IMPROVING ENERGY EFFICIENCY IN WIRELESS SENSOR NETWORKS USING FLOYD WARSHALL BASED SSTBC ROUTING PROTOCOL

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ABSTRACT

The dynamic topology of WSNs allows nodes to join and leave network at any point of energy efficiency is an important issue in wireless sensor networks. One available power saving strategy is having only a portion of nodes work, but this would always compromise data quality as a result. we propose a Floyd-Warshall-STBC on a real-world sensor network data set and validate its effectiveness. In winding up, we put our efforts to validate the proposed approach present comparison with other similar schemes for significant adaptation of trustworthy and secure communication as with node energy life time by using Energy Efficient in Gaussian distribution model that distribute energy level as per requirement for node by same distributed factorization packet node that would be higher efficient node. The energy consumption and maximum optimality that would be authentication by SSTBC node id and proposed technique "Floyd-Warshall based SSTBC" that enhanced network lifetime as compare to existing approach that have to simulate in MATLAB R2014a tool .

KEYWORDS: Wireless Sensor Networks, energy-efficient, clustering, SSTBC, Floyd-Warshall Algo, Shortest Distance between nodes etc.

I. INTRODUCTION

1.1 Overview of WSN

Progresses in wireless communiqué complete it probable to improve wireless sensor network (WSN) containing of minor strategies, which assemble info by collaborating with all additional. These minor detecting plans are named nodes then contain of CPU (aimed at statistics dispensation for statistics storing), cordless and transceiver (for getting and transfer signs or statistics after unique node to additional). The scope of all sensor nodes differs with submissions. For instance, in certain armed or shadowing requests it strength remain closely minor. It's contingent on its limits similar reminiscence scope, dispensation haste and cordless [1].
Nowadays, wireless sensor networks are extensively charity in the profitable and engineering parts such as aimed e.g. ecological observing, environment nursing, healthcare, process nursing and shadowing. For instance, in a armed part, we container use wireless sensor networks to screen an action. If an occasion is activated, these device nodes sagacity it and direct the info to the improper position (named basin) by collaborating with additional nodes exposed in fig 1.

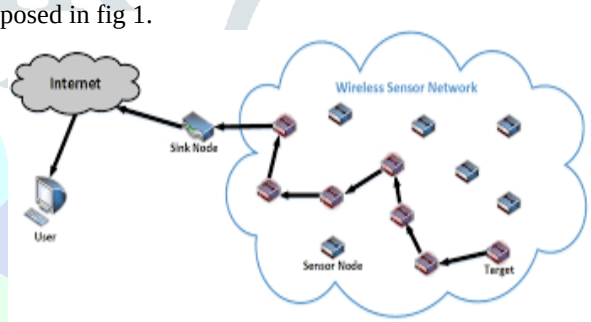


Figure 1.1: Wireless Sensor Network

In WSNs the one basis of lifetime aimed at the swellings is the sequence. Interactive with additional nodules or identifying actions chomps a ration of liveliness in dispensation the statistics and conveying the composed facts to the basin. In numerous suitcases (e.g. inspection requests), it is adverse to substitute the sequences that are useless or exhausted of liveliness.

- Changeless the transmission variety amongst the detecting nodules.
- Using effectual steering and statistics gathering approaches.

A procedure is supposed to must actual provision if and lone if it is debauched and consistent in its responses to the modifications usual in the network. It would deliver dismissed statistics to the improper position or basin by the records that are composed amongst all the detecting nodes in the network. The delay in program of statistics to the basin after the detecting nodes would be small, which clues to a debauched rejoinder.

1.2. GAUSSIAN DISTRIBUTION

SSTBC protocol and propose a Heterogeneous Gaussian and in wireless network can be used to track discourse, and

to predict smooth discourse trajectories with applications to problem solving, which would be transmission of a data packet and its acknowledgment is preceded by sending and receiving packets between a pair by using Mac layer process for target tracking, after that sending and receiving nodes conversational analytics, to realize the framework which improve throughput and failure probability as compare to Gaussian distribution scheme .

1.3. Sleep scheduling phase

By using location information provided by one grid only one sensor node i.e. active node will send data to base station and other nodes will be in sleep mode. In every periodic round the active node in each grid will be selected according to the maximum remaining energy of nodes. So our criteria to keep node active in grid is the remaining energy. In one grid, the node having highest remaining energy will be in active state and other nodes in that grid will be in sleep state.

