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Decrease Number of Bit ID in Wireless Sensor Network by Using Huffman Algorithm

Parisa Mohammadi[1], Shahram Jamali[2], Mortaza Analoui[3]

[1]Department of Computer Engineering, Science and Research Branch, Islamic Azad University, Ardabil, Iran.
[2]Department of Computer Engineering, University of Mohaghegh Ardabili, Ardabil, Iran.
[3]Department of Computer Engineering, Iran University of Science and Technology. Tehran, Iran.

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ABSTRACT

A wireless sensor network consists of many low-cost, low-power sensor nodes, which can perform sensing, simple computation, and transmission of sensed information. Long distance transmission by sensor nodes is not energy efficient, since energy consumption is a superliner function of the transmission distance., which can have their batteries And its sensing tasks in a given environment are doing. It is comprised of one or more master nodes which have sensed data is collected And a central processing and storage system communicates . A sensor node typically gets its power from a battery. Because a sensor network routing protocols require a node identifier These identifiers are required in securing these networks require a unique identifier on each packet has a header . The length of the ID is important in these networks . In this paper we solve the problem of assigning a unique identifier Huffman offer . We use a unique identifier Huffman codes , short for wireless sensor nodes . Our nodes are organized in a tree structure .This tree structure is used to calculate the size of the network and then form the Huffman tree to assign a unique ID to each node deals with the shortest name . Our algorithm for an area with a large number of sensors are simulated using Matlab software. We then evaluate the performance And the results more casts with the same density and non- uniform density compared to more casts. This work provides a solution to identify malicious nodes in wireless sensor networks through detection of malicious message transmissions in a network. A message transmissions considered suspicious if its signal strength is incompatible with its originator's geographical position. We provide protocols for detecting suspicious transmissions – and the consequent identification of malicious nodes – and for disseminating this information in the network. We evaluate the detection rate and the efficiency of our solution along a number of parameters. The department has been using a new method for assigning Huffman node ID - the ID of the sensor introduced that will be the least bit.

KEY WORDS: ID Assignment, Sensor networks, Huffman algorithm

1. INTRODUCTION

Wireless sensor nodes are made using microelectronic portions that can only be supplied with a limited power source (Heinzelman, Chandrakasan,2000). An energy resource can not be changed or replaced in some applications. Therefore, lifetime of sensor node greatly depends on its battery life. Also, the main task of a sensor node in one sensor field is sensing environment and discovering its events, performing quick local operations and the primary data processing and the final data transmission. As a result, the energy consumption can be divided into three parts which include feeling, data processing, and communication which has the highest consumption (Govindan,2001). So many researchers are looking for ways to reduce energy consumption in nodes and hence to increase the useful lifetime of sensor network. And since sensor nodes in wireless sensor networks communicate with each other through identifiers (often in the form of multi-step communication), and greatness of identifiers' length leads to the waste of energy and leads to the decrease of lifetime of wireless sensor nodes, so length of identifier is important in sensor networks. Thus, in this article using Huffman algorithm a method was offered to allocate ID to the wireless sensor nodes through which first the length of allocated ID to the wireless sensor nodes are decreased, second through this method high energy consumption in sending packets and decrease lifetime of wireless sensor networks are prevented (Dunkels, Alonso, and Voight,2004)

2.Related Works

In dynamic addressing method that a local addressing method overhead controls decreases. In this method that is based on the cluster, address can be reused based on distance (Bharghavan,1995). In addressing method, MAC algorithm is presented to the address assignment that its main operation is based on periodic distribution of packets. In this method that is a local addressing each periodic package includes information of neighboring node and the address of each node and its neighbors is obtained through listening to their periodic broadcast (Schurgers, Kulkarni and Srivastava,2001). In local addressing method with more energy efficiency for wireless sensor nodes the main focus is on the clustering of nodes, and nodes are classified in clusters And addresses of nodes of each cluster are unique address of nodes of other clusters (Schurgers, Kulkarni and Srivastava,2001). In Distributed global identification allocation a tree structure is used for identifier assignment and at first, temporary identifiers are allocated to the wireless sensor nodes and at the final phase unique identifiers are allocated to each one of sensor nodes (Eould, Blough,2008).

