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A HIGHLY RELIABLE AND HOP EFFICIENT ROUTING MECHANISM FOR WSN

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ABSTRACT- Wireless sensor systems (WSNs) bring critical favorable circumstances over customary interchanges in today's applications, for example, ecological observing, country security and social insurance. In any case, cruel and complex situations posture incredible difficulties in the unwavering quality of WSN correspondences. To accomplish dependable remote correspondences inside WSNs, it is vital to have a solid steering convention and to have an intends to assess the dependability execution of distinctive directing conventions. In this work, we first model the unwavering quality of two distinct sorts of sensor hubs energy harvesting sensor nodes (EHSNs) and battery-powered sensor nodes (BPSNs). We then present remote connection unwavering quality models for every kind of sensor hubs, where impacts of distinctive parameters, for example, battery life-time, shadowing, clamor and area vulnerability are considered for dissecting the remote connection dependability. In view of the sensor hub and remote connection dependability models, we think about the execution of distinctive steering calculations regarding end-to-end way unwavering quality and number of bounces. An element directing methodology is then proposed to attain to the most dependable end-to-end way in WSNs. Moreover, to encourage a reasonable and exhaustive examination among distinctive steering calculations, an expense capacity approach that coordinates the end-to-end way unwavering quality and number of bounces is proposed, giving a pointer of nature of administration of utilizations running on WSNs.

Keywords:
Wireless sensor network, battery-powered sensor node, energy harvesting sensor node, link failure model, routing algorithm, communication reliability.

I. INTRODUCTION

Wireless sensor systems (WSNs) bring critical points of interest over customary correspondences in applications, for example, country security, human services, structure and environment observing. influence the outline of WSNs, including force administration, adaptation to non-critical failure, versatility, execution cost, topology, and working environment of sensors. Furthermore, vitality consumption, powerless remote connections and hub disappointments decrease WSN execution and dependability [1-6].

In WSNs, sensor hubs screen nature, gather sensed information, and convey the gathered information to sink hub. In some application regions, unforgiving and complex situations posture extraordinary difficulties in the dependability of WSN correspondences. In view of late trial studies [1-3], remote connections in genuine situations can be greatly problematic. Additionally, if the sensor hubs are not inside the transmission scope of the sink hub, then the other sensor hubs go about as hand-off hubs and convey sensed information from the source hub to the sink hub through a solitary way or numerous ways. Therefore, to accomplish dependable remote interchanges inside WSNs which are conveyed in an impromptu manner, it is key to have a solid directing convention.

This paper examines existing steering conventions as far as their dependability execution and proposes new unwavering quality mindful directing conventions. The principle commitments of this work incorporate 1) displaying dependability of vitality gathering and battery-fueled sensor hubs; 2) demonstrating unwavering quality of remote connections considering force utilization, commotion, area vulnerability and remote channel conditions;
3) taking into account the sensor hub and remote connection unwavering quality models, contrasting execution of diverse steering calculations as far as end-to-end way dependability; 4) proposing two static directing calculations and an element directing methodology which coordinate way dependability and number of jumps to enhance the dependability execution; and 5) proposing an expense capacity utilized for steering calculation correlation and

choice. The proposed expense capacity considers two imperative variables: way dependability and number of bounces from the source hub to the sink hub, which serves as a pointer of nature of administration (QoS) of uses running on WSNs.

2. RELATED WORK

"Coverage Problems in Wireless Ad-hoc Sensor Networks" Wireless ad-hoc sensor networks have recently emerged as a premier research topic. They have great long- term economic potential, ability to transform our lives, and pose many new system-building challenges. Sensor networks also pose a number of new conceptual and optimization problems. Some, such as location, deployment, and tracking, are fundamental issues, in that many applications rely on them for needed information. address one of the fundamental problems, namely coverage .its about quality of service (surveillance) that can be provided by a particular sensor network. First define the coverage problem from several points of view including deterministic, statistical, worst and best case, and present examples in each domain. By combining computational geometry and graph theoretic techniques, specifically the Verona diagram and graph search algorithms, we establish the main highlight of the paper - optimal polynomial time worst and average case algorithm for coverage calculation. It also present comprehensive experimental results and discuss future research directions related to coverage in sensor networks.