1.4. Data transmission phase

After the formation of chains, active sensor nodes start data collection and transmission operation. In every round, each active node at the end of chain starts data transmission to the next active node along the chain. The node in the next position receives the data and fuses this data with its own and transmits it to the next active node. This is how data propagate from the farthest node in the chain to the base station. The energy consumption in transmission, reception and data fusion takes place according to the described energy model.

1.5. Clustering Approach

Resource consumption of the network is thus restricted to the activated cluster, where intra cluster communication is dramatically reduced so achieves optimization based sleep scheduling. Therefore, the cluster activation phase has a great importance not only in minimizing resource consumption but also in tracking accuracy. First, all the CHs need to measure the distances between the target and themselves at every sampling instant; then, a comparison among them is required to choose the nearest one. When a target enters the wireless sensor network, the CH that detects the target becomes active while other nodes are in sleep mode.

II. RELATED WORK

In sensor networks, the protuberances additional dispensation essential for statistics procedure. One method to guarantee equilibrium vigor ingesting is to alternate the character below as:

In [1] author proposed has remained presented a randomized and debauched algorithm for allocating and establishing of the instruments in the wireless sensor networks founded on hieratical form of bunches. This enhances the vigor ingesting throughout the message. In difference, this algorithm expressions a problematic that it shoulders the situation of message to be condensational and deprived of any error (characteristic setting). So, it doesn't contract or grip nay error of statistics broadcast or level retransmits situation. This procedure has no idleness construction or instrument. Thus, uniform however, this algorithm decreases the control ingesting but it includes more faintness in the scheme's construction [1].

In [2] where each node communicates only with a close neighbor instead of straight interactive with the basin, and receipts chances spreading to the basin. A mixture procedure APTEEN [3], which permits for complete info repossession, and the nodules in such a system not solitary respond to period dangerous conditions, but stretch a general image of the network at episodic intermissions. Though, suitable bunch head voting devices are obligatory to decrease the vigor ingesting and improve the generation of distribution of the statistics to procedure the facts distribution numerous paths. That presented contingent on forced capitals of wireless networks. This algorithm assistances to use an-other of experiencing of additional upstairs in manifold trails preparation [2].

The author in [3] anticipated and industrialized procedure which examines structure an on-demand procedure for wireless sensor networks steering. That procedure exposed to be speedily altered to the variations of the topology. This imperative problematic, originate after the detail that, the etiquettes those use course stores to perform steering; it was a decent influence since of the vicissitudes of the topology which is careful to be recurrent [3].

In [4], the scholars propose a novel altered algorithm for responsibility treatment of the supplies of dependability and accepting in wireless sensor networks. This algorithm achieves that, all nodules have supreme variety of spreading for any nodule powerlessly in command to evade the disappointment of a connection in devices control boundaries of antennae, which is mostly the cordless. Furthermore, this algorithm usages Entire Period to Live (TTL) in instruction to adapt the statistics dependability equal, therefore, it includes the statistics use more conceivable track and additional strength. The TTL is advanced than the network length for the essential terminated package sake [4].

In LEACH-C [5], the gathering creation is complete at the opening of all rotund by a central algorithm by the basin. Though the vigor charge for bunch creation is advanced in LEACH-C, the general presentation may be healthier than LEACH unpaid to amended bunch creation by the sink.

In [6], apiece nodule calculates the proportion of its individual vigor equal and the collective vigor residual in the net. With this worth both nodules agrees if it develops bunch cranium for this overweight or not. Nodes with advanced control are additional probable to develop bunch crania than nodules with inferior control. The problematic with this system is that both swelling has to estimation the residual liveliness in the system which needs added message with the basin and additional nodules.

In [7], the academics presented a inquiry founded instrument scheme's procedure. In such procedure, a stated

inquiry with QoS is distributed by the operator's supplies. The relations of appropriateness and consistency are operated. The anticipation of the answer is complete in this algorithm inside a stated period, where that period is predefined to be the "target. In such scheme, the responsibility accepting is existence attained by trail and foundation idleness, thus, choosing the idleness of the basis and the optimum route contingent on this algorithm [9].