Other method is address assignment and routing schemes for ZigBee-based LT WSNs (Pan, and Tseng, 2012). To assign addresses to nodes, design rules to divide nodes into clusters. Each node belongs to one cluster and each cluster has a unique cluster

***Corresponding Author:** Parisa Mohammadi, Department of Computer Engineering, Science and Research Branch, Islamic Azad University, Ardabil, Iran. E.mail: Mohammadi_PM@yahoo.com, Tel: (++98)451-3367346

ID. All nodes in a cluster have the same cluster ID, but different node IDs. The structure of a ZigBee network address is divided into two parts: one is cluster ID and the other is node ID. Tree Cast is a global addressing and stateless routing architecture for sensor networks proposed by PalChaudhuri et. al. In this scheme nodes are organized in a tree structure and are assigned addresses according to their position in the tree. Sink node acts as the root of the tree. Child nodes lie within the transmission range of the parent and parent node assigns addresses to its descendant children. Child node randomly generates its own address and gets the address approved by the parent. Parent node keeps track of which child is using which address and ensures that no two children bear the same address. When any address collides, parent notifies the conflicting the child node. If the generated local address of a node is approved by the parent, the node builds its own address by appending the parent address with its own address (SalChaudhuri, Saha , and Johnson, 2004).

3. Unique ID assignment with Huffman algorithm

In this section, using a new method for assignment of Huffman node ID , the ID of the sensor introduced that will be the least bit. This method has already been tested using software c ++ and the results have been favorable. It seems that the current method of allocating identifiers Because in that method we calculate density of sensors by dividing the number of node to the area of land but there is no information about the uniformity of the distribution of the nodes. In this article, we use the Huffman algorithm, in addition to creating a unique identifier ID as long as possible to reduce the bit of a high overhead and therefore to avoid excessive use of energy (Mohammadi, Parisa. and Jamali, Shahram,2012).

3.1 Huffman algorithm

Huffman coding is a method for data elements that occur with different frequencies, is. This method can be used with variable - length fields to save memory usage. All of the information presented in this page is contained in this top frame. This frame consists of a single file with "within the file" links. These links take you directly to the part of the file which you click on. These "within the file" links are available in two places. One is the Table of Contents at the beginning of the file. With larger fields are shown. In this way the input element to element is received, The frequency of each element used in the text are calculated And the abundance of the elements in a binary tree are as follows: The frame located above the bottom frame is the Symbol Key. It is separated from the main page so that the meaning of a symbol contained in the top frame can be found without losing your place. All Symbols which occur in the main page are linked to the symbol frame. Licking on the link to a symbol will make that symbol appear topmost in the symbol-key frame leaving the top frame unchanged. This page is designed to be read from beginning to end by simply using the scrollbar on the right side of the top frame. One can also skip through the page reading only the parts he or she wishes. Good luck, I hope that you find it informative. The frequency of the parent node is the sum of the frequencies of its constituent nodes. Between the last two nodes and nodes that had to have been played, we can continue this process to obtain a tree root. Root frequency should be equal to the sum of the frequencies of the leaves. Now that the tree was constructed for each tree edge we consider a label or a zero. The right edge of the label and each edge is a left heading zero tag. Thus, the path from the root to the leaves move, corresponding to a rooted binary leaf can be obtained It is the leaf of a corresponding code. We show an example implementation of the algorithm. We assume, following 4 elements appear with a frequency of (A=90, B=50, C=100, D=141 and E=242) call, Using Huffman codes to assign each element . Figure 1 shows the Huffman coding method. First, the algorithm remove nodes A and D are things with less frequency , Chooses and the sum of these two new virtual node nodules as parent nodes to two nodes A and D are considered . The following algorithm, which measures the size of the node, is the parent node of a virtual. Therefore chooses node B and node B, and the total size of the virtual parent node, the parent node of the second virtual inserts this procedure until all nodes in the tree structure exist, continues. This must be stated explicitly because many messages are not memory less. The probabilities of the elements in these memorized messages are dependent on the elements which precede them. Finally, a new tree is the shortest path. And each node is assigned a Huffman code.

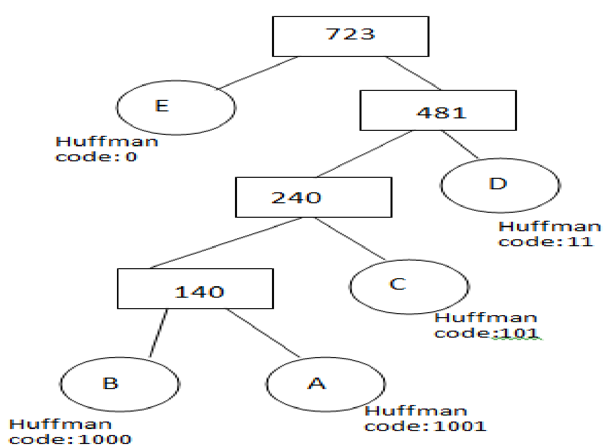

Figure 1. Huffman coding

3.2 Algorithm assigned a unique identifier

In this section, a new method for assigning a unique identifier for a network of wireless sensor nodes is presented. This method starts by organizing nodes in a tree structure. The first node of the signal to be reunited with their and tree pose. Then, each node is assigned a temporary ID and then the tree structure of the network size (total number of nodes in the tree) is calculated and then form the Huffman tree to assign IDs Unique identifier for each node with the lowest deals. The algorithm is divided into four main phases:

