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TABU Search Based Stable Election Protocol in Sensor Network

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Abstract*— *WSNs has become major space of analysis in process theory attributable to its big selection of applications. However attributable to restricted battery power the energy consumption has become major limitations of WSNs protocols. Although several protocols has been planned thus far to boost the energy potency more however still a lot of sweetening is done. SEP has shown quite important results over the on the market WSNs protocols. However it's neglected several problems. So as to beat the constraints of the sooner work a brand new improved technique is planned during this analysis work. The planned technique has the power to beat the constraints of the SEP routing protocol by mistreatment clump and TABU search. The graphs are drawn along with the parameters dead nodes, alive nodes, remaining energy. The comparisons have clearly shown that the planned technique outperforms over the others.

Keywords*— *Wireless sensor network (WSN), SEP, D-SEP, M-SEP, TABU SEARCH.

I. INTRODUCTION

Wireless sensor networks consist of hundreds of tiny sensor nodes [1] each sensor nodes form a group to detect data and retrieve data within the system so that the WSNs become more scalable and also improve the energy efficient, that groups which receive and retrieve data is basically form a cluster, in simple words when the large sensor nodes network is divided in to small units nodes then that unit node is known as 'Cluster'. Every cluster is managed by node cluster head (CH) and other nodes are referred as cluster nodes. Cluster nodes do not communicate directly with the sink node. Cluster head will aggregate[6] the data, received from cluster nodes and transmits it to the base station which minimizes the energy consumption and number of messages communicated to base station.

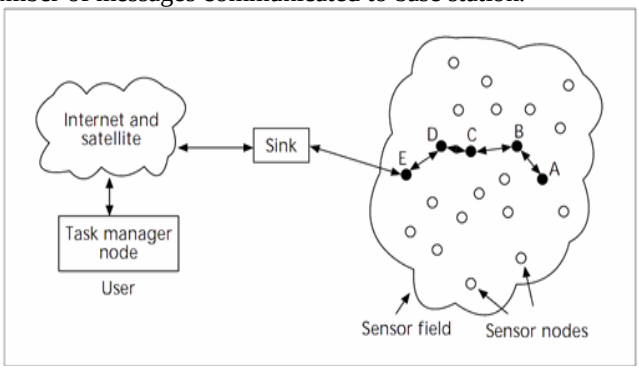

Figure1. Sensor network architecture

A. Sensor Node

Sensor node is the important component of WSN because of its multiple role features. It senses data, stores data, routes data and processes data.

B. Clusters

Clusters [5]are small manageable units which simplify tasks such a communication.

C. Cluster Heads

Cluster heads are the leader who organizes cluster activities. It collects data from several sensor nodes and then aggregates those data and also organizes the schedule of a cluster for communication with BS.

D. Base Station

Base station is a central component which collects data from several nodes distributed at different locations. The deployment of base station is also a critical issue of WSN. It acts as an intermediate between the network and end-user.

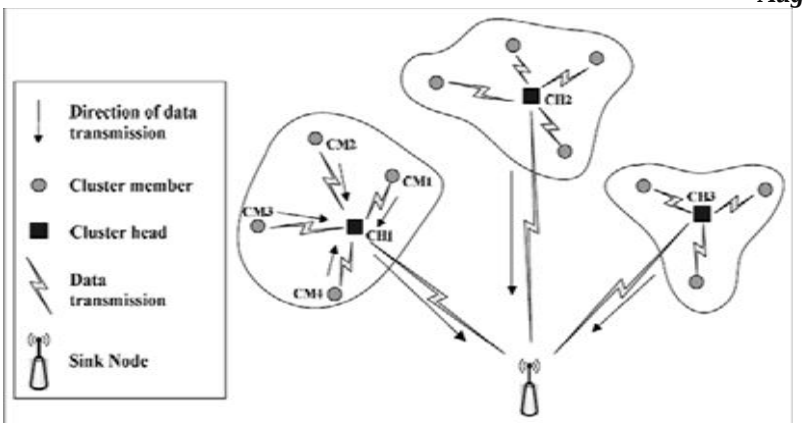

Figure2. Nodes are organized in independent clusters

E. End User

The data in a sensor network can be used for a wide-range of applications. Therefore, a particular application may make use of the network data over the internet, using a PDA, or even a desktop computer. In a queried sensor network (where the required data is gathered from a query sent through the network). This query is generated by the end user.

