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# Design of Multi-Rate WLANs Using Non-Linear Algorithm

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**Abstract**: The main aim is to investigate the problem of achieving proportional fairness via AP association in multi-rate WLANs. This problem is formulated as a non-linear programming with an objective function of maximizing the total user bandwidth utilities in the whole network. Such a formulation jointly considers fair- ness and AP selection. We first propose a centralized algorithm NLAO-PF to derive the user-AP association via relaxation. Since the relaxation may cause a large integrality gap, a compensation function is introduced to ensure that our algorithm can achieve at least half of the optimal in the worst-case. This algorithm is assumed to be adopted periodically for resource management. To handle the case of dynamic user membership, we propose a distributed heuristic BPF based on a novel performance revenue function, which provides an AP selection criterion for newcomers. When an existing user leaves the network, the transmission times of other users associated with the same AP can be redistributed easily based on NLAO-PF.

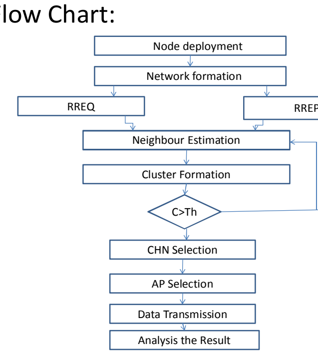
**Keywords**: AP association; bandwidth allocation; multi-rate WLANs; proportional fairness.

## I. Introduction

The advancements in wireless communication technologies enabled large scale wireless sensor networks (WLANs) deployment. Due to the feature of ease of deployment of sensor nodes, wireless sensor networks (WLANs) have a vast range of applications such as monitoring of environment and rescue missions. Wireless sensor network is composed of large number of sensor nodes. The event is sensed by the low power sensor node deployed in neighborhood and the sensed information is transmitted to a remote processing unit or base station. To deliver crucial information from the environment in real time it is impossible with wired sensor networks whereas wireless sensor networks are used for data collection and processing in real time from environment. The ambient conditions in the environment are measured by sensors and then measurements are processed in order to assess the situation accurately in area around the sensors. Over a large geographical area large numbers of sensor nodes are deployed for accurate monitoring. Due to the limited radio range of the sensor nodes the increase in network size increases coverage of area but data transmission i.e. communication to the base station (BS) is made possible with the help of intermediate nodes.

Depending on the different applications of wireless sensor networks they are either deployed manually or randomly. After being deployed either in a manual or random fashion, the sensor nodes self-organize themselves and start communication by sending the sensed data. These sensor networks are deployed at a great pace in the current world. Access to wireless sensor networks through internet is expected within 10-15 years. There is an interesting unlimited potential in this wireless technology with various application areas along with crisis management, transportation, military, medical, natural disaster, seismic sensing and environmental. There are two main applications of wireless sensor networks which can be categorized as: monitoring and tracking.

Flow Chart:



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## II. MODULES

*A. Network Formation*

The simulation is done in ns2. In the simulation model, there are 50 sensor nodes deployed in a 800x600 m2 field. All the nodes are set as static nodes. The type of the wireless propagation model is Two Ray Ground. Routing protocol which is used in this simulation is AODV.

*B. Neighbor Estimation*

Where a HELLO message is only sent to a destination that is not in the neighbor list. This difference can provide less routing packets and therefore, better normalized routing load. Algorithm can smartly find neighbors while sending and receiving RREQ and RREP. This implementation permits the protocol to discover neighbor nodes quickly and utilize neighbor node information in the route discovery process.

*C. Cluster Formation*

Cluster formation methodology: In most recent approaches, when CHs are just regular sensors nodes and time efficiency is a primary design criterion, clustering is being performed in a distributed manner without coordination. In few earlier approaches a centralized (or hybrid) approach is followed; one or more coordinator nodes are used to partition the whole network off-line and control the cluster membership.

*D. Leader Election*

Probability of a node to become leader is calculated based on following three descriptors: Residual energy,Proximity to Base Station ,Weighted density. Weighted-density of node is product of the density (number of alive neighbors available for the node) and the fraction of the current and initially supplied energy available at the node at a particular time instant.

*E. Packet Forwarding*

The dynamic selection of the forwarding zone represents a mechanism for reducing the number of candidate relay nodes. To this purpose, a node, upon receiving the data packet, evaluates its own gain function and compares it to a, so called, Threshold. The selection of the threshold is an interesting feature since it basically allows restricting or enlarging the area where nodes are required to forward the packet

*F. Analysis*

We will analysis our research to following Parameters:
Packet Delivery ratio
Residual Energy
Delivery Latency

## III. CONCLUSION

We investigated the challenging issues pertaining to the collection of the ``big data'' generated by densely distributed WSNs. To address these challenges, we proposed a mobile sink based data collection method by introducing a new clustering method. Our clustering method is based upon a modified Expectation-Maximization technique. Furthermore, an optimal number of clusters to minimize the energy consumption was evaluated. Numerical results were presented to verify the effectiveness of our proposal.

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