3.2.1. Phase 1: tree building and temporary ID assignment

First a node in the network to show the existence of a signal plays there is so stated. Each node of the nodes adjacent to the signal can be received. Each individual node adjacent node finds that is a strong signal that node as its parent chooses. First, they do not address any of the nodes and the sink node address zero. Adjacent nodes in the sink node and the sink node to signal their lower-level nodes are connected to the fathers. Each node begins to send messages to the sink of each node are connected and then asks them to select a temporary address. The nodes are connected randomly selects an address and send it for approval to the sink node. If the address is confirmed by the sink node, the sink node, that node returns a confirmation message. Temporary address of the parent node of each node attached to the holding (Mohammadi, Parisa. and Jamali, Shahram,2012).

3.2.2 Phase 2: collecting the sub-tree sizes

In this phase, the size of the nodes of the tree whose leaf nodes to the root node are reported. As the number of nodes in the tree, the tree node is That it has completed phase one of the knot .A node is identified as a leaf ; Is equal to the size of the tree and it sends a message to the parent node . Each non- leaf nodes waiting for them under the tree as child nodes of the same.

The size of the message tree by the parent node is a confirmation message .Once the initiator node of the tree as the message gets out to all children, The total number of nodes in the network to be aware of. This total to calculate the minimum number of bits needed to achieve the unique identifier for each node in the network is used. Here we are heading for a tree node that number was 10.Below are the number of nodes, each node represents the node.

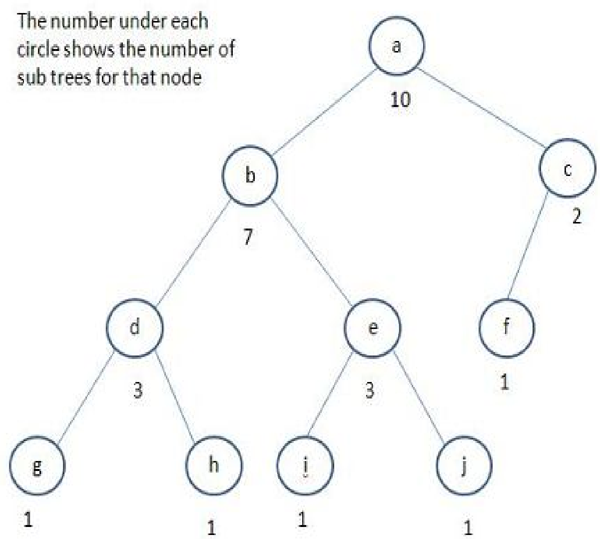

Figure 3. Phase 2

3.2.3Phase 3 : Creating a Huffman tree using Huffman

After the specified number of nodes in the tree , According to the following Huffman tree is created using Huffman Be provided to the premises allocated ID .

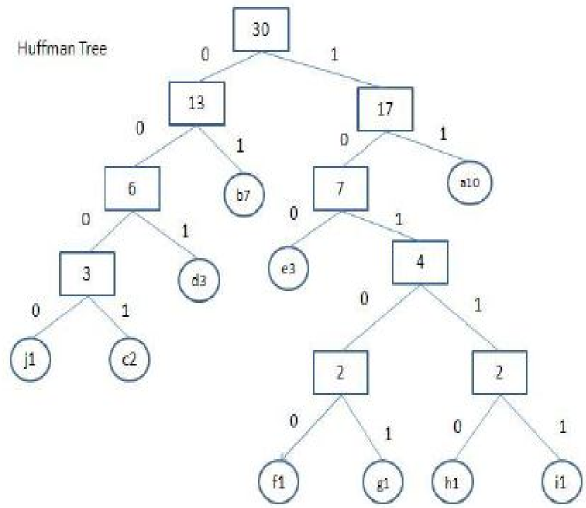

Figure 4. Phase 3

3.2.4 Phase 4 : Assign a unique ID using Huffman national final

At this stage of the Huffman tree using Huffman code unique to each node is created. This code was created as a permanent identifier each node in the network will be considered Shown in the figure below . Once we create the Huffman code , Temporary IDs of nodes that can be located at the deepest level of the tree , we And permanent identifier nodes , then the nodes in the lower level nodes show And forth to the sink node . Algorithm 1 shows the pseudo- code assigned identifier Hoffman After the implementation of the Huffman algorithm proposed in this paper , we evaluate the performance of the Huffman method. And results of the methods and practices more Hofmann casts with the same density and non- uniform density compared to more casts.