"Routing Techniques in Wireless Sensor Networks" Wireless Sensor Networks (WSNs) consist of small nodes with sensing , computation, and wireless communications capabilities. Many routing , power management, and data dissemination protocols have been specifically designed for WSNs where energy awareness is an essential design issue. The focus, however, has been given to the routing protocols which might di ending on the application and network architecture. presents a survey of the state-of-the-art routing techniques in WSNs. Worst outline the design challenges for routing protocols in WSNs followed by a comprehensive survey of different routing techniques. Overall, the routing techniques are classified in to three categories based on the underlying network structure: ∞at, hierarchical, and location-based routing. Furthermore, these protocols can be classified in to multipath-based, query-based, negotiation-based, QoS-based, and coherent t-based depending on the protocol operation. We study the design tradeoÆs between energy and communication overhead savings in every routing paradigm. it also highlight the advantages and performance issues of each routing technique

"Optimal transmission ranges for randomly distributed packet radio terminals" In multihop packet radio networks with randomly distributed terminals, the optimal transmission radii to maximize the expected progress of packets in desired directions are determined with a variety of transmission protocols and network configurations. It is shown that the FM capture phenomenon with slotted ALOHA greatly improves the expected progress over the system without capture due to the more limited area of possibly interfering terminals around the receiver. The (mini)slotted non persistent carrier-sense-multiple-access (CSMA) only slightly outperforms ALOHA, unlike the single-hop case (where a large improvement is available), because of a large area of "hidden" terminals and the long vulnerable period generated by them. As an example of an inhomogeneous terminal distribution, the effect of a gap in an otherwise randomly distributed terminal population on the expected progress of packets crossing the gap is considered. In this case, the disadvantage of using a large transmission radius is demonstrated.

"The availability and reliability of wireless multi-hop networks with stochastic link failure "The network reliability and availability in wireless multi-hop networks can be inadequate due to radio induced interference. It is therefore common to introduce redundant nodes. This paper provides a method to forecast how the introduction of redundant nodes increases the reliability and availability of such networks. For simplicity, it is assumed that link failures are stochastic and independent, and the network can be modeled as a random graph. First, the network reliability and availability of a static network with a planned topology is explored. This analysis is relevant to mesh networks for public access, but also provides insight into the reliability and availability behavior of other categories of wireless multi-hop networks. Then, by extending the analysis to also consider random geometric graphs, networks with nodes that are randomly distributed in a metric space are also investigated. Unlike many other random graph analyses, our approach allows for advanced link models where the link failure probability is continuously decreasing with an increasing distance between the two nodes of the link. In addition to analyzing the steady-state availability, the transient reliability behavior of wireless multi-hop networks is also found.

3. PROPOSED AND EXISTING SYSTEM

3.1 PREVIOUS APPROACH

The previous approach made use of breath first search algorithm(BFS). In graph theory, BFS is a strategy for searching in a graph when search is limited to essentially two limitations :(a)visit and inspect a node of a graph;(b)gain access to visit the nodes that neighbors the currently visited node. The BFS begins at a root node and inspects all the neighboring nodes. Then for each of those neighbor nodes in turn, it inspects their neighbor nodes which were unvisited, and so n until the destination is reached.

There is disadvantage in this approach: (a) the main drawback of BFS is its memory requirement .since each level of the tree must be saved in order to generate the next level. And the amount of memory is equal to the number of hops stored ,the face complexity of BFS is O(b^d). As a result , BFS is severely space bound in practice so will exhaust the memory available on typical computers in a matter of minutes.(b) If the solution is farther away from the root, BFS will consume lot of time.(Refer figure 1)

3.2 CURRENT APPROACH

In the current approach two algorithms namely Weighted H algorithm (WH) and Reliable link H algorithms are used. Weighted H algorithm protocol finds the path with minimum hop count between a given source and the sink node in WSN .

