ISSN: 2321-7782 (Online)
Volume 2, Issue 7, July 2014
International Journal of Advance Research in Computer Science and Management Studies
Research Article / Survey Paper / Case Study
Available online at: www.ijarcsms.com

Crossbreed Routing Protocol for SPEED Terminology in Wireless Sensor Networks

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Abstract: In case of Wireless Sensor Networks, normally attack occurs during communication. The attacks can be DOS, DDOS, black hole etc. The previous work is done in static routing but this paper presents the work on dynamic routing. To reduce the delay in the network, an approach is required that provides end to end guarantees by maintaining a desired delivery speed. Such approach is used by SPEED protocol. SPEED also contains a congestion control mechanism and performs dynamically. Many problems arise when the network meets some kind of attacks; performance of the network further degrades. Here we are using the two performance parameters throughput and energy consumption for comparison the presented work is the improvement over the SPEED protocol, respective to BCO (Bee Colony Optimization) algorithm and some parameter. From the results, it reveals that BCO algorithm gives better results with high throughput and low energy consumption. All the simulations are carried out in MATLAB.

Keywords: Wireless Sensor Network, SPEED, throughput, energy consumption, BCO, attack.

I. INTRODUCTION

Many exciting results have been recently developed for large-scale sensor networks. These networks can form the basis for many types of smart environments such as smart hospitals, battlefields, earthquake response systems, and learning environments. While these potential applications remain diverse, one commonality they all share is the need for an efficient and robust routing protocol.

The main function of sensor networks is data delivery. We distinguish three types of communication patterns associated with the delivery of data in such networks. First, it is often the case that one part of a network detects some activity that needs to be reported to a remote base station. This type of communication is called unicast. Alternatively, a base station may issue a command or query to an area in the sensor networks. This type of communication motivates a different routing service where one end-point of the route may be an area rather than an individual node. We call this area-multicast. Finally, since sensors often measure highly redundant information, in some situations it may be sufficient to have any node in an area respond. We call a routing service that provides such capability, area-anycast [2].

II. CHALLENGES IN WIRELESS SENSOR NETWORKS

A. **Node deployment:** Node deployment in WSN is application dependent and affects the performance of the routing protocols. The deployment of nodes can be either deterministic or random. In deterministic deployment, the sensor nodes are placed manually and data is routed through the paths that are pre-determined. However, in random deployment, the sensor nodes are arranged in a random manner.

B. **Energy consumption without losing accuracy:** Sensor nodes can use up their limited supply of energy while performing computations and transmitting information in a wireless environment .The lifetime of sensor node depends on the battery lifetime. In a multi hop WSN, each node has a dual role as data sender and as data router. The malfunctioning of some sensor nodes due to power failure can cause significant topological changes and might require rerouting of packets and reorganization of the network.

C. Node Capability: Depending on the application, a sensor node can have a different role or capability such as relaying, sensing and aggregation if all these functions are performed by the same node it would drain the energy of that node more quickly. Sensor node deployment varies with respect to the demand of the application, therefore the number of sensor nodes can be hundreds, thousand or even more. To handle network scalability, routing algorithm should have the capability to cope with scalable network [3].

III. Issue in WSN

Beyond the basics of WSN routing just presented, there are many additional key issues including:

- Reliability,
- Integrating with wake/sleep schedules,
- Unicast, multicast and anycast semantics,
- Real-time,
- Mobility,
- Voids,
- Security, and
- Congestion [5]

