Performance Evaluation of MCHSEP and SEP protocol for Wireless Sensor Networks

L. Jagadeesh Naik, K.V. Ramanaiah, K. Soundara Rajan

ABSTRACT--- The major difficult problems in wireless sensor networks are energy and latency. In this paper to designing routing new protocol based on energy and delay the MCHSEP (Mini Cluster Hierarchical Stable Election Protocol) protocol is proposed which is amendment of the SEP-protocol to enhance the stable period of the network by proficient clustering technique. MCHSEP protocol deals with the network supported density of the nodes range of mini clusters created whereas introduce an efficient mechanism for connections surrounded by nodes. MCHSEP protocol will enlarge the stable amount of the wireless sensing element network by making no of mini clusters with during a cluster assignment MCHs. The MCHs send message to CH and CHs transmit data to Base Station. Cluster formation like SEP protocol only. The performance of SEP and MCHSEP routing protocols in wireless sensor networks is evaluated and compared. The result has been conceded out by varying number of sensor nodes using NS2.

Keywords— MCHSEP, SEP, Wireless Sensor Networks, Energy, Routing.

I. EXISTING TECHNIQUES

The routing protocol for wireless sensor networks for most part classify by means of their routing approach and network configuration. the Geographic positions, hierarchical routing and flat routing and routing. The LEACH is proposed in Heinzelman, which is basic and well accepted and defined protocol in the literature. LEACH protocol cluster formation is based on architecture of randomize turning round of the Cluster Heads to uniformly share out the energy resources across the network. The wireless sensor networks nodes are grouped into numerous various clusters, one of the WSN nodes is chosen to be Head. Every WSN node put out its information to their belongs head nodes. The head node sends the gathered information to sink node. the process between every WSN nodes and every CH(Head Node) and that between CHs and the sink node are direct and one-hop broadcast. SEP (Stable Election Protocol) [1] have good permanence and more stable period with through put than exiting clustering heterogeneous WSN protocols. So each and every WSN node in a heterogeneous network have two levels hierarchical network alone elects itself as a head node of cluster based on its preliminary power relative to that of other WSN nodes in cluster.

D-SEP[1] protocol has choosing head node in cluster is disseminated approach in two, three, many levels of hierarchical WSN. The important enhancement has been using D-SEP in evaluation with SEP consumption of the energy, information spread and WSN lifetime to sink node. D-SEP main objective is to extend WSN lifetime and permanence of the WSN in the existence of heterogeneous WSN nodes. Since CH(cluster-head) consume additional energy than cluster members node in processing of gather information from their element nodes, performing signal special consideration and broadcast the aggregated information to subsequently WSN node or Sink Node. D-SEP is 4.3 time's increased stable period than SEP. The simulation results indicate that stability period of network D-SEP is more stable period when compared with protocol of SEP.

Z-SEP [1] scheme for heterogeneous atmosphere: two-levels of heterogeneity. The sensor network scenario is separated in to three zones: Zone 0, Head Zone one of the network and Zone two head of the network. Normal nodes are placed into a zone zero to diminish the energy consumption and zone zero nodes broadcast data directly to sink station of the WSN. The 51% of advanced WSN nodes are placed in zone one. and remaining 51% placed into zone two and they make use of clustering method to transmit data to sink station of the WSN network. The stability period is improved just about 51%, by varying the operation of the variety of types of node in various zones in the networks based on their energy requirement. Z-SEP also less energy consumption of the networks when compared with WSN networks protocol like LEACH and SEP.

Z-SEP [1] scheme for heterogeneous atmosphere: two-levels of heterogeneity. The sensor network scenario is divided in to zones likes Zone 0, Head Zone 1 and Head Zone 2. Normal nodes are only deployed in zone 0 to reduce the energy consumption and they transmit data directly to base station. Half of advanced nodes are deployed in Head zone 1 and half in Head zone 2 and they use clustering technique to transmit data to base station. The stability period is improved just about 51%, by varying the operation of the variety of types of node in various zones according to their energy requirement. Z-SEP is also increased compared with LEACH and SEP.

TDEEC [1] scheme which higher stability of the network and less energy consumed property of the heterogeneous wireless sensor network and hence increases the lifetime.

