptability and dependable activity of MANET.
- Developing a calculation utilizes the Fuzzy cost created by participation work and scaled elements can choose to advance the course parcel for next jump to lessen Energy and furthermore can consolidate Security for grouping (enrollment) in MANET.

4. Proposed Energy Efficient Clustering Algorithm using Fuzzy-K Means Algorithm

The primary target of the proposed vitality proficient grouping plan is to give adaptation to internal failure. The group arrangement has a few stages:

- We should setup the limit esteem.
- To measure the vitality level for nodes.
- To set counter time.
- First the most extreme vitality dimension of node goes about as bunch head.
- After time out we should gauge next most extreme vitality dimension of node, at that point the greatest vitality level node go about as next bunch head.
- Suppose new node arrived, we should quantify the vitality dimension of that node too.
- Likewise the above edge esteem nodes are going about as bunch head.

The fundamental objective of this grouping is to evade single connection disappointment and system life time improved. It can spare group head vitality.

The principle venture in performing bunching is the choice of the group head. Here this procedure is done utilizing Fuzzy Logic and K implies bunching calculation. Fuzzy rationale is a control approach and furthermore a method for handling information dependent on the enrollment works. The Fuzzy module being inserted in the sensor node with set of very much characterized standards, gives us the capability dimension of that specific node for being a group head. The K implies grouping Algorithm utilized in the Base station at that point picks the best among the certified nodes and chooses them as the bunch head. In the event that once the group head is chosen, at that point the comparing part nodes will send the information to that specific Cluster Head and these Cluster Heads total the information got and after that sends the expected infor-
mation to Base station. At that point it is said to be culmination of one round. After every single round, the base station again checks the vitality dimensions of the sensor nodes and grouping is performed if necessary.

To accomplish most extreme advantages from fuzzy rationale for CH race, it is important to investigate the elements that affect CH decision, utilize viable intends to gauge every one of these variables, and assemble a productive fuzzy model described by the powerful blend of fuzzy standards and the fitting structure for the fuzzy sets. In like manner, the proposed FIS show conspires in Figure 2 is worked to meet the previously mentioned necessities so as to accomplish a productive CH decision in MANET.

4.1 The Proposed Clustering Technique FL-EEC/D

The FL-EEC/D system utilizes the previously mentioned fuzzy model for CH decision. It controls the appropriation of CHs dependent on deciding and upholding a particular least partition remove between CHs to ensure their reasonable dissemination. Each CH must be a long way from the nearest CH by the separation d, as a base. The separation d is versatile relying upon the elements of the MANET, the quantity of nodes and the ideal CHs rate. It is registered utilizing Algorithm 1.

![Fuzzy system](image)

**Figure 2.** Fuzzy system.

**Algorithm 1 Calculation of the minimum forced distance between CHs.**

```
function CALC_MIN_DIST(N, p, dimX, dimY)
    cc ← ceiling(p × count(N))
    c ← 1
    r ← 1
    df ← cc − 1
    l ← 1
    while l ≤ ceiling(√cc) do
        l ← l + 1
        while j ≤ l + 1 do
            if df ≥ |cc − (l × j)| then
                cc ← |cc − (l × j)|
                c ← l
                r ← j
            end if
            j ← j + 1
        end while
        l ← l + 1
    end while
    rX ← dimX
    rY ← dimY
    d ← \sqrt{\frac{rX \times rY}{cc}}
    return d
end function
```

\( d: \) minimum distance between CHs
4.2. Evaluation of FL-ECC/D

A relative assessment of FL-ECC/D is performed utilizing numerous situations, to represent and approve its conduct under various densities, scanty, moderate or thick and through various places of the BS. The correlation depends on the measurement of vitality adjusting and arrange lifetime as far as FND, 10PND, QND, and HND. All nodes in the situations are arbitrarily circulated over a region of 200 _ 200 meters.

The proposed FL-ECC/D is similarly assessed for the instance of situating the BS at the focal point of MANET. Figures 3 and 4 look at the accomplished normal lifetime of FL-ECC/D for FND, 10PND, QND, and HND, separately, against the accomplished normal lifetime of LEACH, FL[1]/D and K-means LEACH. The system sizes are 50, 100, 200, 300 and 400 nodes.

5. Conclusion

Vitality is one of the essential issues which ought to be considered in the MANET. Grouping is a basic system the board task that can be utilized to lessen the vitality utilization of system and improves the lifetime of MANET. FISs are the best decision for structure compelling grouping calculations/methods for vitality proficient directing conventions in MANET, because of its high capacity of consolidating and viably mixing info parameters to deliver appropriate choices about CH determinations. To accomplish the most ideal consequences of vitality proficient directing conventions in MANET, it is prescribed to use each parameter affecting the vitality productivity of the MANET steering convention. The fuzzy framework utilized in the derivation motor of this plan is the Mamdani fuzzy framework which is a straightforward guideline base strategy. This plan makes symmetric bunches and decreases the absolute node to cluster head remove.

6. References

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