II. SEP (STABLE ELECTION PROTOCOL)

GeorgiosSmaagdakis, Ibrahim Matta and AzerBestavros [6,7,8] proposed SEP (Stable Election Protocol) in which there two types of nodes called normal nodes and advance nodes with advance nodes having (1+a) more energy than the normal nodes. Every sensor node in a heterogeneous two-level hierarchical network independently elects itself as a cluster head based on its initial energy relative to that of other nodes. The probabilities for nodes to be cluster head [13] is given by equation (1):

$$p=\begin{cases}\frac{p_{opt}}{1+am} & \text{for normal nodes;}\\ \frac{p_{opt}(1+a)}{1+am} & \text{for advance nodes;}\end{cases} \qquad (1)$$

Unlike [2], SEP does not require any global knowledge of energy at every election round. Unlike [3], [4], SEP is dynamic in that it does not assume any prior distribution of the different levels of energy in the sensor nodes. Furthermore, the analysis of SEP is not only asymptotic, i.e. the analysis applies equally well to small sized networks. Finally SEP is scalable as it does not require any knowledge of the exact position of each node in the field

III. D-SEP (DETERMINISTIC-SEP)

In this paper, authors have proposed a new SEP protocol called as Deterministic-SEP (D-SEP) [11,12], for electing cluster heads in a distributed fashion in two-, three-, and multi-level hierarchical wireless sensor networks. There has been significant improvement has been shown by using D-SEP in comparing it with SEP in terms of network lifetime, energy consumption and data transmission to BS.

The results of D-SEP reveal that there is 323% & 207% improvement in the overall lifetime of the network by using D-SEP after comparing two-level (m=0.3, a=1.5) & three-level (m=0.5, m0=0.4, a=1.5, b=3) respectively.

IV. M-SEP (MODIFIED SEP)

The authors represent three cluster based routing protocols; Low Energy Adaptive Clustering Hierarchy (LEACH),Deterministic Cluster Head Selection in LEACH(DCHSLEACH)in single energy level nodes, Stable Election Protocol(SEP) in two energy level nodes. They proposed a two energy level based Modified Stable Election Protocol (M-SEP) [9,10]. Then they adopted a new approach to define the lifetime of sensor network using four new matrices FND(First Node Dies),SND(Some Node Dies),HND(Half Node Dies) and LND(Last Node Dies). After simulating in MATLAB it reveals that M-SEP protocol performs 55%, 22.5%, and 40% respectively longer than LEACH,DCHS-LEACH, SEP. It also shows that M-SEP increases the stability period and packet transmission rate as compare with other routing protocol.

V. TABU SEARCH

TS are often thought-about as a generalization of repetitive enhancements like militia. it's considered an adaptive procedure having the flexibility to use several ways, like applied mathematics algorithms and particular heuristics, that it guide to beat the constraints of native optimality. TS rely on ideas that may be employed in each computer science and improvement fields. Over the days TS was better by several researchers to suit one among the popular key approach. Stand-in constraint, cutting plane approach, and steepest ascent are massive milestone within the improvement of TS.[2] TS apply boundaries to direct the search to diverse regions. These restrictions are in respect to memory structures that may be thought of as intelligent qualifications. Intelligence wants adaptative memory and responsive exploration .As an example, whereas climb a stack one remember (adaptive memory) attribute of methods s/he has traveled and makes strategic choices (responsive exploration) on the thanks to reach your peak or descent. TS conjointly uses approachable investigation as a result of a nasty strategic call could offer a lot of data than an honest random one to come back up with

quality solutions. TS has memory property that distinguishes it from different search styles. it's adaptive memory that's conjointly completely different from rigid memory employed by branch and sure methods. Memory in TS has four dimensions: quality, recency, frequency, and influence. TS force a move to a neighbor with least value deterioration. TS uses memory to stay track of answers antecedently visited so it will forestall revisiting that solution. Memory-based strategies are hallmark of TS approaches. several applications don't embrace advanced features of TS since sensible solutions are generally achieved by easy styles[7].