In the case of multiple paths with the same fewest hops. WH picks up most reliable path among them .In case of Reliable link H algorithm considers only links that have reliability greater than a particular value when finding the shortest hop path . this protocol chooses neighbors wisely, taking into account information about link reliability. O

Objectives

1. Design and Implementation of Random topology distribution algorithm which is used to disperse the nodes randomly in the network.
2. Design and Implementation of Routing table formation algorithm which is responsible for generation of routing tables for each of the nodes in the network.
3. Design and Implementation of H algorithm which is responsible for finding the root towards the destination using breath first search approach.
4. Design and Implementation of Weighted hop algorithm which finds the route from source node to destination node in such a way that number of hops is minimum it finds out multiple paths from source node to destination node and chooses a path whose number of hops is least.
5. Design and Implementation of Reliable hop algorithm which computes the reliability of each nodes in the neighbors and pick a node in such a way that it has highest reliability and moves forward and repeats the process until the destination is reached
6. Comparison of H algorithm ,WH algorithm and RH algorithm with respect to route discovery time ,number of hops , energy consumption , reliability ,over heads and cost function.

4. SYSTEM MODEL

Consider a WSN comprising of sensor hubs V = {SN1, SN2, . . . ,SNn}, sent in a two-dimensional checked range A. Every sensor SNi (i= 1, … ,n) has position (xi, yi). The area of every sensor could be predefined or arbitrary. In the genuine condition, strategies, for example, triangulation [23] can be utilized to estimated their position utilizing radio quality from a couple of known focuses. Every sensor hub has a sensing scope of sri, inferring that it can screen any focus inside a span of sri. At the end of the day, a point in the checked territory is secured by SNi on the off chance that it is inside the sensing scope of SNi. Allude to [42] for talk on diverse scope issues. Every sensor hub has a transmitting scope of tri, inferring that it can correspond with any sensor hub inside an Euclidean separation of tri. We consider two sorts of sensor hubs, battery-fueled sensor hubs (BPSN) and vitality reaping sensor hubs (EHSN).

In this paper, a WSN is displayed utilizing an arbitrary geometric chart G(V, E) where V signifies an arrangement of consistently circulated sensor hubs and E speaks to an arrangement of correspondence connections interfacing the sensor hubs. The connection between a couple of sensor hubs exists on the off chance that they are inside radio transmission scope of one another and if the correspondence connection between the two hubs has not fizzle

5. MODULES

5.1 Random topology Distribution

This algorithm is responsible for distributing the nodes randomly in the network in a given area (refer figure 1)

5.2 Routing Table Formation

This module is used to generate the routing tables dynamically as soon as the topology distribution is completed each node will compute the routing table by exchanging the messages. (refer figure 2)

5.3 Hop Algorithm based on breath first

BFS searches breadth wise in the problem space. Breath first search is like traversing a tree where each node is a state which may be a potential candidate for the solution .BFS expands node from root of the tree and then generate one route of the tree at a time until a solution is found. It is implemented by maintaining a queue of nodes .initially the queue just the root. In each iteration, node at the head of the queue is removed and then expanded. The generated child nodes are then added to the tail of the queue.(refer figure 3), advantage of BFS is they never get trapped exploring the useless path forever and if there is a solution BFS will definitely find out.

5.4 Weighted Hop Algorithm

The WH algorithm will overcome the disadvantages of hop algorithm as it does not discover the route based on the breath first search approach. It finds out the neighbor node and then for each of the neighbor node acts like a root node and then multiple routes are discovered from each of the neighbor's and one route which has the lowest number of hops is chosen .complexity is less compare to H algorithm but packet loss in the route will be high if a node is chosen which has low battery and low reliability.(refer figure 4)

5.5 Reliability (Single path) Link H Algorithm

Reliability link h algorithm considers only links that have reliability greater than a particular value when finding the shortest path. This protocol chooses neighbors wisely, taking into account information about the link reliability

