A Secure Novelty Leach Protocol to Extend the Life Time of Wireless Sensor Network

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Abstract

Wireless Sensor Networks plays a major role in recent technology. In many real time applications we are using Extending Network life time is the main unseen area in wireless sensor network (WSN). There are many clustering approaches that were used earlier to enhance the network lifespan. .It is also necessary to protect the network from unauthorized access .In this paper we have defined a Novelty LEACH protocol to raise the overall lifespan of the wireless sensor network that joins the concept of LEACH(low energy adaptive protocol) and the security issues especially the detection of malicious node in the network. LEACH is a dynamic protocol, in which cluster head rotates for each round. For security purpose, the author uses cryptographic techniques such as encryption and decryption.

Keywords: *LEACH, Cluster Head, Cluster member, Encryption, Decryption.*

I . INTRODUCTION

Wireless sensor networks (WSN) consists of various sensor nodes in order to frame a network. The nodes in the network senses data from the physical medium and process the data. Finally send the collected data to the base station. Sensor network has many applications such as soil makeup, noise levels, the presence or absence of certain kinds of objects, humidity, vehicular movement, temperature, pressure, mechanical stress levels on attached objects, flood detection, forest fire detection etc., The characteristics of Wireless nodes are tiny, low cost, ease of deployment etc.,

The major problem of wireless sensor networks are energy consumption of nodes and prolonging the life time of the network . So in this paper the author proposes an algorithm called Low Energy Adaptive Clustering Hierarchy (LEACH) , in order to solve the above problem.

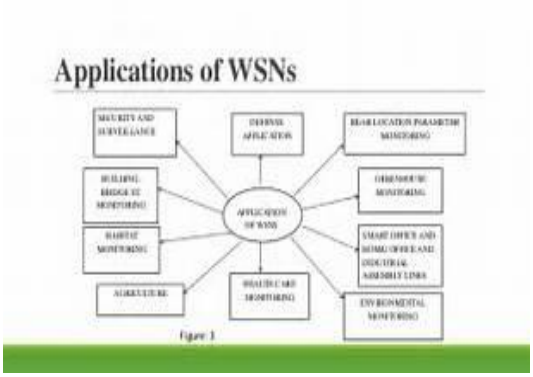

Fig . 1

II . LEACH ALGORITHM TECHNIQUES

LEACH protocol is typical representative of hierarchical routing protocols. It is self adaptive and self organized. It employs a cyclic process that involves cluster set up stage and steady state stage. The steady state stage must be longer than the set up stage so as to reduce unnecessary energy costs.At the stage of cluster forming, a node randomly picks a number between 0 and 1. This number is compared to the threshold values. If the number is less than the threshold values , it becomes cluster head in the cycle otherwise it becomes common mode. When clusters have formed, the nodes start to transmit the inspection data. Cluster heads receive data sent from the cluster members, the received data was sent to the gateway after fused. This is a frame transmission. In order to reduce unnecessary energy costs , steady state stage is composed of multiple frames.

The execution process of the Wireless Sensor Network with LEACH is explained as follows.

Step1: construct the motes and frame the network.

Step2: select the cluster heads among the Wireless nodes.

Step3: Divide the network in to various clusters.

Step4: At the end of first round, check the energy consumption of every node. If the energy level is too low, then go to step2 otherwise proceed the output through selected cluster head.