In [8] the LEACH procedure has remained anticipated. This thesis contemplates the LEACH to be main algorithm and procedure in wireless sensor networks and liveliness optimization. The period LEACH respects Low Vigor Adaptive Gathering Ladder. This algorithm founded on gathering (creation statistics in lockups) of the nodes in which both bunch has a cranium of that collection, where that cranium is interactive straight to the dishonorable position and all additional cell's protuberances is connected to the craniums of gathering (CH) [10].

III. SYSTEM MODEL

3.1. Proposed sensor Scheme

In this subsection we explain the proposed sensor scheme which employs sleep scheduling of sensor nodes with the help of their geographical information and then routes the data

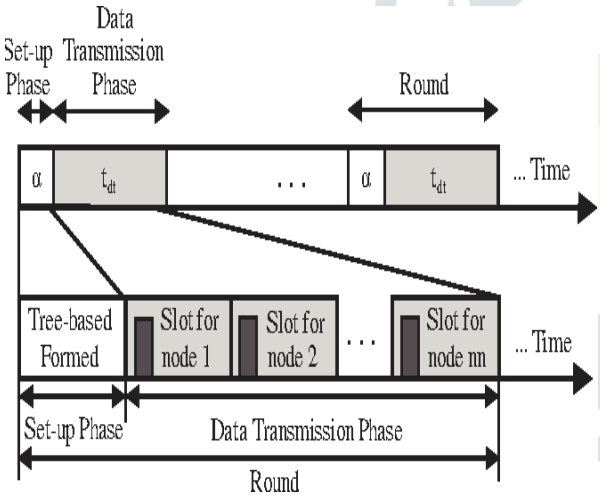


Figure 3.1: Data Transmission Routing According to F-SSTBC Algorithm

Above figure 3.1, active nodes to the base station using chaining (multi-hop) concept. The structure of the proposed routing scheme for wireless sensor network is shown in fig. 3.1. SSTBC operates in three phases: (1) sleep scheduling phase i.e. to find out the active nodes in sensor field (2) chain formation phase in between active nodes (3) data transmission phase.

3.2. SHEDULING PROCESS

A. SSTBC

SSTBC is designed based on proactive wake up: when a node (i.e., alarm node) detects a target, it broadcasts an alarm message to proactively awaken its neighbour nodes (i.e., awakened node) to prepare for the approaching target. To enhance energy efficiency, we modify this basic proactive wake-up method to sleep schedule nodes precisely. Specifically, PPSS selects some of the neighbor nodes (i.e., candidate node) that are likely to detect the target to awaken. On receiving an alarm message, each candidate may individually make the decision on whether or not to be an awakened node, and if yes, when and how long to wake up. We utilize two approaches to reduce the energy consumption during this proactive wake-up process:

- Reduce the number of awakened nodes.
- Schedule their sleep pattern to shorten the active time.

First, the number of awakened nodes can be reduced significantly, because:

- Those nodes that the target may have already passed during the sleep delay do not need to be awakened;
- Nodes that lie on a direction that the target has a low probability of passing by could be chosen to be awakened with a low probability. For this purpose, we introduce a concept of awake region and a mechanism for computing the scope of awake region.

Second, the active time of chosen awakened nodes can be curtailed as much as possible, because they could wake up and keep active only when the target is expected to traverse their sensing area. For this purpose, we present a sleep scheduling protocol, which schedules the sleep patterns of awakened nodes individually according to their distance and direction away from the current motion state of the target.

3.3. GAUSSIAN DISTRIBUTION FOR DATA PROCESSING

In derivation, normality refers to an assumption that the distribution of a random variable follows normal (Gaussian) distribution. Because of its bell-like shape, it's also known as the "bell curve". The formula for normal distribution is:

$$f(x) = \frac{1}{\sigma^2\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

Normal distribution belongs to a location-scale family of distributions, as it's defined two parameters:

- μ - *mean* or *expectation* (location parameter)
- σ^2 - *variance* (scale parameter)

We say that a random variable is normally distributed with mean μ and standard deviation σ if the probability density function is given by

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad \text{for } -\infty < x < \infty$$

The Gaussian distribution is important because many distributions are (at least approximately) Gaussian. The "Central Limit Theorem" states if one takes the average of n

samples from a population, regardless of the underlying distribution of the population, and if n is sufficiently large, the distribution of this mean will be approximately Gaussian with a mean equal to the mean of the original distribution, and a standard deviation of approximately: $\sigma_{\text{average}} = \sigma/\sqrt{n}$.