IV. Related Work

Deepak Ganesan et. al. in 2002 [1] propose a multi-path routing scheme to perform energy efficient recovery form routing failures. SPEED performs load balancing by randomly forwarding packets among multiple concurrent routes. **Tian He et. al in 2003 [2]** authors discussed the SPEED protocol that supports soft real-time communication which is based on feedback control and stateless algorithms for large-scale sensor networks. It is one of the QoS based routing protocol. Various components of this protocol are discussed like an API, a neighbor beacon exchange module, delay estimation module, the Stateless Non-deterministic Geographic Forwarding module (SNGF), Neighborhood Feedback Loop (NFL), Backpressure Rerouting and Last mile processing. The protocol is implemented on GloMoSim and Berkeley notes and performance was compared to five other ad-hoc routing protocols and conclusion is drawn that SPEED has improved performance as compared to other protocols. **Doddapaneni.Krishna Chaitanya in 2011 [4]** discussed wireless sensor network characteristics, various types of attacks in the network, Denial-of-Service (DoS) attacks are recognized as one of the most serious threats due to the resource constrained property in WSN. This paper presents an evaluation of the impact of DoS attacks on the performances of Wireless Sensor Networks by using the OPNET.

V. Proposed Approach

SPEED protocol is stateless protocol in which no routing table is created. It works according to dynamic routing i.e randomly. With the help of BCO (Bee Colony Optimization) algorithm it finds the shortest path to reach its destination. This optimization technique gives the better results with high throughput and low energy consumption.

A. BCO (Bee Colony Optimization) Algorithm

The BCO is inspired by bee's behaviour in the nature. The basic idea behind the BCO is to create the multi agaent system (colony of artificial bees) capable to successfully sovle difficult optimization problems. The artificial bee colony behaves partially alike and partially different from bee colonies in nature. Inspite of the existence of large number of different social insect's species and variation in their behaviour patterns, it is possible to describe in individual insects as capable of performing a variety of complex tasks. The BCO approach is the bottom up approach.

- *Basics of BCO Algorithm[3]*

In the ABC mode three groups of bees: employed bees, onlookers and scouts are present in the colony. For each food source there is only one artificial Employed bee. For all the employed bees in the colony equal to number of food sources are present around the hive. Employed bees first go to their food source and then come back to their hive and dance. The employed bee whose food source has been abandoned becomes a scout and starts to search a new food source. Onlookers are those who watch the dances of employed bees and choose food sources depending on dances. The following steps describe the working:

1. Initially for all employed bees the food sources are produced.
2. REPEAT UNTIL (requirements are met)

A. Each employed bee first goes to a food source in her memory and tries to find a neighbour source, then evaluates its nectar amount and starts dancing in the hive.

B. Each onlooker bee observes the dance of employed bees and then decides one of their sources, and then goes to that source. After choosing a neighbor, next task is to evaluate the nectar amount.

C. Abandoned food sources are found and are replaced with the new food sources discovered by scouts.

D. The best food source found so far is registered.

3. If the best food source is found then end.

In ABC, a population based algorithm, the position of a food source denotes a possible solution to the optimization problem and the nectar amount of a food source represents the quality or fitness of the associated solution. The number of the employed bees and the number of solutions in the population are always equal. The first step involves an initial population to be generated which is randomly distributed. After initialization, the population has to repeat the cycles of the search processes for all types of bees. An employed bee changes the position of source in her memory and discovers a new food source position ,on the condition that the nectar amount of the new source is more than that of the previous source, the bee remembers the new source position and forgets the old one. After all employed bees complete their search process; they exchange and distribute the position information of the sources with the onlookers in the dance area. Each onlooker assesses the nectar information taken from all employed bees and then decide source of food depending on the nectar amounts present in the sources. The sources abandoned are determined and new sources are randomly produced to be replaced with the abandoned ones by artificial scouts.