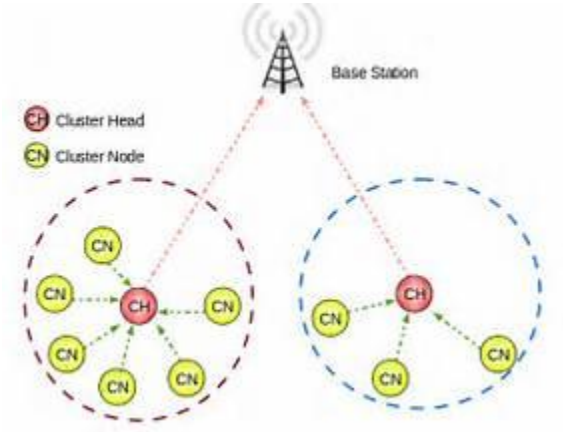

Fig .2

III . LITERATURE REVIEWS

A. LEACH – TLCH

It is a two levels cluster head LEACH protocol proposed by Chunyan and others. Same process of selection and cluster formation is adopted in this method. For collecting and fusing data from the member nodes, secondary cluster head is used and it sends them to its cluster head. The cluster head plays an important role to send this data to base station. In case of cluster without secondary cluster head, the cluster head is responsible for collecting data from the member node , fusing the data and sending them to base station. In the first order energy transfer model, for long distance data transfer, the energy consumption for data collection and fusion is less than that of data transfer. So the life of clusters with secondary cluster heads will not be extended so as to bring new energy imbalance of consumption of entire network. Hence the main problem of energy consumption can be solved by this LEACH-TLCH protocol.

B. LEACH – P

Nidhi Guptha , Harish Guptha and Ram Lal proposed a protocol known as LEACH-P protocol. In WSN, some of the nodes become cluster heads, aggregate the data of the cluster members and transfer it to the sink. So the source of heterogeneity arises from initial setting. The LEACH protocol assumes all the nodes are supplied with same amount of energy that results instability in heterogeneity. In LEACH- Proposed (LEACH-P) protocol, the stability of clustering hierarchy is improved using the concept of heterogeneity by implementing advanced nodes and common nodes. In this protocol, they proposed stable election protocol to increase the time interval of the death of first node by 8 times. This reduces communication energy by 8 times compared with direct transmission and minimum energy transmission routing.

C. MS-LEACH

It is modified version of S-LEACH which enhances the security of S-LEACH by providing data confidentiality node-cluster head authentication proposed by Mona and Eman]. This can be done by using pair wise keys shared between cluster heads and their cluster members. MS-LEACH provides pair wise key with no communication overhead in addition to the two symmetric keys used in S-LEACH. MS-LEACH is superior than S-LEACH in terms of power consumption, network lifetime network through put and routing level.

D. LEACH-SM Protocol

LEACH-SM [7] is a protocol used for space management. It modifies LEACH by enhancing it with an efficient management of spares. It is also designed for static sensor nodes and static targets. The LEACH-SM protocol achieves the following objectives:

• Extending WSN lifetime.

• Maintaining the above-threshold coverage throughout the WSN lifetime.

• Reducing transmission of redundant data to cluster heads.

• Allowing all sensor nodes in all clusters to decide in parallel if they become primaries or

spares.

• Maintaining scalability by using only local information.

LEACH-SM adds a phase, called the spare selection phase, to the original LEACH protocol. It follows the setup phase, and is followed by the regular operation of the WSN. Spare management is carried out by spare selection performed during the spare selection phase by the Decentralized Energy-efficient Spare Selection technique (DESST).

DESST extends WSN lifetime since the nodes that become spares go asleep, while the WSN as the whole maintains the required above-threshold target coverage.

IV . Novelty LEACH

A. The Setup Phase

Step 1: Cluster-head selection

In step 1, each and every applicant node has to choose a number (in random) in the range of 0 to 1. Say for example node chooses a value 0.05. Then it has to compare the chosen value with a calculated threshold value, say Pt(n). Now, if the chosen number is lower than the threshold value Pt(n), then that applicant node will be selected as the CH in this step.

Step 2: Cluster formation

The non-CH nodes receive the HEAD_Adv_Msg broadcast from the CH and send join-cluster message (JOIN_Clu_Msg) to the CH for which it has the received signal strength, among other factors. The JOIN_Clu_Msg transmission contains the node's ID and the CH's ID.

Step 3: Schedule TDMA and CDMA

After the network is organized into clusters, each CH creates TDMA time slots and distributes them to each member in its cluster. Each CH also selects a CDMA code that it will use to forward sensed data to the BS.

B. The Steady-state Phase

The sensor nodes begin sensing in their areas and send data to their CH within the TDMA time slot allocated in Step 3. The CH node will receive sensed data from all members in its group, then compress or aggregate them by data fusion and transmit to the BS. The state of the network will return to Step 1 of the setup phase and a new round is started.

