Evaluation of an RSSI-based Location Algorithm for Wireless Sensor Networks

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Abstract:- In today's world the conservation of energy is an important factor when it comes to usage of technology. As WSN are deployed very in wide range of application like military, automobiles, universities etc. The WSN can be of different kind of networks like Bluetooth, WIFI, and ZigBee etc. This paper mainly based on power optimization of Zigbee with the help of RSSI. Its aim is to present reliable, low-cost, low-power and wirelessly connected device for monitoring and control purposes. This research paper is to mainly focus on enhancement of the node connectivity and to use to user power in efficient way based Vth.

INTRODUCTION

 In the recent years the researchers have been consistently developing the wireless communication and day by day the researchers are advancing into new standards . There are different kinds of wireless communication networks like Bluetooth, Wi-Fi, Zigbee etc. Among these Zigbee is IEEE 802.15.4 standard which reliable and can provide very longer usage. The zigbee network can be formed from at least two nodes to hundreds of nodes In order to from a good scalable network the network should be formed with a good protocol. In this paper we would like to present the enhancement of the network connectivity along with power optimization and efficient usage of nodes in the large scale network Power optimization concept is implemented on the router node where the node is no longer required in the network or if it suffers from any malfunction then shifting the path from the current one to next adjacent node. By exchanging the place of router from one node to other node thus good connectivity of nodes in the network can be achieved. Here I organized the concept into sections where each section describes the Zigbee network formation and working in detail.

ZigBee and EEE 802.15.4:-

So first let us understand the term ZigBee, ZigBee is a wireless sensor network device which is evolved in 1990's and many researches are being carried out on it and as the time passes new improvements are being made to it. ZigBee is a worldwide standard communication designed by the team working under IEEE 802.15 workinggroup-4. ZigBee is the low data rate WPAN standard and has detailed specifications for low data rate nodes, its power consumption is very low and are thus long battery life is possible as compared to other standards like WIFI and Bluetooth because these standards have been designed for high data rate applications such as video, voice and other multimedia applications. ZigBee devices transmit data in range of 10-75 meters, that depends on the RF environment and the transmitter power consumed to transmit data, it works in the unlicensed band worldwide (868 MHz, 915MHz or 2.4GHz). The data rates are defined in the range of 20kbps at 868MHz, 40kbps at 915MHz and 250kbps at 2.4GHz. IEEE and ZigBee Alliance have been working together to define all the protocols for IEEE 802.15.4/ZigBee. IEEE has the responsibility to define protocols for the two lower layers, MAC and physical. While ZigBee alliance focuses on the upper layers (from network to the application layer). IEEE802.15.4 now has all the detailed specifications physical and MAC layers for developing different types of topologies like star, mesh, and tree. Various network routing protocols are designed for low power conservation, and to ensure low energy consumption.

Advantages of ZigBee:- unique standards in the implementation of the network protocol complexity is less ,wide range of formation of networks either small or very large easy design, uses very low power ,secured network better reliability with longer usage

Zig Bee Device Types :-

ZigBee forms network in the combination of three types of devices. These devices are: ZigBee coordinator ZigBee router ZigBee end device The above listed are the most commonly termed device name in the network

ZigBee co-ordinator:-

The co-ordinator is the main device which is the source to form the network. Generally there will be one co-ordinator

in the particular network surrounded by many nodes. The co-ordinator node is creator for initializing the network and selecting the suitable channel and allowing other devices to connect to its network.

ZigBee Router:-

A router is next level device to the co-ordinator it is present like intermediate device to access the information between co-ordinator and the end device and to pass on messages in a network. The capabilities of the router are it can connect to the other nodes in the network like co-ordinator, router, and end device. The other name termed to the router is FULL FUNCTION DEVICE as the router has less permission when compared to that of the co-ordinator.

ZigBee End Device:-

These nodes are final category of the devices of the Zigbee. The end nodes are also called as REDUCED FUNCTION DEVICES as the end nodes in the network. These nodes are connected to a router directly and to the co-ordinator indirectly through the routers. These nodes form the final boundary of the network. Another important aspect in the network is the network area. The network area is also defined as the Personal Operating Space. The POS defines the area till what extent the nodes have been deployed

Proposed System :