B. Flowchart

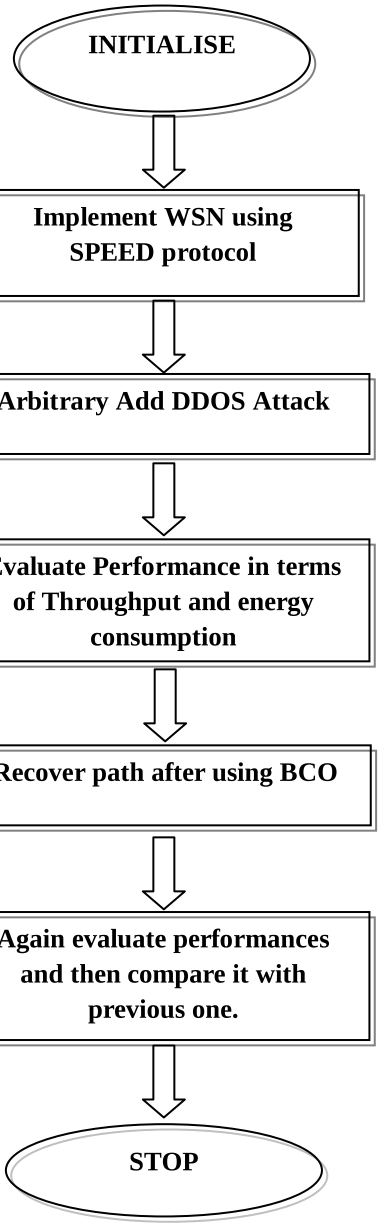


Fig.1 Flowchart of proposed technique

Step 1: Start with initial network.

Step 2: Implement the network using SPEED protocol.

Step 3: Now in path arbitrary DDOS attack is added.

Step 4: Then check the performance in terms of throughput and energy consumption.

Step 5: After that BCO algorithm will start working.

Step 6: Randomly shortest path is find and path is recovered with the help of BCO.

Step 7: At last, again check the performance and compare it with previous results.

VI. EXPERIMENTAL RESULTS

Graphical user interface of proposed technique

- Network of size 1000 m*1000m is constructed.
- We have created a network having 25 regions.