Algorithm For Tabu Search

Start
T: = [ ];
S: =original result;
S*:=s
Repeat
Find the best acceptable s' ϵ N(s);
If f(s') > f(s*) then s*:=s'
S:=s';
Update tabu list T;
Until stopping norm:
stop;
A necessary tabu search algorithm
Where T is a tabu list and N(s) is the set of region solution.

VI. EXPERIMENTAL SET-UP

In order to implement the projected style and implementation has been done. Table 6.1 has shown a range of constants and variables needed to simulate this work. These parameters square measure normal values used as benchmark for WSNs**.**

Table 6.1: Experimental Setup

PARAMETER	VALUE
AREA	(100,100)M
BS LOCATION	(50,175)M,
INITIAL ENERGY (QUANTITY)	IN JOULES 0.1
E_{elc}	50NJ/BIT
E_{efs}	$10PJ/BIT/M^2$
E_{mp}	$0.0013PJ/BIT/M^4$
D_0	87M
E_{DA}	5NJ/BIT/SIGNAL
DATA PACKET SIZE	4000BITS

VII. RESULTS AND DISCUSSION

To study the SEP, D-SEP AND M-SEP routing protocol in wireless sensor network. To proposed and implement TABU SEARCH BASED STABLE ELECTION PROTOCOL for selection of cluster head .To comparative analysis of proposed TBSEP(TABU SEARCH STABLE ELECTION PROTOCOL) with SEP, D-SEP AND M-SEP by using parameters Dead Nodes, Alive Nodes, Remaining Energy.