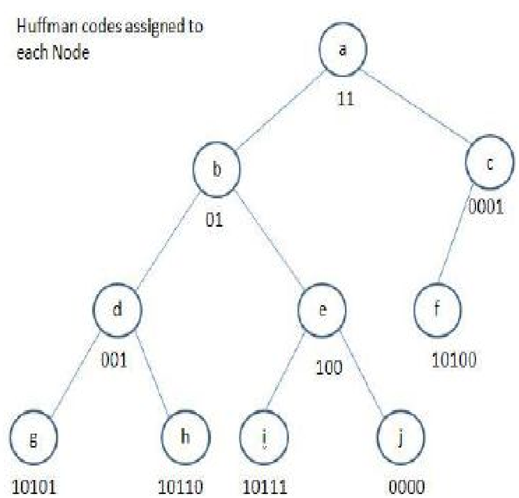

Figure 5. Phase 4

HUFFMAN Algorithm (1)

```
Void Huffman ()
{
For (all the nodes in the network tree)
            Calculate distance to the root;
Make (V_List); // list of nodes
While (V_List is not empty)
{
          Sort (V_List based on the distance of each node to the root);
           Make a Virtual node;
          Find (two smallest nodes in the V_List);
          Make (a HuffTree with Virtual node in the root and two smallest nodes left and right child of it);
          Put the sum of two children in the Virtual node;
```

```
        Remove two smallest nodes and add Virtual node to the V_List;
        Sort (V_List);
    } // end of while
    For (all the edges in the HuffTree)
    {
         Label left edges with 0;
        Label right edges with 1;
    }
    For (all the leaves in the HuffTree)
        Traverse from root to the leaves and write the label of edges in the path;
}
```

4.Performance Evaluation

Our proposed algorithm can be implemented in four phases and will evaluate its performance. The method casts a more uniform density within a simulated environment, we are aware of the gravity sensors Using this density, we can determine the number of bits for each level And density sensors (distributed evenly) by dividing the we calculated the number of nodes in the area, we are here with a simple example to explain the Guggenheim. Suppose we have an area of 1000 square meters and the number of sensor nodes is 1000. Thus the density of nodes is From one area to another node, the node is placed in a square meter (The number of sensor node on level). If the domain of nodes acquires signals is 10 meters. The maximum number of nodes that sink nodes are placed in the signal region , 10 × 10 × 14/3 × 1 (density 314) will be . We use a 9- bit addressing for each level. Now assume that we have the same density of nodes, but the node distribution is not uniform and may Density in the central area is higher than in other sectors. In this case, we can address 10 bits to 1000 nodes connected to the sink node can use . Sensor networks may be one of the best examples in which the pervasiveness of energy efficient design criteria is desirable, due to the inherent resource limitation, which makes energy the most valuable resource. Sensor nodes shouldbe able to establish self-assembling networks that are incrementally extensible and dynamically adaptable to mobility of sensor nodes, changes in task and network requirements, device failure and degradation of sensor nodes.

5.simulation results

In this section, the proposed method (ID assigned by Hoffman) and multicast approaches more and more casts with the same density of non- uniform density simulation in Matlab environment to simulate We compare the results obtained .

We have proposed in a 400 × 400 square meters with 800 nodes at different times with different signal strength and the number of different nodes run And every time the signal strength of sensor nodes were considered, The 20 units will enhance Results for method -casts and more uniform distribution And more non- uniform distribution of casts with the proposed method (ID assigned by Hoffman) are obtained. The results of the proposed program, the average number of bits ID is required for the assignment is . The results are as follows: The effect of signal strength varies from 6 to 14 In a sensor network, where the length of the bit allocation of an identifier for a better way to cast a more uniform distribution and the casts with non- uniform distribution and the proposed method (Hoffman) need Show . Node 476 is the average number of nodes in the network. First, the signal strength of the network nodes and the number of bits 50m assume that sensor nodes with different signal range (50 meters) required Using a larger cast and a more uniform distribution of the non- uniform distribution of multicast algorithm (Huffman) obtains . Figure 6: Average number of bits allocated for sensor nodes based on the signal strength meter 50 different shows . As we see in Figure 6, The number of bits that the proposed sensor has been assigned to each Node, Much less than the number of bits allocated Find more casts using the same density and non- uniform density is greater casts . Once the results obtained by the signal strength of 50 meters, Signal power increases to 20 m. Consider the signal strength of 70 meters This procedure will continue until the signal strength of 190 meters And every time after rising 20 meter signal strength results are recorded separately and as we see in all forms The number of bits using Huffman is assigned to each sensor node, Is much less than the number of bits That means more casts with the same density and longer casts with non- uniform density is allocated. We now consider all signal strength listed in the proposed algorithm results show an overall shape .