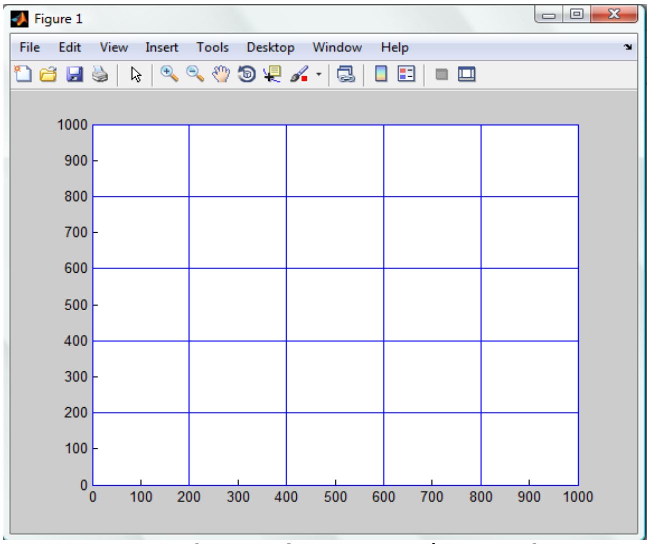


Fig. 2 shows simulation scenario of our network

Number of sensors

Number of sensors in one block = 12

Total number of sensors in whole network = 25 *12 = 300

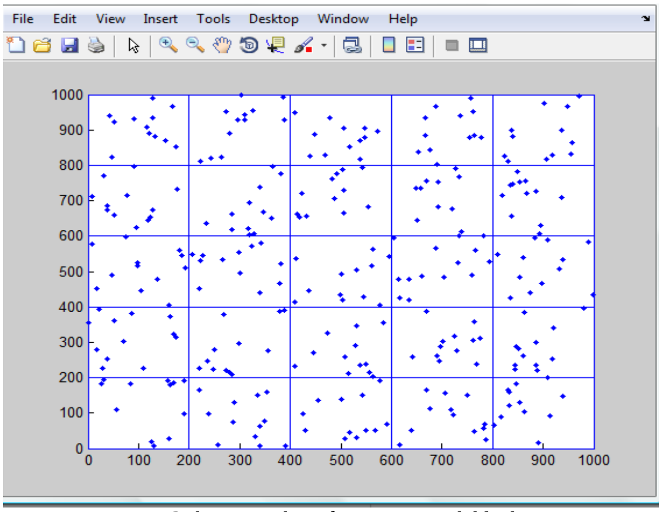
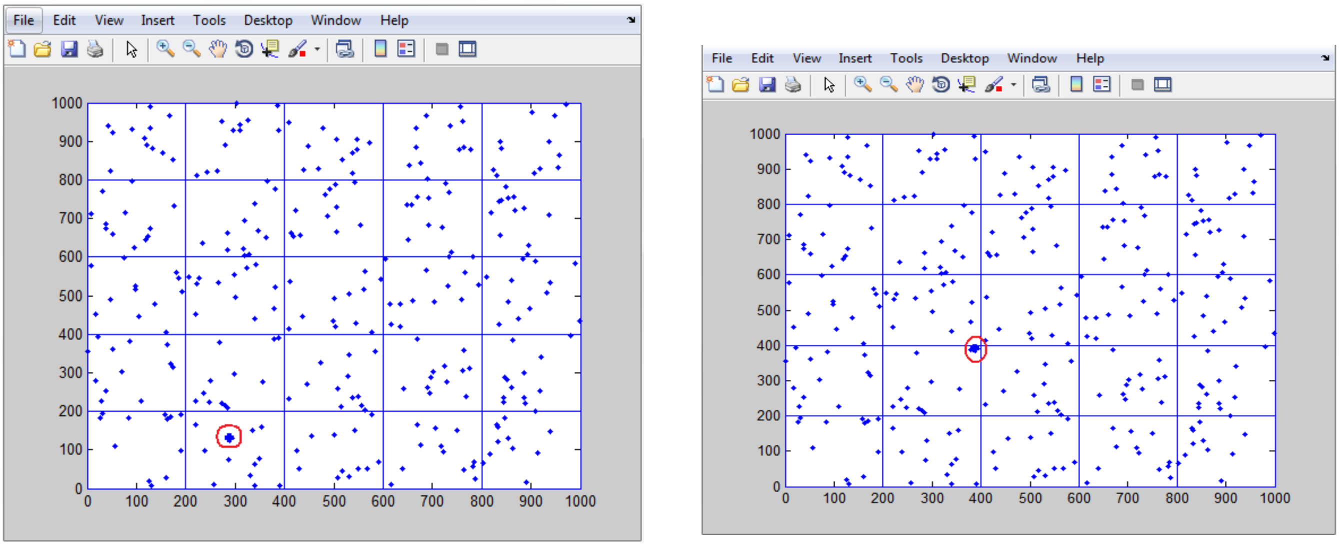


Fig.3 shows number of sensors in each block

Movement of Data Packets

After the creation of simulation scenario of network the data packets moves in the network .Data packet starts moving from first block. Fig. 4 (a) and (b) highlights the data packets in blocks.

