Magnify Lifeless Nodes in WSN Using Shortest Path ALGO for Reducing Energy Diversion

Mohit Bakshi, Anugrah Srivastava

***Abstract*— To magnify network of lifeless node in Wireless Sensor Networks (WSNs).The selection of path for data deportation are eclectic in such a form that the over all energy absorbed along the path is lessen. Wireless sensor network is a set of a large number of small devices which gain information from physical environment using sensor nodes. These nodes measure, store and send the information to other nodes in the network. To transmit data sensor nodes require battery power. So power boost is a major issue in wireless sensor network. To support high extensible and better data gathering, sensor nodes are often grouped into dislocate, non-flapping subsets called clusters. An efficient routing algorithm is required to utilize power of nodes. In this paper we aim to improve network lifetime using LEACH based protocol. We are using DBEA-LEACH (distance-based energy aware) additionally selects a cluster head not only based on distance, but also by examining residual energy of the node greater than the average residual energy level of nodes in the network. We propose the enhanced LEACH convention for first node die time upgrade. In this paper i am doing one more enhancement to use Dijkstra's algorithm as routing algorithm to reduce power consumption. We are using Dijkstra"s algorithm to reduce the power consumption and finding the shortest power consumed path between Source to Destination using minimum number no nodes.**

***Index Terms*— Network Clustering; routing protocol; LEACH; WSN; Node improvment; Lifetime; DBEA-LEACH; Dijkstra's algorithm.**

I. INTRODUCTION

Wireless Sensor Networks (WSNs) have gained booming interest in recent years. Wireless sensor network is a collection of a large number of small devices which collects information from physical environment using sensor nodes. They are used in various fields: military, agriculture, meteorology and medicine. Wireless sensor network is a set of a large number of small devices which gain information from physical environment using sensor nodes. These nodes measure, store and send the information to other nodes in the network. To transmit data sensor nodes require battery power. So power boost is a major issue in wireless sensor network. It's arduous to recharge or to change batteries in the battery-powered sensor nodes. That is the reason why many researchers have been incorporated to increase the network life time.[1]. To support high extensible and better data gathering, sensor nodes are often grouped into dislocate, non-flapping subsets called clusters. LEACH (Low Energy Adaptive Clustered Hierarchy) as the name suggests optimize the limited capacity of battery to Prolong network lifetime and improving quality of service. In wireless sensor network (WSN), a large number of low power sensor nodes jointly gather information from their surrounding environments and transmit them towards the Base Station[2]. In LEACH Clusters are created and a cluster head (CH) is assigned to each cluster. These Cluster heads are also known as Master Nodes. Cluster Heads are responsible for collecting and processing the data from their respective clusters, and transmitting this data to the BS. In data processing the power consumption is larger than in data transmission. The aggregation of data at CHs greatly reduces the energy consumption in the network by minimizing the total data messages to be transmitted to the BS. Also, the CHs act as local sinks for the data, so that data are transmitted over a shorter transmission distance [5]. The process of cluster formation consists of two phases, cluster-head election and assignment of nodes to cluster-heads. The clustered WSN compromises three types of entities: the base station, cluster head sensor node and non-cluster head sensors. This is done by adopting different strategies for selecting the cluster heads, their threshold values and monitoring different parameters like the energy level and distance between them.

We are using DBEA-LEACH (distance-based energy aware) additionally selects a cluster head not only based on distance, but also by examining residual energy of the node greater than the average residual energy level of nodes in the network. We propose the enhanced LEACH convention for first node die time (FDT) upgrade. In this paper i am doing one more enhancement to use Dijkstra's algorithm as routing algorithm to reduce power consumption.

In standard protocols with every round the energy of nodes decays until the node dies. In some protocols nodes directly transmit the data to the base station and the energy consumed by nodes is larger because larger transmission power is required to transmit the data to base station. The nodes which are farthest will die earlier because of larger transmission distance.

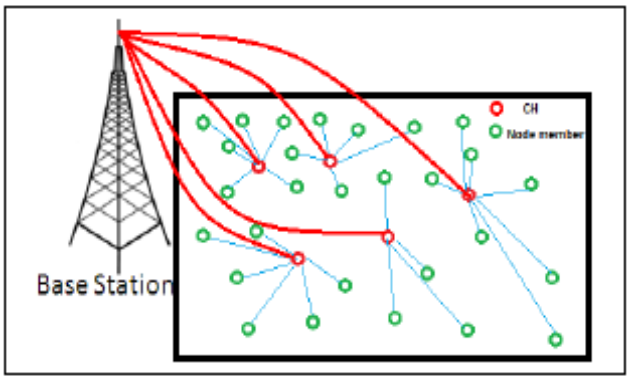


Fig 1 Wireless sensor network

Mohit Bakshi, M.Tech. Scholar, CSE Department, FET, RAMA University, Kanpur
Anugrah Srivastava, Assistant professor, CSE Department, FET, RAMA University, Kanpur

II. RELATED WORKS

LEACH protocol is a basic hierarchical protocol for the WSN. It's made up of nodes cluster. Each cluster has a special node as cluster head. This latter collects data from nodes that belong to the respective cluster and transmits it to the base station [1][2].