SEP

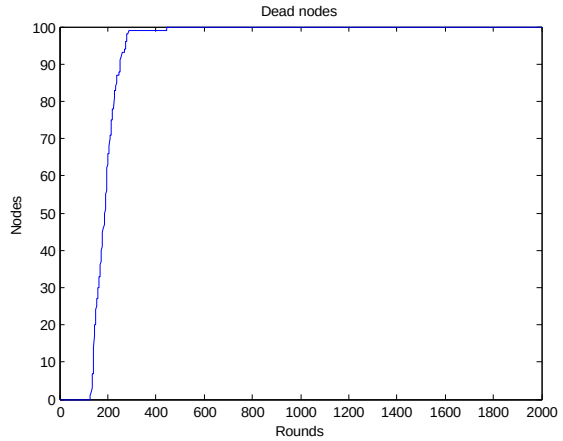

Fig 1:-Dead nodes Vs rounds in SEP

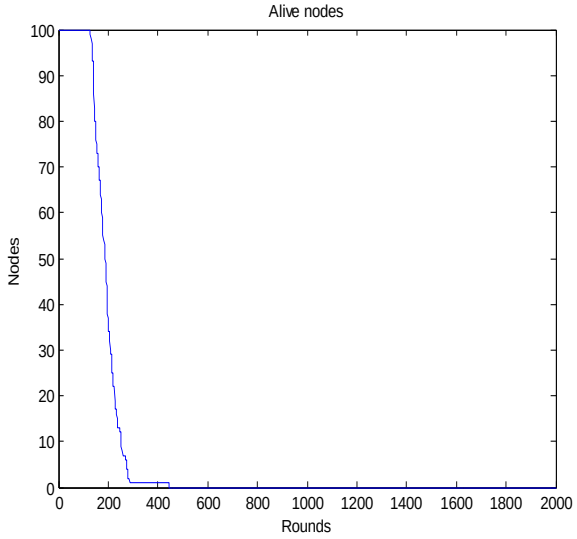

Fig 2:-Alive nodes Vs rounds in SEP

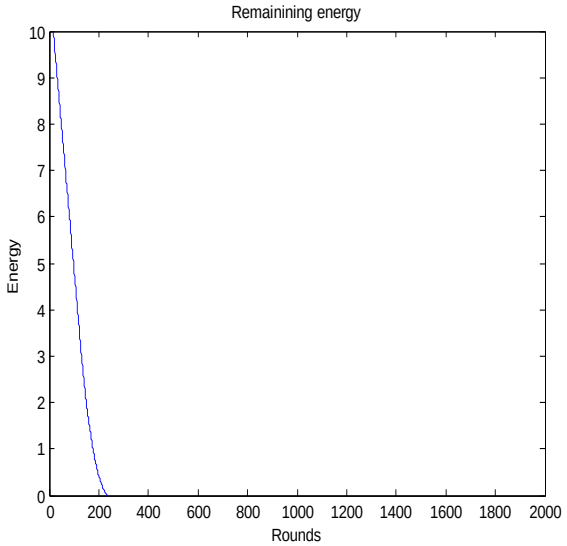

Fig 3:-Remaining energy Vs rounds in SEP

D-SEP

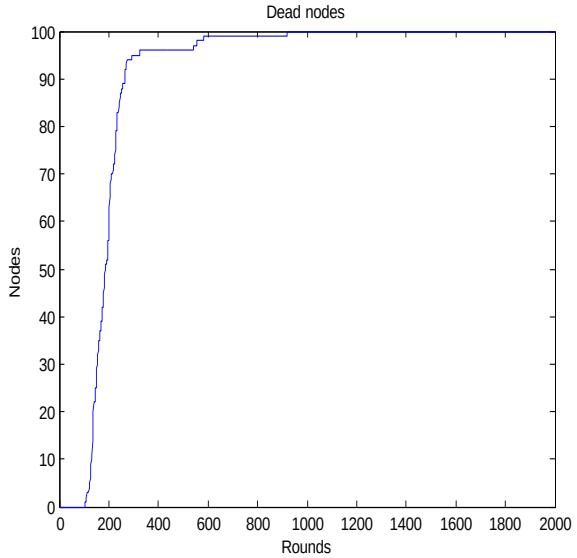

Fig 4:-Dead nodes Vs rounds in D-SEP

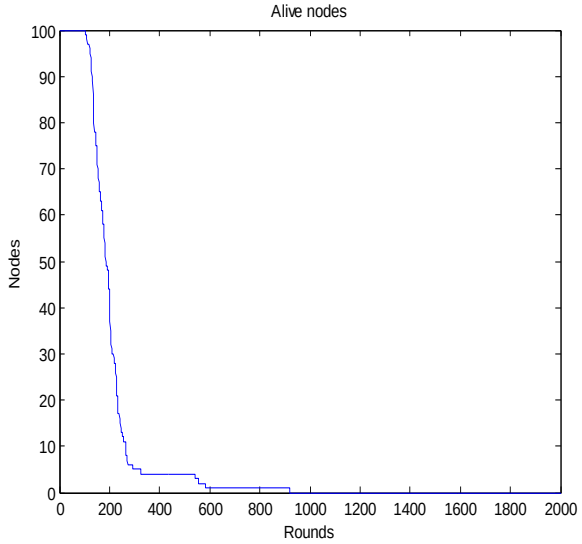

Fig 5:-Alive nodes Vs rounds in D-SEP

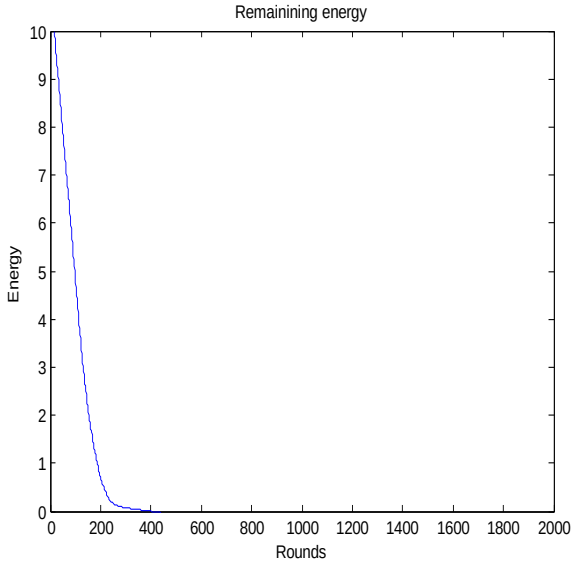

Fig 6:-Remaining energy Vs rounds in D-SEP

M-SEP

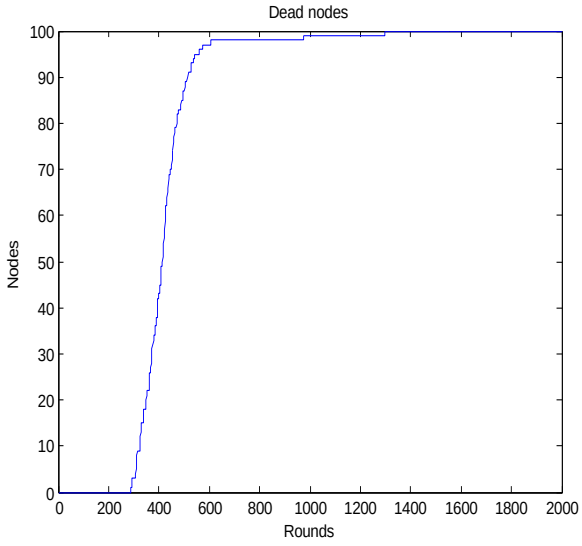

Fig 7:-Dead nodes Vs rounds in M-SEP

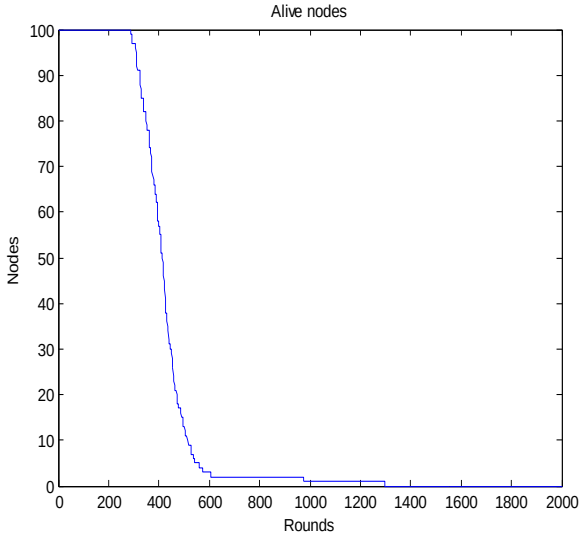

Fig 8:-Alive nodes Vs rounds in M-SEP

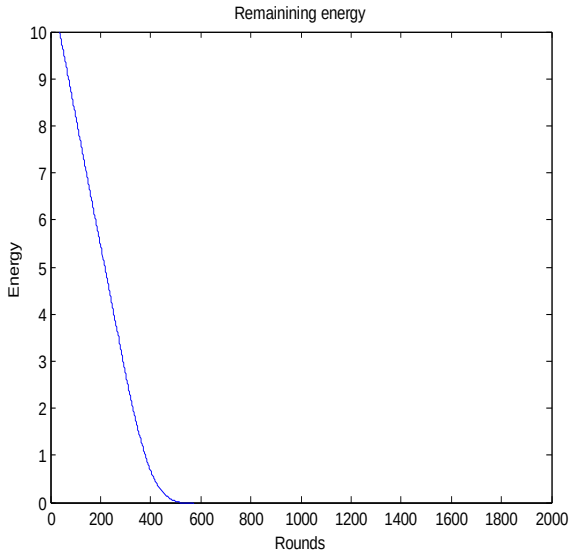

Fig 9:-Remaining energy Vs rounds in M-SEP

TABU-SEP

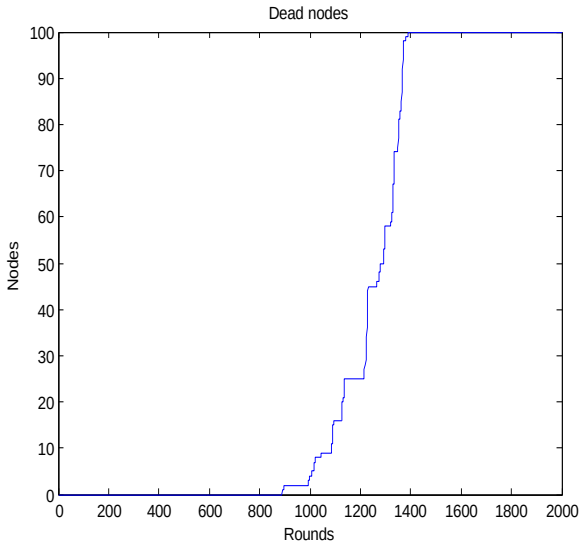