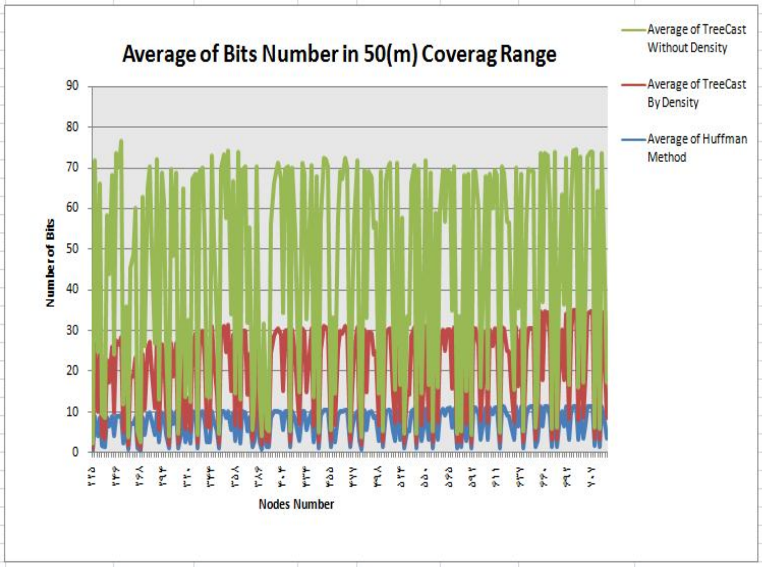

Figure 6.Average of Bits Number in 50(m) Coverage Range

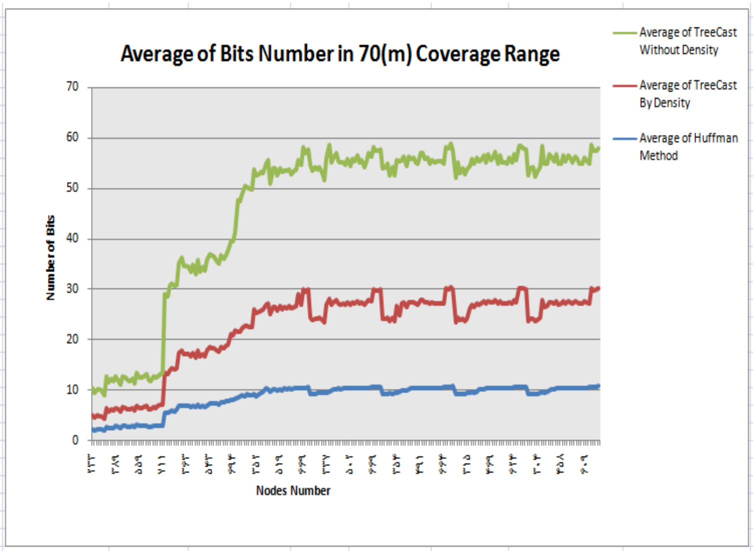

Figure 7.Average of Bits Number in 70(m) Coverage Range

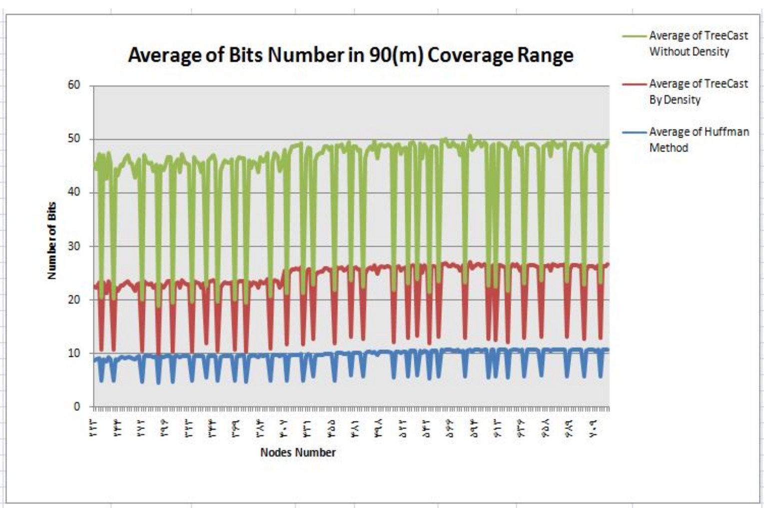

Figure 8. Average of Bits Number in 90(m) Coverage Range

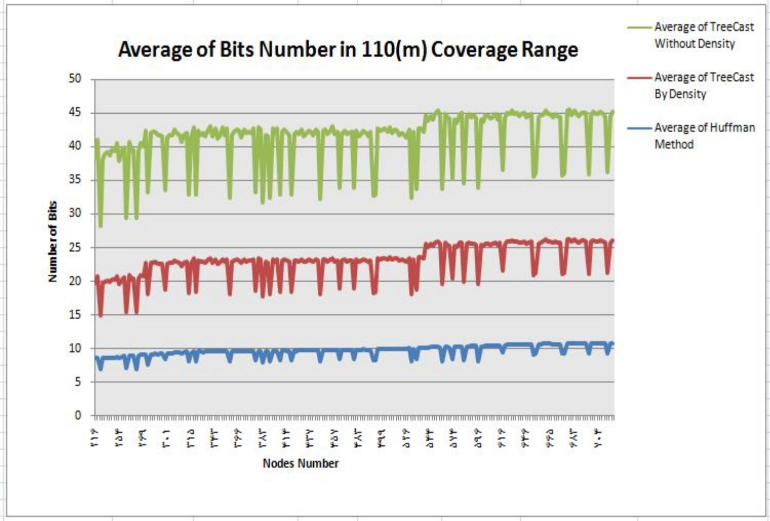

Figure 9. Average of Bits Number in 110(m) Coverage Range

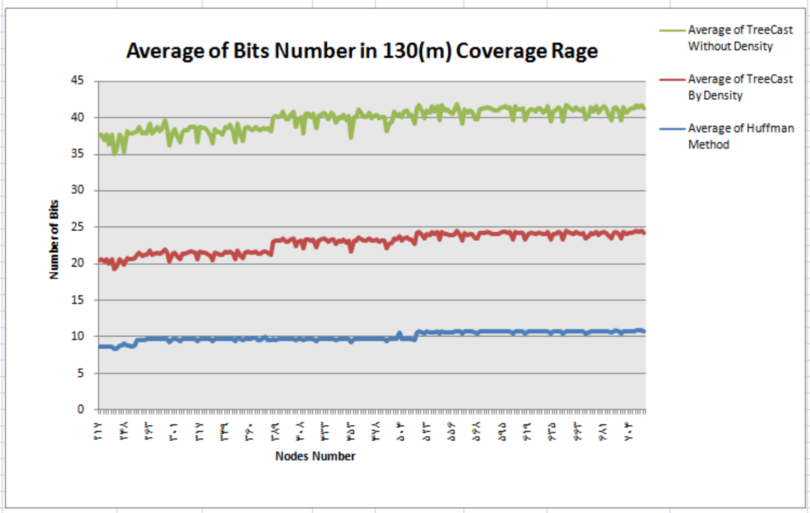

Figure 10. Average of Bits Number in 130(m) Coverage Range