V. PROPOSED ALGORITHM

Phase I: Steps of Cluster-head Selection
Begin
1. Start a round with all the active nodes
2. Queue size taken here that is upper ceiling of $1/5^{th}$ of all the present nodes

$$Q_i = \left\lceil \frac{1}{5} th \right\rceil$$

3. Calculation of Pi(t) value at each node as CH selection procedure
4. If $RB_i > RB_{avg}$ &&$DB_i < DB_{avg}$
5. Then It will be selected as CH and then node. type ="CH"
6. Else node. type = normal
7. Broadcast MSG_CH_AD to all other nodes.
8. Queue formation done of next probable CH.
9. Normal network operation continues.

CASE FOR HANDLING NEW NODES

phase II. Authentication Check

1. Sensor nodes compute MAC with help of secret key K and destination address
K MAC □M□ □Hk(M= destaddr□
2. Cluster-head computes MAC' using the common key Ks. CH has its own database of keys.
3. If $SensorNode_{MAC=}$□$ClusterHead_{MAC}$
4. Then authentication successful
5. Else drop that sensor node ID

Phase III. Detection Phase

1. Sender : Receiver Packet ratio Check
If the packet sends from the neighboring nodes to the Ch = Packets received rate at the base station
2. Then marking of that nodes
3. Else Suspicion level ++
Because of Sender : Receiver failure ratio reaches an upper bound.
4. If the nodes are marked in step 2then go for selective time variant flooding.
5. If Nodes that are passed in step 4
6. Then marks deleted and
Suspicion level--
7. Else nodes are blacklisted.
8. If nodes are not marked go for flooding check
9. Passed then again go to step 1
10. Else detect ++ and go to blacklisted

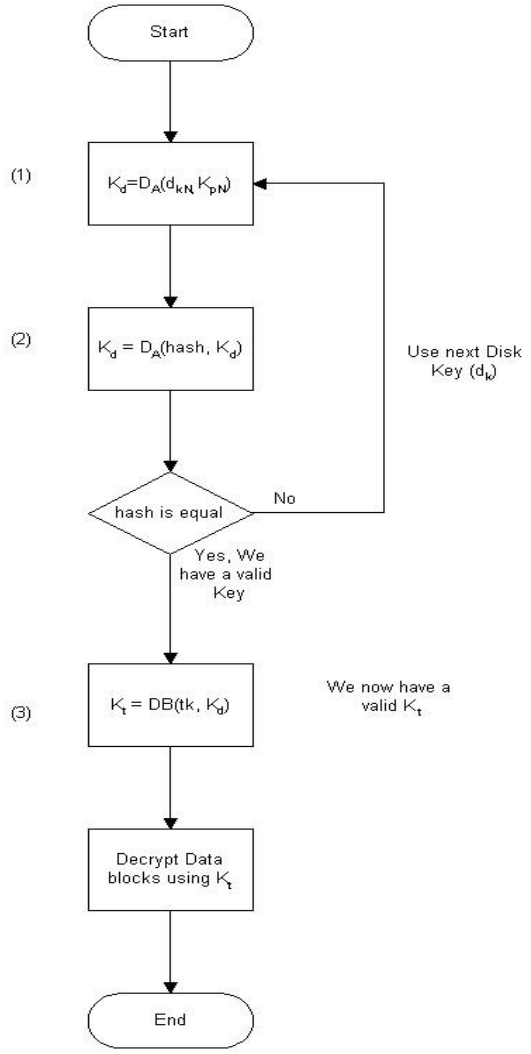

Fig . 3

Phase IV. Information Dissemination
1. If (detect >0)

2. Then Transmits ALERT message to the Base Station
3. Retransmits ALERT message to other neighboring nodes confirming the detected node is blocked.

Phase V. Isolation/Elimination Phase

1. CH sends an encrypted message to all the neighboring nodes
2. The blocked nodes are went for elimination

VI . Conclusion

In this paper ,the LEACH protocol is projected into a new dimension in order to enhance the features of WSN. Thus the above proposed Novelty LEACH algorithm extends network lifetime and also reduces the data transmission rate. The proposed approach checks the user authentication and detects the malicious node in the network. So that the intruders are identified and the network is protected.

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