Reliability of each link is calculated using the formula (refer figure 5)

$$p_{link} = \frac{1}{2}\left[1 - erf\left\langle \frac{10\log\left(\frac{d}{R}\right)}{\sqrt{2\log(10)\varphi}} \right\rangle\right] * \varphi$$

$d = distance\ of\ intermediate\ node\ to\ sink$

$R = range$

$\varphi = rational\ \ factor\ \ 0 \le \varphi \le 6$

6 FURTHER IMPLEMENTATION

Reliability Oriented Multipath link H algorithm

The process of this algorithm is same as single path reliability. But it as advantage compare to single path , has it finds two links(destination) which as a greater reliability for the same source node and helps in choosing the best reliable path (refer figure 6)

7 RESULT

In this work, we demonstrated the unwavering quality of two distinct sorts of sensor hubs: Energy harvesting sensor hubs(nodes) (EHSNs) and battery-powered sensor hubs(nodes) (BPSNs).We likewise introduced remote connection disappointment models for every sort of sensor hubs. In these models, we consider diverse parameters, for example, battery life-time, shadowing, clamor and area vulnerability on remote connection dependability. Taking into account the hub and connection dependability models, we thought about execution of distinctive directing conventions including D, H, R, RH, and WH as far as the normal end-to-end way unwavering quality. An element directing approach that incorporates the two best execution steering calculations R and RH was further proposed. Comparison of BFS, Weighted hop and single path reliability for Route discovery time, Number of Hops ,energy ,reliability, dead nodes, alive nodes we conclude that single path reliability is having more efficient than BFS and Weighted hop. But compare to all three algorithms multipath is having more reliability(in the further implementation). Later on, we plan to explore dependability investigation and configuration of half and half WSNs which incorporate both EHSN and BPSN inside the same system.

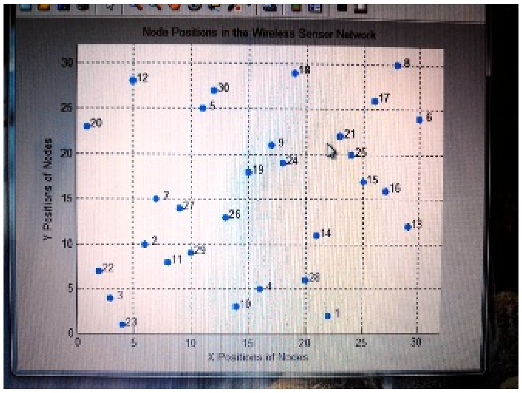

Fig.1 Node deployment

Distance Matrix Combination of Routing Tables
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    0   5.8310   1.4142   2.8284   3.1623   5.0990
    4.4721   3.6056   5.0000   5.6569
5.8310   0   7.2111   5.8310   8.2462   4.4721
    7.0711   2.2361   10.8167   7.0711
1.4142   7.2111   0   3.1623   2.8284   6.3246
    5.0990   5.0000   3.6056   5.8310
2.8284   5.8310   3.1623   0   5.8310   7.0711
    7.2111   4.1231   6.0828   2.8284
3.1623   8.2462   2.8284   5.8310   0   5.6569
    3.1623   6.0828   4.1231   8.6023
5.0990   4.4721   6.3246   7.0711   5.6569   0
    3.1623   3.6056   9.4340   9.4868
4.4721   7.0711   5.0990   7.2111   3.1623
3.1623   0   5.3852   7.2801   10.0000
3.6056   2.2361   5.0000   4.1231   6.0828
3.6056   5.3852   0   8.6023   6.0828
5.0000   10.8167   3.6056   6.0828   4.1231
9.4340   7.2801   8.6023   0   8.0623
5.6569   7.0711   5.8310   2.8284   8.6023
9.4868   10.0000   6.0828   8.0623   0

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Fig.2 Routing table formation