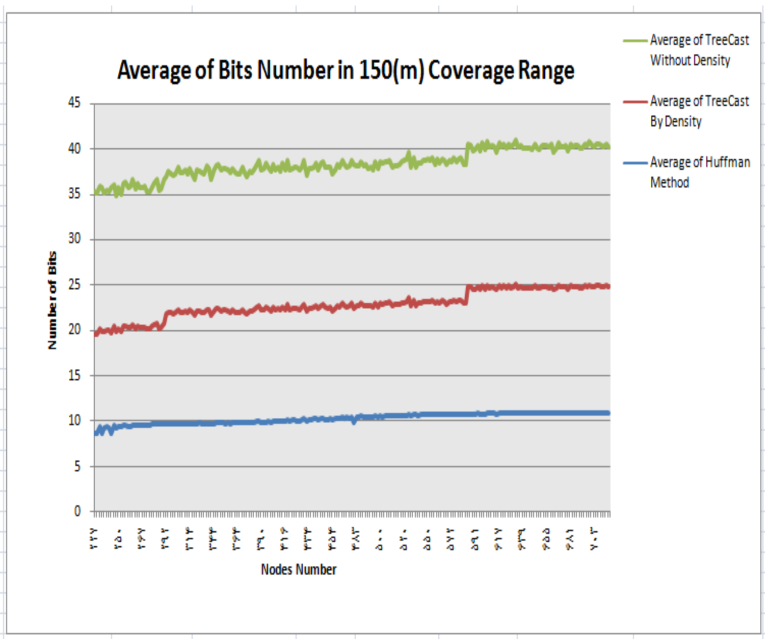

Figure 11. Average of Bits Number in 150(m) Coverage Range

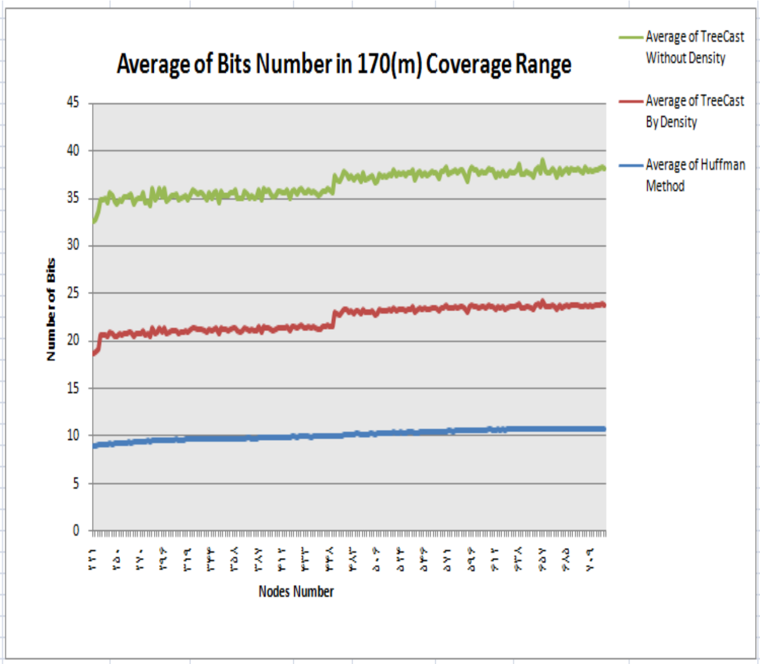

Figure 12. Average of Bits Number in 170(m) Coverage Range

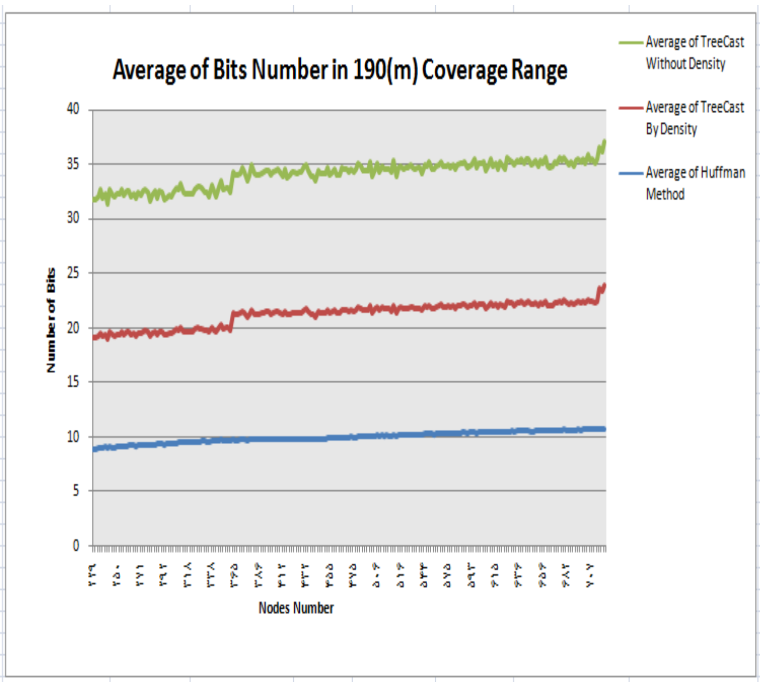

Figure 13. Average of Bits Number in 190(m) Coverage Range

Figure 14 Average length of address allocation The signal strength for all the different numbers of sensor nodes Using the proposed method of Hoffman and casts a more uniform density And non uniform density indicates more casts . Figure 14 shows the Huffman method increases network signal strength over a small effect on wireless sensor node address is allocated. However, in more ways than casts and casts no density with the increase in signal strength over the address assigned to the wireless sensor node is reduced. Our network also affect the depth of the tree The number of bits allocated to the sensor node algorithm requires.