In this paper protocol is based on hierarchical routing for Wireless Sensor Networks, MCHSEP (Mini Cluster Hierarchical Stable Election Protocol), this protocol enhances the SEP method, gives a few exposure problems

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commencing which SEP protocol suffers, and also gives better performance than SEP protocol in terms of energy consumption , delay and packet delivery ratio. The MCHSEP protocol is basically two levels of clustering in WSN nodes to provide good communication between Sink nodes and WSN nodes.

II. SEP (STABLE ELECTION PROTOCOL)

In SEP protocol, latest head node of the cluster obtain chosen for every epoch and as end result the weight become fine circulated and unbiased in the middle of the nodes of the WSN. The best possible proportion of nodes is p_{opt} well thought-out that has to become cluster head in every round [1]. we've got assumed identical distributed algorithms to create clusters within the network. to come to a decision whether or not a node to become cluster head or not a threshold T(s) is self-addressed that is as follows:

$$T(s) = \begin{cases} \frac{p_{opt}}{1-p_{opt}.(r.mod.\frac{1}{p_{opt}})} x, if\ s \in G' \\ 0, otherwise \end{cases} \quad (1)$$

In the above equation 1 indicates that present round is r and G is the set of sensor nodes that contain not happen to group head surrounded by the last 1/popt rounds. At the start of every round, every node that be within the right place to the set G elects a arbitrary range zero or one. If the random number range may be a smaller quantity than the threshold T(s) then the nodes turn out to be a cluster head in the present surrounding.

$$E_{Tx}(l, d) = \begin{cases} L.E_{Elec} + L.\epsilon_{fs}.d^2, if\ d < d_0 \\ L.E_{Elec} + L.\epsilon_{mp}.d^4, if\ d \geq d_0 \end{cases} \quad (2)$$

Where ϵ_{fs} (free-space fading), E_{Elec} the power dissolute per bit to rush the receiver or transmitter circuit, and ϵ_{mp} (multi-path fading) area unit the energy expenditure of transmission one bit knowledge to realize a suitable bit error rate and d is that the distance between a cluster member node and its cluster head. By equation the 2 word at d = d0, the subsequent equation as

$$d_0 = \sqrt{\frac{\epsilon_{fs}}{\epsilon_{mp}}} \quad (3)$$

the optimum figure of cluster kopt for cluster base WSN, have being a n WSN nodes scattered randomly in a (XxY) sensor network scenario is as shown

$$k_{opt} = \sqrt{\frac{n}{2\pi}} \sqrt{\frac{\epsilon_{fx}}{\epsilon_{mp}}} . \frac{M}{d^2} \quad (4)$$

Again, the optimal possibility of a WSN node to be converted into head node of the cluster be capable of be designed as

$$p_{opt} = \frac{k_{opt}}{n} \quad (5)$$

SEP protocol planned a brand novel answer that is termed the stable election protocol. This protocol is predicated on the energy of conventional and advanced sensors nodes. SEP protocol has been propose two dissimilar (Popt) weighted most excellent election likelihood; first one for conventional sensor nodes and also the different for the advanced nodes. September defines the (Pnor) that is that the weighted election likelihood for traditional nodes, and also the (Padv) the weighted election likelihood for the advanced nodes.

Therefore, the weighted probabilities of normal and sensors are formed as following respectively.

$$P_{nor} = \frac{p_{opt}}{(1+a*m)} \quad (6)$$

$$T_{adv} = \frac{p_{opt}}{(1+a*m)} * (1+a) \quad (7)$$

$$T_{Snor} = \begin{cases} \frac{P_{nor}}{(1-Pnor(rmod\frac{1}{P_{nor}}))}, if\ s_{nor} \in G' \\ 0, Otherwise \end{cases} \quad (8)$$

$$T_{Sadv} = \begin{cases} \frac{P_{adv}}{(1-Padv(rmod\frac{1}{P_{adv}}))}, if\ avd \in G' \\ 0, Otherwise \end{cases} \quad (9)$$

Where r is that the current epoch, G' is that the set of the conventional nodes that haven't become cluster heads at intervals the last (1/Pnor) epoch [2, 3,5].

III. MCHSEP (MINI CLUSTER HIERARCHICAL STABLE ELECTION PROTOCOL)

The proposed protocol mainly work based on multi level hierarchical. The WSN divided into clusters and CHs (Cluster Heads) like SEP protocol. The each cluster again divided into mini clusters. In mini cluster have one MCH (Mini Cluster Head). The selection of MCH is based on distance between nodes and remaining energy of nodes. MCHs are selected based on cluster size. The MCH collect aggregated data from each node and send to CH then CH receives aggregated data from MCHs transfer to sink node. The MCH must communicate with only CHs does not directly communicate to sink node. In MCHs and CHs receives data by using TDMA technique. In this proposed protocol reduces delay and energy consumption.