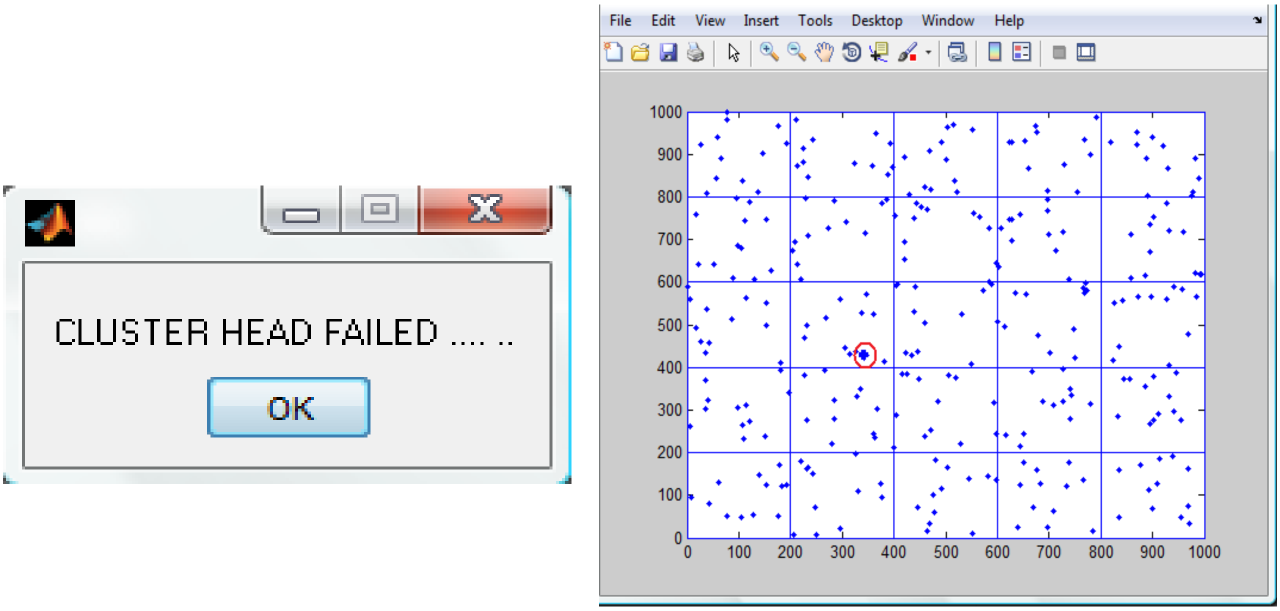


(a) (b)

Fig. 4 (a) and (b) shows movement of data packet in blocks

Cluster Head Failed

During the movement of data packets in the blocks the data packet is failed in 12th block. Because of occurring of attack i.e DDOS attack the data packet will not move further. Then it shows the message box that CLUSTER HEAD FAILED.

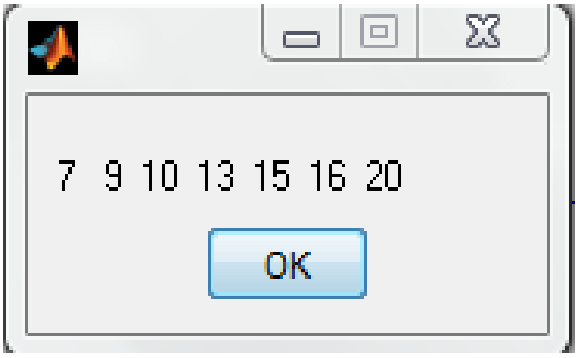


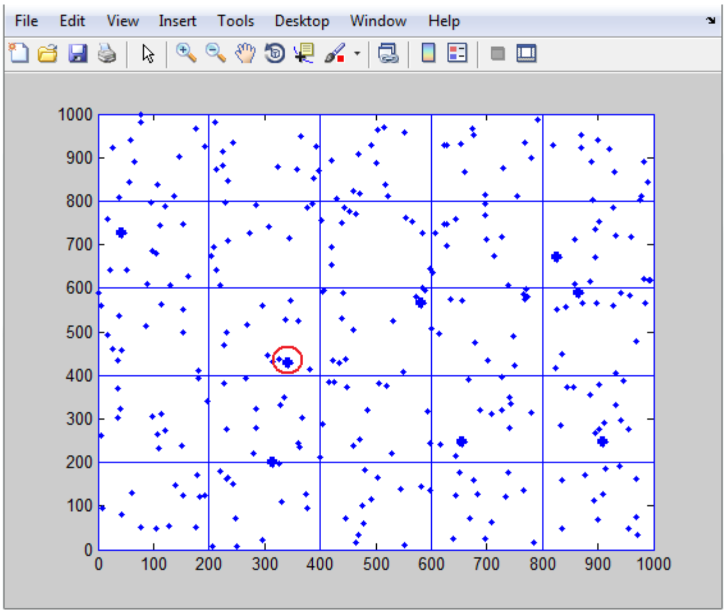
(a) (b)

Fig. 5 (a) and (b) shows cluster head (data packet) failed.

Static path is assigned

Static path is assigned by system. During the routing attack occurs and stop transfer the data packets. Then after that BCO algorithm runs and gives the shortest path.