The proposed system mainly focuses on two points ☐ The first point is based on the connectivity handled by the co-ordinator or the router. For example let us consider a clustered tree network which is comprised of many nodes then it very important to the co-ordinator to communicate with all the nodes and to establish an efficient network. There are different protocols for the zigbee standards .But the following protocol implemented recently proves that it can enhance the node connectivity to maximum level and ensuring that no nodes goes into orphan state. It follows the tree structure where every node is connected with the help of a RSSI received signal strength value. Thus enabling intermediate nodes making as router and limiting their connectivity max four i.e. two end nodes and two routers.
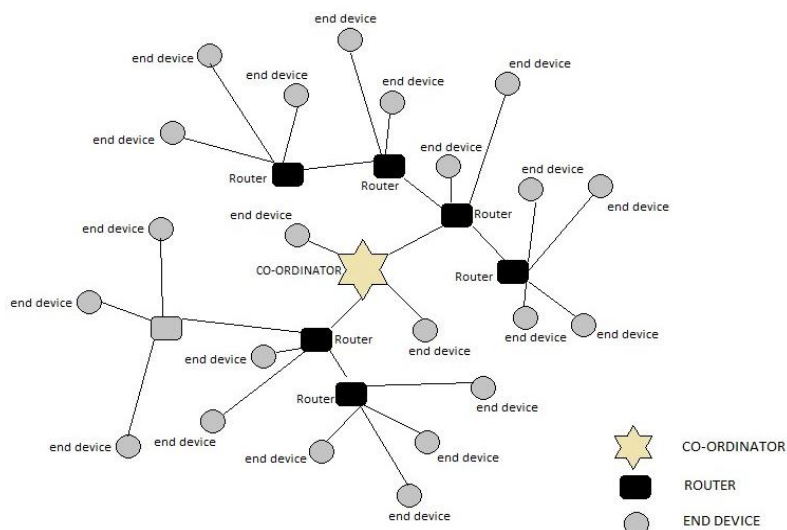

As given in the figure the clustered tree network is formed. The network joining is mainly based on the signal strength received at the co-ordinator and next its routers in a hierarchical order When the results are observed in the stimulated environment then the node connectivity graph has been improved over the previous DAAM protocol of ZigBee

The graphs can be observed as
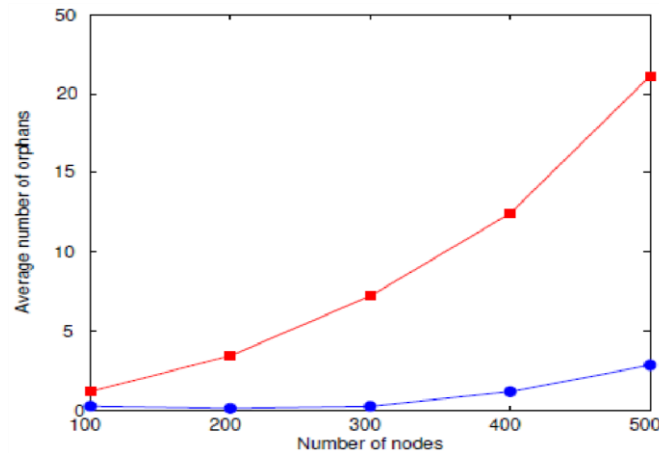
the red line represents the network without modifications to the protocol the blue line represent the network with modifications to the protocol The second task involved in further modifications to the network is exchanging the place of the router to the next nearest one depending on the energy (battery power) present in them If a node is completely playing the role of a router then the power consumed is high when compared to the other nodes linked through it. Then at certain point as the time passes by the node battery goes below the threshold value and thus making it not to function further. At this point the all other nodes need to search for the new parent or to go into an orphan state. which is not at all a good aspect of the network formation

Solution to the above problem can be achieves though the following process Let us consider the network as given in the figure below
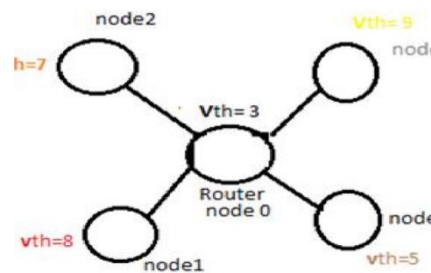
Here in the above given network node 3 is initially assigned as the router for the surrounding nodes . The router assignment is done at the starting formation of the network .Now after some time period the battery voltage level will goes below the threshold level Vth=3 (here the Vth values are assumed not practically considered). But whereas the other nodes threshold values are of different values like 5,7,8,9 for the nodes surrounding the router Now the task comes assign the new node as router for the given nodes The important consideration is to followed is the node having the highest and maximum Vth value Here the next maximum Vth value is preset for the node 3 with Vth = 9 , so this is having the highest value of power resource , if this is made as router the network reliability can be further increased So after replacing the node with highest value then the node with highest Vth value then the above given network will be reformed as given.
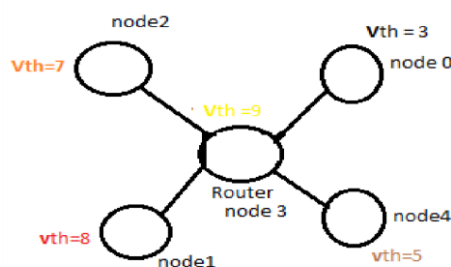
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