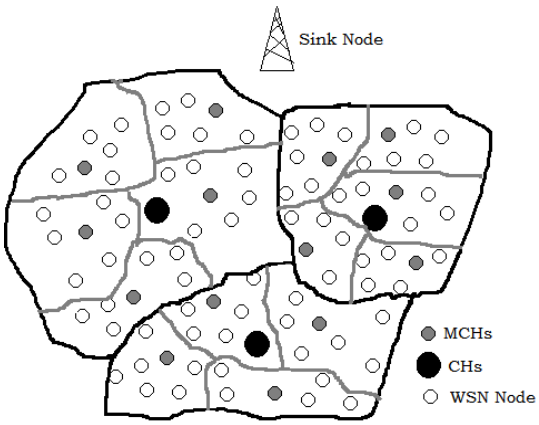

Figure 2.1 : Mini Cluster Heads with in cluster

A. Mini Cluster Formation

The cluster formation based on K means algorithm, nodes information received by the CHs from the each node in cluster, the node information like position of sensor node, concentration of nodes and residual energy, based in sequence of CHs compute possibility P_i, based on likelihood value P_i the CHs select node turn out to be a MCHs

$$P_i = \frac{E_r}{E_i} * D$$

Here a E_i is preliminary energy E_r is a residual energy and D is Density of the sensor nodes with a in cluster

The CHs send advertisement message to their MCHs by using CSMA protocol to the other sensor nodes of the come together based to signal potency of the announcement information a normal node elect their small cluster by sending a joint message to its MCHs. Subsequent to in receipt of all the joint communication from normal nodes, the MCHs create a CSMA time slots table and each every node of the small cluster obtains its CSMA period for data send and node goes to be asleep stage again it need to broadcast data it become a active. In the steady-state sensed aggregated data are transmitted from normal node to MCHs and then from MCHs to CHs and finally CHs transmit to the sink node

IV. SIMULATION RESULTS

In this paper evaluate the SEP and MCHSEP routing schemes. The model results were conceded out with the NS 2.35 network simulator. The model consequences are evaluated by changeable number of sensor-nodes and speed of sensor-nodes. The fallowing simulation parameter was used for evaluation of the routing protocols shown in table 4.1.

Table 4.1: parameter

Protocols	Parameter
Routing Protocols	SEP, MCHSEP
Simulation area	1000×1000 sq. m
Number of Nodes	60,70,80,90,100
MAC	IEEE 802.11
Traffic Type	CBR
Data Rate	0.05 MBPS
Speed	5,10,15, 20 m/sec
Initial Energy	20 Joules
Simulation time	100 sec
Antenna	Omni Directional

Simulation is finished for a hundred seconds by observance the amount of sensor and mobility of sensor constant i.e. a hundred nodes and twenty m/sec severally.

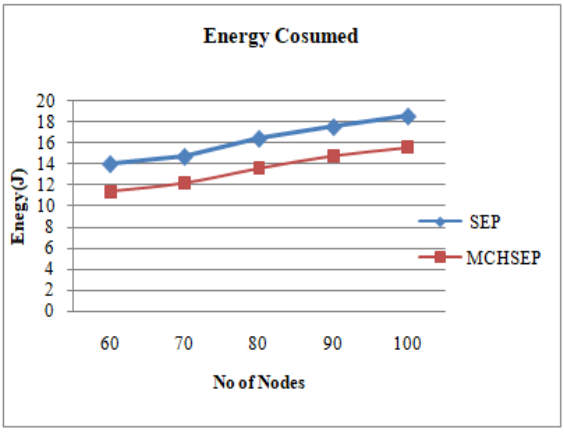

Figure 4.1: Energy Consumed

The figure 4.1 indicates that the average energy obsessive by SEP and MCHSEP schemes by changeable no of nodes. The results illustrate that the MCHSEP is consuming low energy when comparing with SEP protocol so that MCHSEP scheme is further well-organized than SEP in case of energy.