Fig 10:-Dead nodes Vs rounds in TABU-SEP

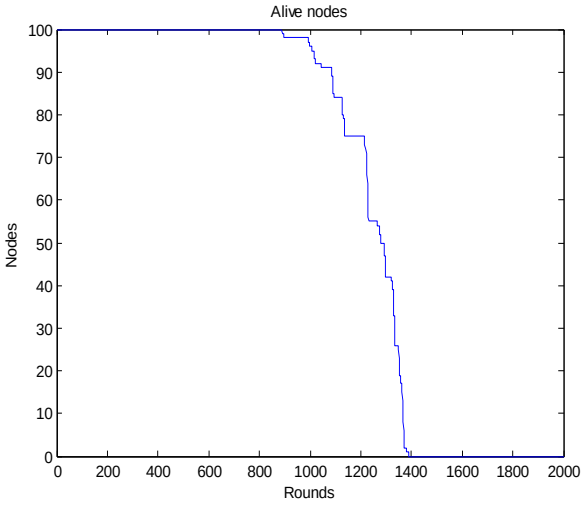

Fig 11:-Alive nodes Vs rounds in TABU- SEP

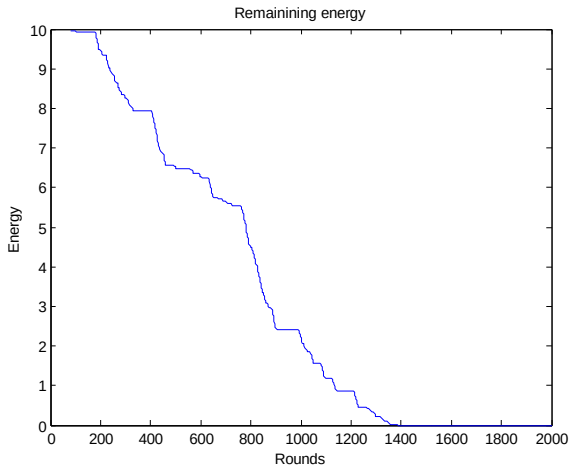

Fig 12:-Remaining energy Vs rounds in TABU-SEP

The comparison among SEP,D-SEP,M-SEP and TABU-SEP with respect to dead nodes, alive nodes and remaining energy. It has been clearly shown that the number of rounds for first node dead in case of the proposed are quite more than the SEP,D-SEP,M-SEP and similarly, alive nodes are more in TB-SEP and residual energy in case of the TBSEP are quite more than the other protocols. It has clearly confirmed that TBSEP is comparatively better than the existing protocol.

VIII. CONCLUSION AND FUTURE SCOPE

Many protocols has been planned thus far to enhance the energy potency more however still abundant sweetening may be done. SEP has shown quite vital results over the on the market WSNs protocols. however it's neglected several problems. so as to beat the constraints of the sooner work a brand new improved technique is planned during this analysis work. The planned technique has the flexibility to beat the restrictions of the SEP routing protocol by exploitation agglomeration and TABU search. The planned technique is intended and enforced within the MATLAB tool with the assistance of knowledge analysis tool case. Experiments has clearly shown that the planned technique outperforms over the on the market strategies. but this work has not take into account the utilization of 3D WSNs, thus in future work we have a tendency to willl extend the planned technique for 3D WSNs surroundings

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