3.4. Floyd Warshall algorithm

We define d ij (k)to be the shortest path from i to j such that any intermediate vertices on the path are chosen from the set (1,2,….. k). In other words, we consider a path from i to j which either consists of the single edge (i; j), or it visits some intermediate vertices along the way, but these intermediate can only be chosen from (1,2,….. k) . The path is free to visit any subset of these vertices, and to do so in any order.

3.5. Pseudo for PROPOSED WORK

1: when node wants to send data
2: node sense channel. If it is free it simply sends data.
3: if (ACK == yes) then packet received successfully (repeat process 1)
4: if (ACK == no) means acknowledgment not received then new digital signature back-off is called to calculate the waiting slot time.
5: if (n=number of node detect< no of transmission) then discard packet
Else
End if
Step 6: wait till WT = 0 and then send packet again
If (sensor) then
Go to step 5
Else
Go to step 1

3.6. Complete Flow structure of our algorithm

1. Create a sorted sequence of edges based on their transmission and overall energy loss.
2. Randomly shuffle the sequence of sorted edges. Construct a Floyd warshall based number of vertices *n* and edges as parameters in a function.
3. Remove the edges that are in the previously generated spanning tree(s) and obtain a reduced graph.
4. Repeat the above procedure on the reduced graph and generate Floyd based until no more minimum trees can be generated.
5. The internal nodes print the final matrix *q* of shortest paths among all node-pairs
6. Select the root node to be the node with the highest energy among the nodes If no direct acknowledgement path or reverse path is present between two nodes, then there can be no direct path existing between them.
7. The rooted directed tree along with the links from the leaf nodes to their nearest node forms the directed graph tree.
8. Repeat the data gathering process for every T rounds and then switch to the next edge disjoint spanning tree in the k- tree list.
9. Compare this approach with just a MST- based and Floyd based SSTBC – for every round. Choose the node with the highest energy as the root and form a rooted directed tree.
10. If weight of a path is not equal to that of its reverse path, then that path as well as its reverse path is invalid.
11. The rooted directed tree along with the links from the leaf nodes to their nearest CDS node forms the MST- based root and proposed Floyd based SSTBC.

3.7. Algorithm 1: Path Selection

1) Initialize Node N and the Node N negotiates with the nodes in the transmission range.
2) Node i establishes its Neighbor Table with initial cost parameter on the basis of distance, bandwidth & neighbor node id.

node.
5) After accepting the path info, Node i cut down the path with repeated entries of nodes among multipath and establish finalized cost of path.

3.8. Path Forwarding

The path forwarding is the process of the choosing the path to transmit the data and then send the data over the selected path. The path forwarding process has been completed using the bandwidth, path energy and neighbor node. Algorithm

1) When Node i has some data to transmit, it will reexamine the desirable paths towards sink node and the Node i analyze the Path P = {P1,P2,P3,_ _ _ _ _ _ _ ,PN}based upon their cost information.

2) Node i measures the path information on the basis of Residual Energy (R Ep), Next Hop, Neighbor ID (Nidp) & Available Bandwidth (bwp).
3) The path with higher REp is chosen and If all the path have identical REp then, Path with maximum bwp is preferred and data is transmitted through the selected P.

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IV. RESULT and DISCUSSION

4.1. RESULTS EXPLANATION

MATLAB is used as a simulation tool for the network arrangement set up and for setting up the data transmission between numerous nodes present in the network. MATLAB core programming and

3) If the neighbor node Ni knows the path to the sink, then it will respond with route information to the querying node I