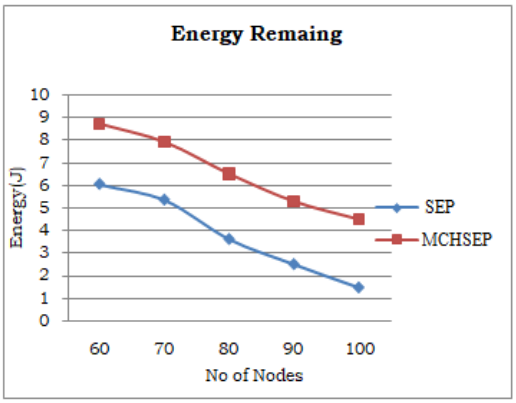

FIGURE 4.2: Energy Remaining

From the figure 4.2 shows that typical standard residual energy by SEP and MCHSEP schemes by changeable number of sensor nodes. Simulation results show that the MCHSEP is having superior residual energy comparing with SEP protocol so that MCHSEP is more energy efficient than SEP.

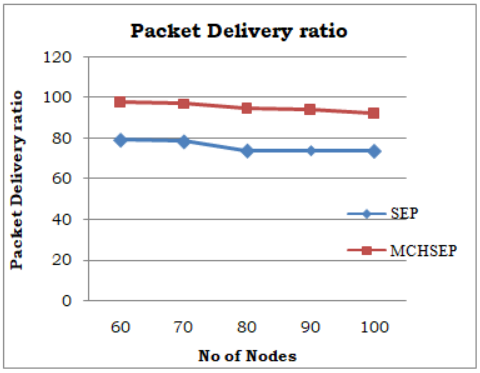

Figure 4.3: Packet Delivery Ratio

From the fig 4.3 shows packet delivery ratio is nothing however the ration of variety of packets received by destination to the quantity of packets sent by destination node. From the fig. 4.3 observe that performance of MCHSEP is best compared to SEP protocol by variable variety of sensor nodes.

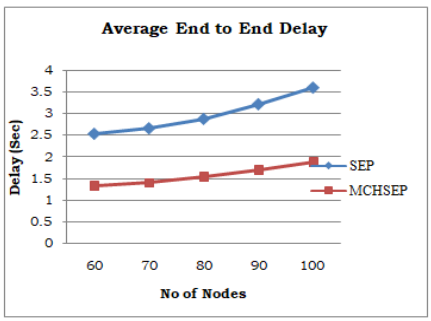

Figure 4.4: End to End Delay

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Higher than figure 4.4 have a tendency to observe that SEP protocol is larger delay than the MCHSEP protocol. In SEP protocol the CHs collect knowledge from all WSN nodes with in cluster wherever as MCHSEP collect knowledge from solely MCHs (Mini cluster heads) exploitation CSMA technique delay is extremely but SEP protocol.

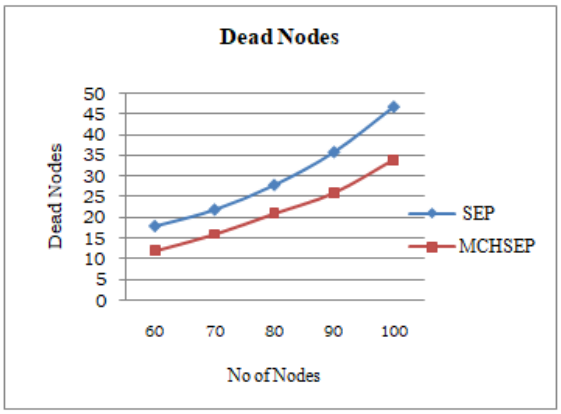

Figure 4.5: Number of Dead Nodes

The comparison is given in figure 4.5 we observed from the graph that the number of dead nodes of MCHSEP is always lower than that of SEP which makes it more desirable for increasing the network period is usually higher in MCHSEP than SEP protocol by varied speed of the node in wireless sensing element networks.

V. CONCLUSION

We projected cluster primarily based protocol for WSN to enlarge the stabile amount of network and cut back the energy consumption and delay. The MCHSEP protocol is modification of the Sep protocol to boost the life time of the network by efficient bunch approach. MCHSEP scheme deals with the network supported density of the nodes range of mini clusters whereas introducing an well-organized mechanism for communications encircled by nodes. MCHSEP theme enhances the stable amount of the wireless sensing element network by making no of mini clusters with in an exceedingly cluster assignment a MCHs. MCHSEP is compared with the SEP protocol by judge using performance parameters like dead node and energy consumption with reverence to range of nodes variation. regarding 10-19% improvement in energy consumption and dead nodes, 12-14% reduced by delay has been achieved by using MCHSEP protocol.

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