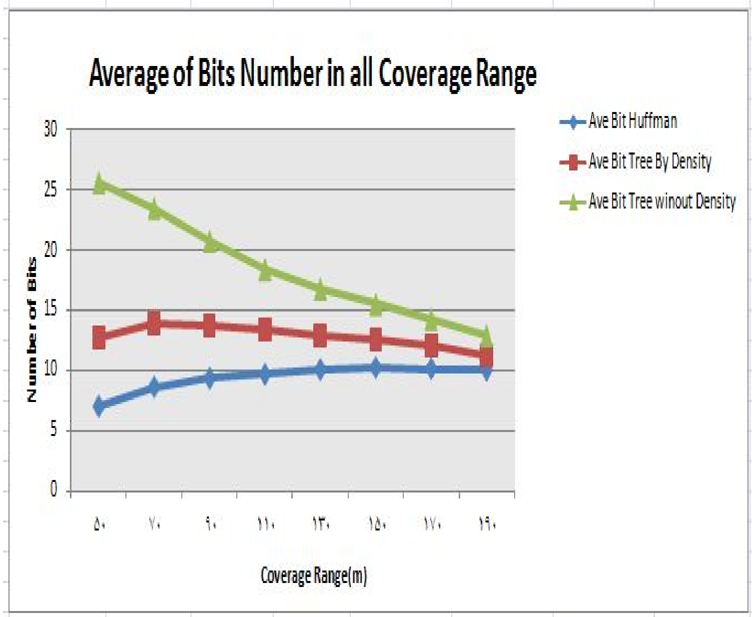

Figure 14. Average of Bits Number in all Coverage Range

We also investigated. We see in Figure 15, Little effect on the depth of the bit allocation tree network The wireless sensor nodes using our algorithm is Hoffman Increase with tree depth and the number of network bits allocated and does not change much . However, in more ways and more uniform density cast with non- uniform density with increasing Depth of the tree over the network address assigned to sensor nodes Wireless also significantly increases.

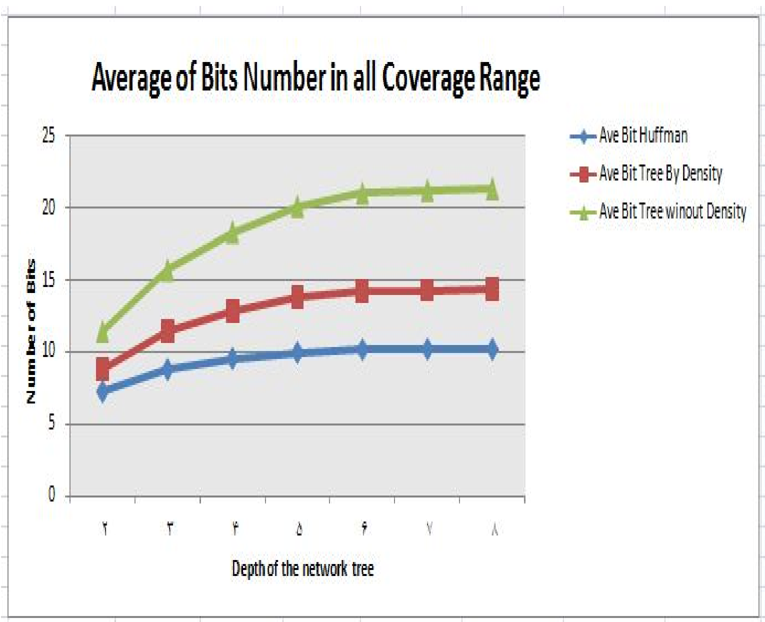

Figure 15. Average of Bits Number in all Depth the Network Tree

6.Conclusions

In wireless sensor networks, communication between sensor nodes often multi- step method is used therefore, these networks require routing protocols are unique identifiers. On the other hand, the ID of the packet length and consequently the energy consumption of sensor nodes is The length of the ID is important in these networks . So being unique identifiers and reduce the length of objects that scientists are working on it . In this study, the method for assigning a unique ID that previously proposed wireless sensor nodes , We reached the conclusion of the assignment ID Using this method, due to a relatively long id ; Username repetitive , high overhead , and higher energy costs are appropriate .

Therefore, the Huffman algorithm to design a unique ID allocation was used. The proposed algorithms with respect to signal strength varies on different numbers of wireless sensor nodes that were randomly selected, was performed using Matlab software and the results ID allocation methods more casts with the same density and non- uniform density is greater casts were compared. Simulation results show that, Compared with the method used to assign an identifier Hoffman - more casts and casts a more uniform density and non- uniform density is greater casts a much smaller number of bits allocated to the sensor node.

There was also a weak signal to a deeper tree network. And therefore the greater the number of bits to allocate more method - casts ID is required, But in no way affiliated with Hoffman due to the parent node child nodes, the tree depth has no influence on the length of the address.

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The authors declare that they have no conflicts of interest in the research.

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