Parameters	Value
No of nodes, n	100
N/w size X × Y	100 × 100
Receiver Energy, ERX	50nJ
Transmitter Energy, ETX	50nJ
Free space Energy Consumption, E_{fs}	.01nJ
Multipath Energy Consumption, E_{mp}	.0013pJ
Initial Energy, E_0	0.5J
Data Aggregation Energy, EDA	5nJ
Packet size	1400bits
Percentage of advanced nodes, m	0.1, 0.2& 0.3
Multiple ofnormal node energy, a	1, 2, 3

and node '**i**' will restore the routing information .
4) Else the Neighbor node Ni will forward the query to its querying node & it will proceed till it arrives at the sink node. Once the path to sink is formed, the nodes will relay the route reply towards the querying

commands are used as a simulation tool. MATLAB is a software program that permits you to do data manipulation and visualization, calculations, math and programming. It can be used to do very simple as well as very sophisticated tasks. To estimate the performance of our algorithm proposed Floyd-SSTBC-Gaussian distribution has been simulated in MATLAB 2014a and the results were compared with

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We achieved imitations for dissimilar standards of “a” and “m” though custody b continuous that is 0.3. For the principal circumstance “a” = 1, m = 0.1, for additional circumstance a = 3 and m = 0.2.Here “a” is energy enhancement and m is threshold value.
This is whole to detect alteration in system’s constancy, lifetime and amount comparative to upsurge in amount of development nodes and their dynamisms. Subsequently popt = 0.1, is the best prospect of CHs, we attained dissimilar likelihoods for both category of nodules in agreement with dissimilar standards of α and m. Additional strictures used in reproductions are exposed in Table 1.

Table 4.1. Simulation Parameter (Input) -: Below mentioned is simulation parameter that we configure in our proposed simulation:

1. Energy Consumption:

Total energy consumption of the network, assuming that all the nodes have rechargeable batteries so that the nodes don’t die due to loss of energy, the amount of energy used if 250 of the nodes send data to the base through 1000 rounds is given in Joules as shown in the Figure 5.1:

Energy Consumed is given as:

$$\frac{Average\ Energy\ Comsumption\ on\ Idle\ ,Sleep,\ Transmiting\ and\ Receiving\ Node}{Total\ Energy\ Comsumed}$$

Table 4.2. Energy consumption comparison and no of rounds

No. of round	SSTBC(Energy consumption)	Proposed(Energy consumption)
0	50	12.5
200	45	11
400	40	10
600	35	8
800	30	7
1000	24	6.5
1200	19	5
1400	14	3.5
1600	10	2.5

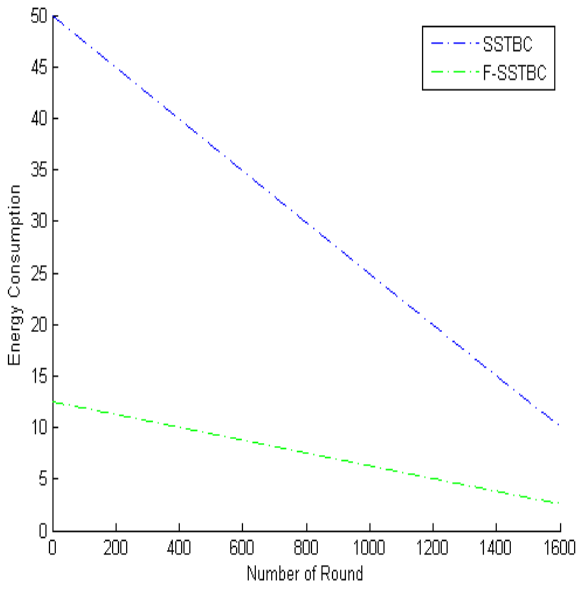


Figure 4.1: Total energy consumption of SSTBC and Proposed F-SSTBC in 1600 rounds.

2. Alive Nodes per round: These are the total number of nodes that have not ill yet expected all of their energy.

Table 4.3 Node Alive and No of Rounds

No. of rounds	SSTBC (No. of Nodes Alive)	Proposed (No. of Nodes Alive)
0	100	100
200	100	100
400	100	68
600	100	47
800	100	24
1000	90	11
1200	65	9
1400	32	9
1600	12	9