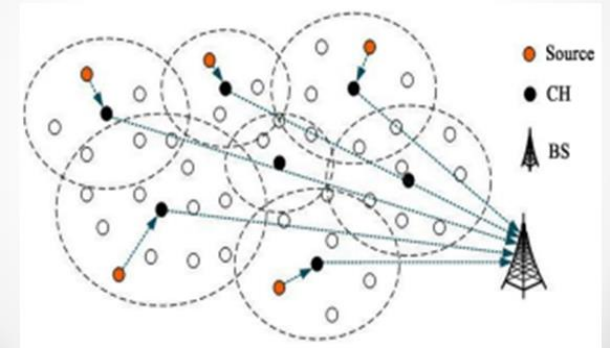


Fig 2 Leach diagram

LEACH protocol has two phases, the set up phase and the steady state phase. In set up phase, the clusters are formed and the cluster heads are chosen. Each node decides if it will become a cluster head. The decision is made by the node selecting a stochastic number between 0 and 1. If the number is less than a threshold T(n), the node becomes a cluster head for the current round [1].

The threshold is set as.

$$T(n) = \begin{cases} \dfrac{p}{1 - p * [r \bmod \left(\frac{1}{p}\right)]} \end{cases}$$

- p is the probability of needed being selected as a cluster head node.
- r is the number of rounds passed .
- G is the collection of ordinary nodes mod denotes modulo operator.

In the steady state phase the cluster head is maintained and the data is transmitted between nodes. The cluster head sends all the data to the base station after receiving and aggregating it. Each cluster communicates using the TDMA technique,

which divides time of communication by duration, each time duration corresponds to a node of the cluster that can deliver data in their time slot. A node is free only when a node is out of area or dead

III. METHODOLOGY

A new approach using LEACH is proposed which focus on lifetime maximization as well as on Quality of Service (Qos). The performance of WSN depends upon many parameters but lifetime maximization is important aspect of any network. In proposed method for improving lifetime an Qos, few parameters are chosen i.e. node died time Enhancement and cluster head selection probability using DBEA-LEACH and after once we about to know that which node is died first or which node become a lifeless in WNS after that we using Dijkstra's algorithm for finding the shortest path between the base node to destination node.

In FDT time enhancement is said to be where Stability period is the time when death of the first node occurs. This time is also known as the First node die or first node death time of node.

In DBEA-LEACH protocol the selection process for Cluster head node is more likely to be selected as a cluster head if the distance of it from the BS is nearly equal to the average distance of the network sensor nodes to the BS.

The below figure shows that before and after formation of cluster and how cluster head helps to improves the quality of service and maximization of lifetime of wireless sensor network[3]. Fig 4, shows how cluster head select and how send the data to the base station.

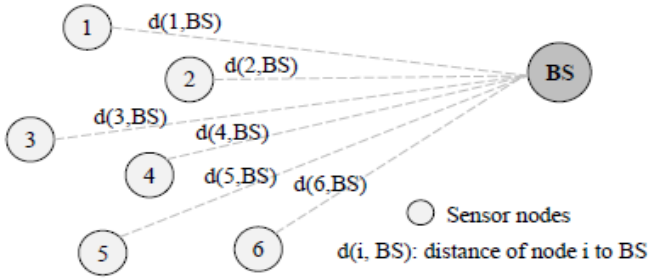


Fig 3 Example of before the formation of cluster

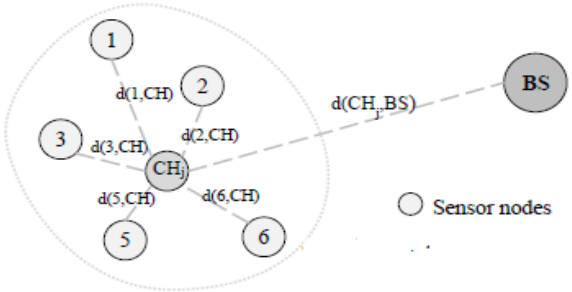


Fig 4 Example of after the formation of cluster

DIJKSTRA ALGO FOR POWER OPTIMIZATIOM

Dijkstra's algorithm,[5] conceived by computer scientist Edsger Dijkstra in 1956 and published in 1959, solves the single-source shortest path problem for a graph with non-negative edge path costs, producing a shortest path tree. This algorithm is often used in routing and as a subroutine in other graph algorithms.