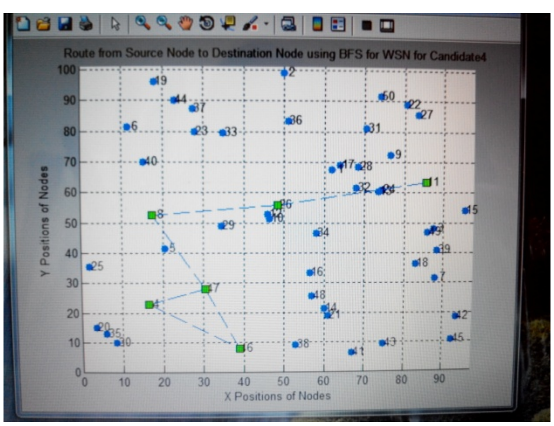


Fig.3 BFS for each neighbors of neighbors

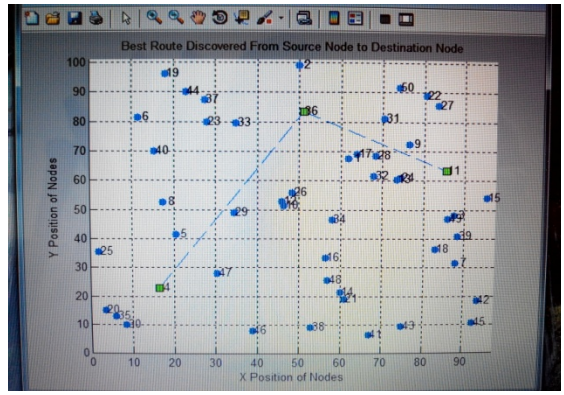


Fig.3.1 Best route for BFS

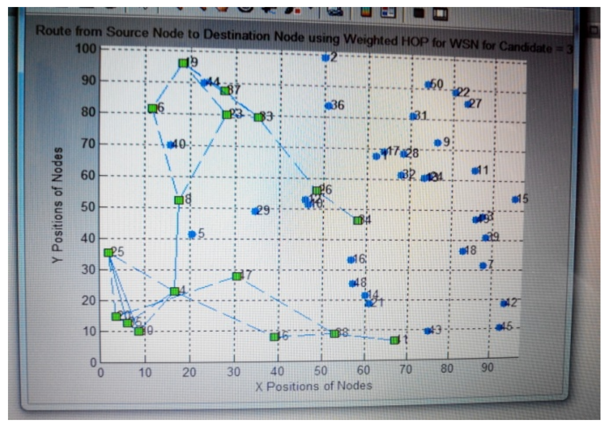


Fig.4 Route discovery of each neighbor node in hop

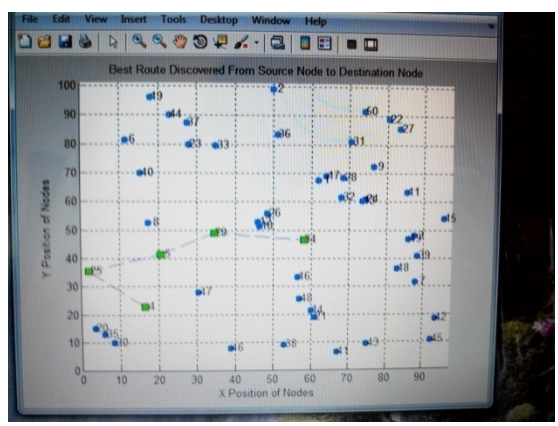