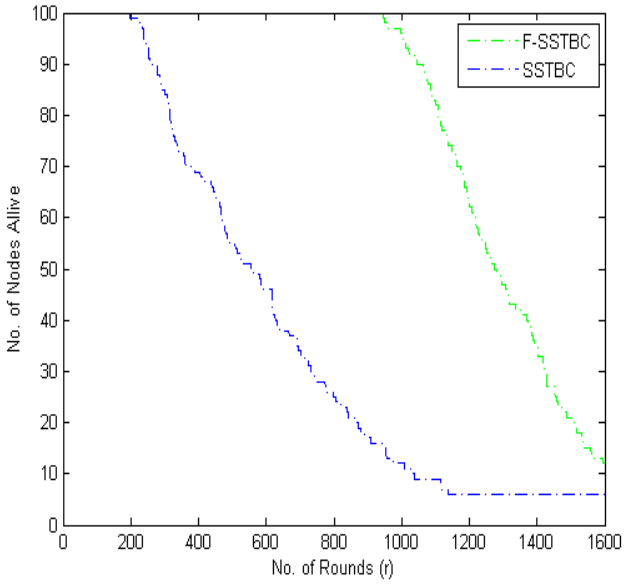


Figure 4.2 Performance comparison between SSTBC and Proposed F-SSTBC for no of alive nodes

3. No. of Packets Received

Number of packages received -It is the quantity of packages received by the routers at the network coating due to the volume of the length.

The numbers of data received at the base station for those of the four routing protocol increases continually when the simulation time (round time) increases Fig. 5.3. In the case of proposed routing Protocol the number of Data Received at the base station becomes more as compare to other algorithm when the number of round time of the simulation increases in other protocol scenarios when the simulation time reaches 50 seconds the data received by this routing protocol becomes zero in both other due high energy requirements of these routing protocols. Still Floyd-warshall-SSTBC routing protocol is better in terms of receiving amount of data than that of, SSTBC protocols

Packet To Base station is given by:

$$= \frac{\text{Number of packets Received}}{\text{Number of packets sent}} * 100$$

Table 4.4 Packets received by BS in No of Rounds

No. of rounds	SSTBC (PACKET TO BS)	Proposed (PACKET TO BS)
0	0	0
200	1200	1200
400	2200	2800
600	2950	4000
800	3500	5200
1000	3800	6700
1200	3850	7900
1400	3900	8500
1600	4000	8800

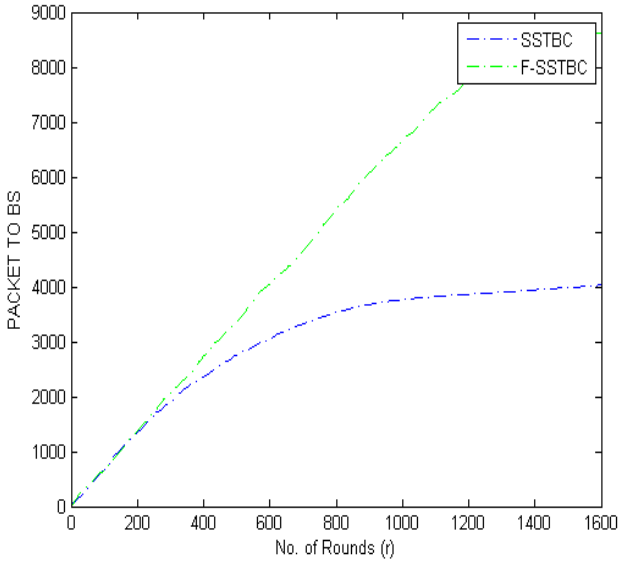


Figure 4.3 Performance comparison between SSTBC and Proposed F-SSTBC for Packet Sent to Base Station

IV. CONCLUSION

The impartial of research were to progress an method for picking the cluster-head in a assumed gathering on the basis of three parameter such as node energy , node stability, and mobility for a WSN and to afford incomes to include dissimilar parameters similar energy in jule, consequence that suggestively touch the cluster-head selection accidental on distance based.

Proposed method Floyd-SSTBC is one of the maximum well-known gathering approaches; it selects cluster heads founded on lifetime period perfect. So there are potentials for certain CHs that may be actual near to both other and

can be positioned in the ends of energy equal for CH assortment founded on amount of national nodules, residual energy, coldness to basin and energy dispersal aspects. The imitation reports show that the anticipated procedure intensifications the next generation and achieves improved than the present procedure.

VI. FUTURE WORK

It is pragmatic that future study on SSTBC algorithm goals to use the multi hop communiqué decoration and optimum amount and selection of gathering craniums. We also interested to deal the problem of energy efficiency at MAC layer.

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