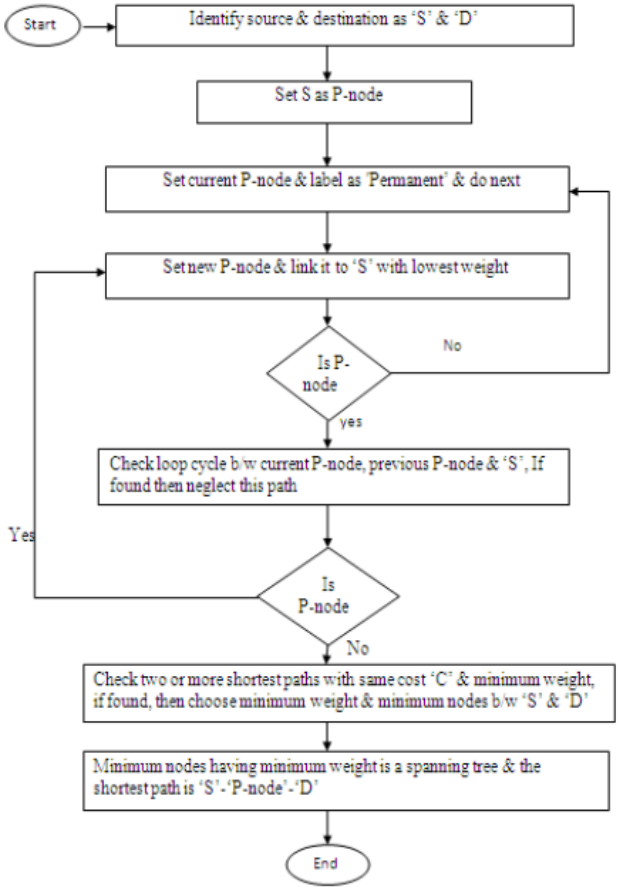
Classical Dijkstra's algorithm is used to solve the shortest path problem from one source node to all other. nodes in a graph. This paper uses modified Dijkstra's algorithm as routing algorithm. Modified Dijkstra's algorithm find shortest path from single source node to single destination node. Dijkstra's algorithm assigns tentative distance value to each node in network. Initially a value of zero is assigned to source node and infinity to other nodes. It divides the nodes into two sets: - tentative and permanent.[5]

Proposed Dijkstra's Algorithm[10]

1. Choose a network area with sensor nodes.
2. Identify source and destination node as S & D.
3. Fix source node as P-node(permanent node)
4. Search nearest sensor node. Set it current P-node, label permanent & do next.

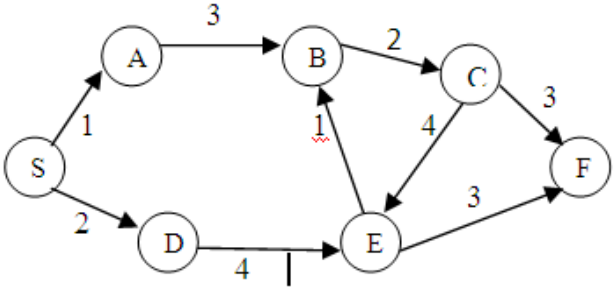
5. Set new P-node & link it to current p-node with lowest weight.
6. Check loop between current P-node, previous P-node and source „S". If found neglect this path and go back to step 4.
7. Check two or more shortest paths with same cost C & minimum total weight of path. If found then choose minimum nodes between „S „to „D".
8. Fix destination „D" as P-node.
9. Spanning tree having minimum cost & minimum nodes of network and the path of spanning tree is a best way to save power in WSN.

Flow chart-



IV. ANALYSIS

The proposed method of increasing the lifetime of nodes mainly depends on the battery usage. In the proposed method, if we can reach from Source to Destination in same cost with two different paths P1 & P2 then select minimum path weight as well as minimum nodes between Source to Destination.[9]



There are four possible paths between Source to Destination.

1) S, A, B, C, F
2) S, A, B, C, E, F
3) S, D, E, B, C, F
4) S, D, E, F

V. CONCLUSION

Lifetime of network is defined by the lifetime of the nodes of the network. Lifetime of the nodes is constrained by the limited battery power level. A node when transmit data in network consumes battery power. Poor utilization of battery power of nodes may lead to network failure or data loss. So power optimization is a major issue in wireless sensor network. This paper proposed Dijkstra's shortest path algorithm with other two protocols DBEA-LEACH and FDT-LEACH.The proposed hierarchical routing protocol increases the number of packets received at the sink by adapting cluster-head selected in consequent rounds is decided based on the residual energy and distance to the base station and other side Dijkstra's algorithm finds an optimal path between a source node and destination node in network, if one exists. Optimal path routing reduces the power consumption, hence increases the lifetime of wireless sensor network .Although our proposals can achieve performance improvements, still many aspects of its design need to be investigated.

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