Fig 4.1 Best route in w hop

Fig 5 Best Reliability Route without any relays

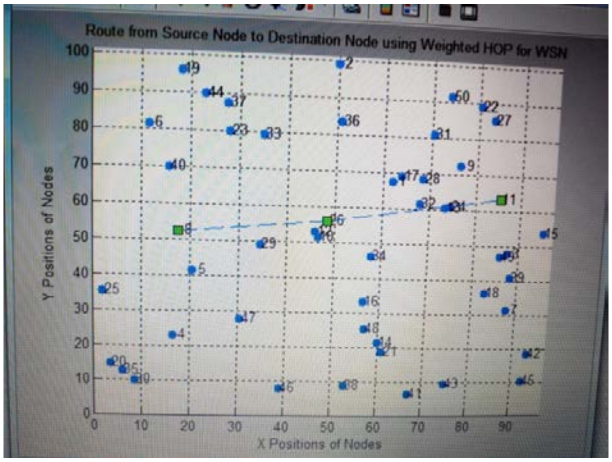


Fig 6 Multipath reliability with SN1 of same sink node

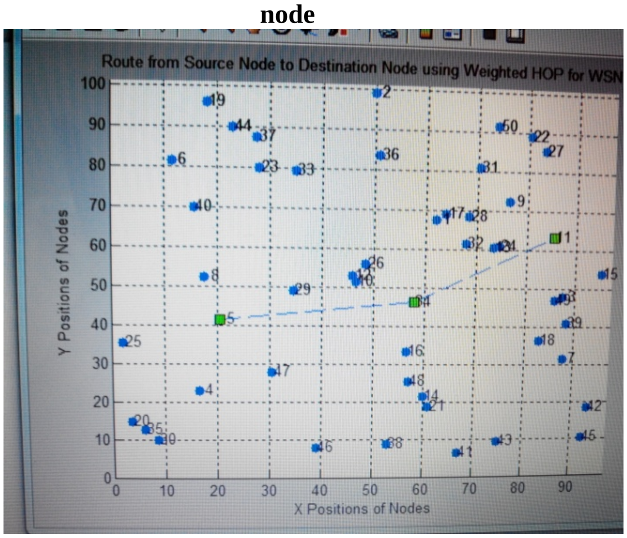
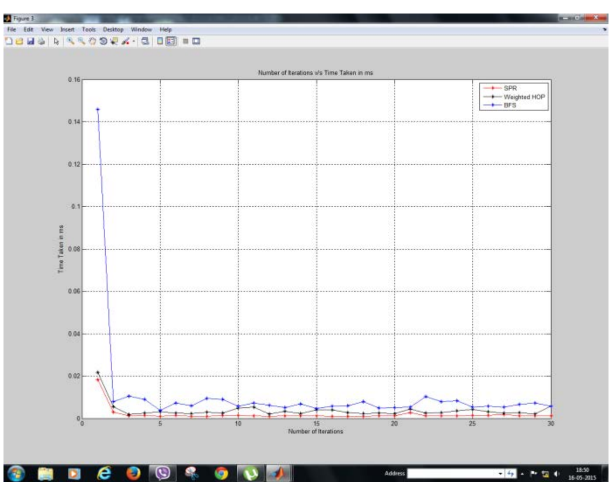
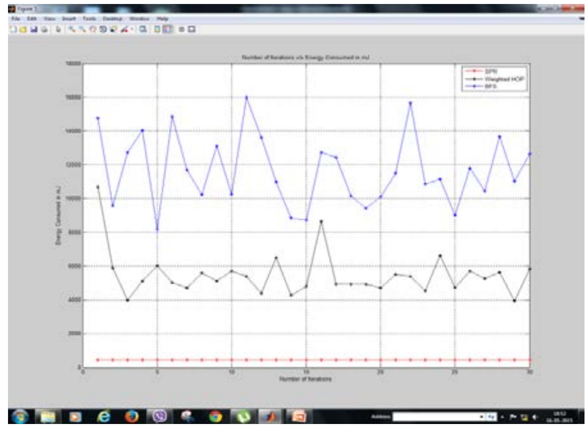


Fig6.1 multipath reliability with SN2 of same sink node

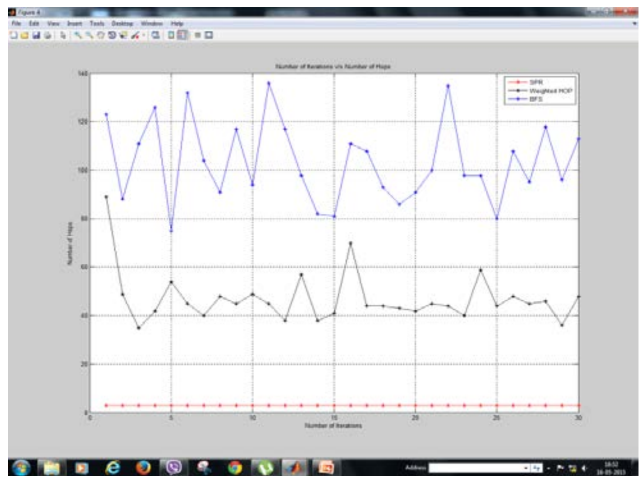
7.1 1Comparison result



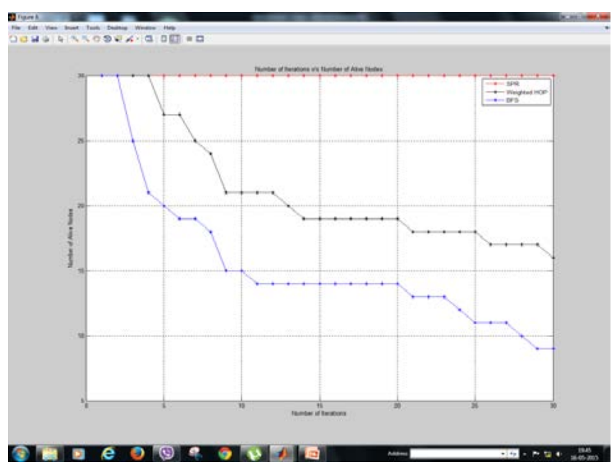
Time taken



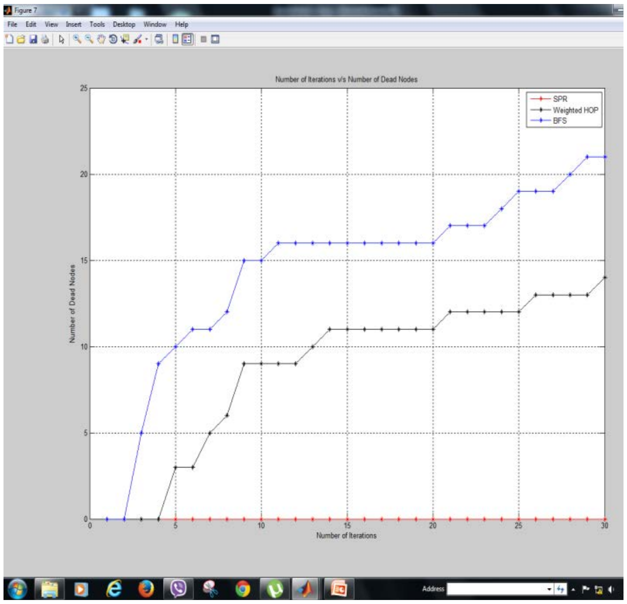
Energy consumption



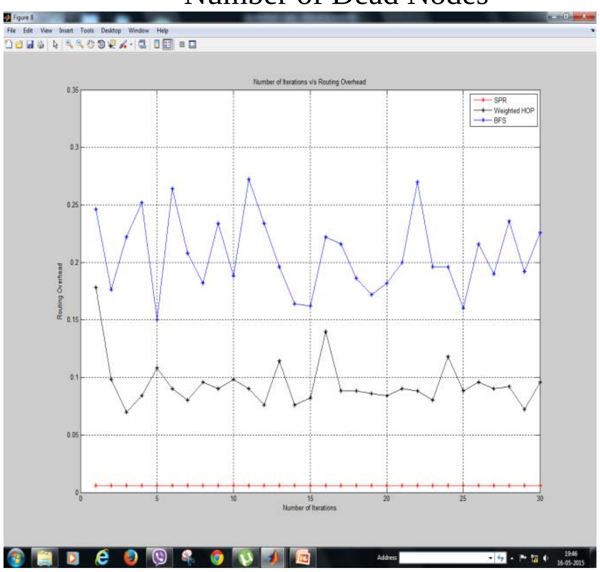
Number of hops



Number of Alive Nodes



Number of Dead Nodes



Routing overhead

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