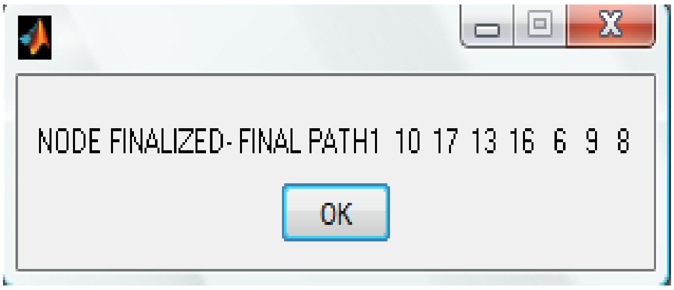


(a) (b)

Fig.6 (a) and (b) shows static path in the network

Randomly Finalized Path using BCO

Static routing consumes time to reach its destination but in dynamic routing it chooses the shortest path to reach its destination and consumes less time. After the failure of cluster head the BCO algorithm runs and choosen the randomly shortest path. It displays the message box for final path and also shows the destination block. The source node never becomes destination node.



(a)

(b)

Fig. 7 (a) and (b) shows final shortest path using BCO algorithm

VII. Comparison of Basic of Throughput and Energy Consumption

This graph represents throughput factor. In this graph black line represnts the speed and blue line represents the speed and energy of proposed algorithm. The graph shows that our proposed algorithm results in higher throughput. Also the throughput is enhanced by 10% on use of BCO.

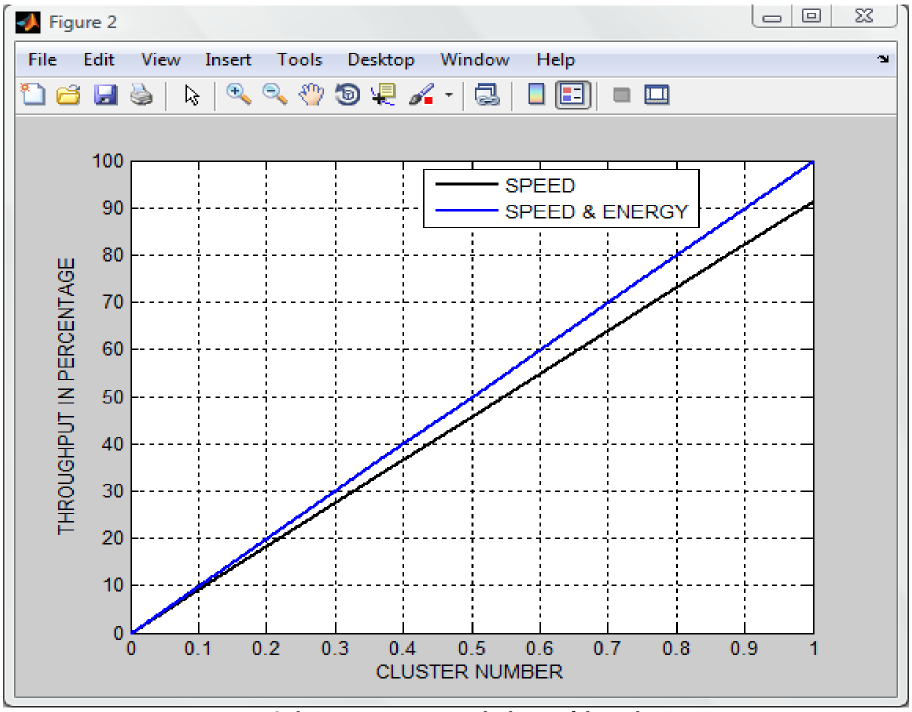


Fig. 8 shows comparison on the basis of throughput

This graph represents energy consumption factor. In this graph black line represents the energy consumed without BCO and green line represents energy consumed with BCO algorithm. It is clear from the above graph that the energy consumption increases if BCO algorithm is not used whereas energy consumption decreases if BCO is used.

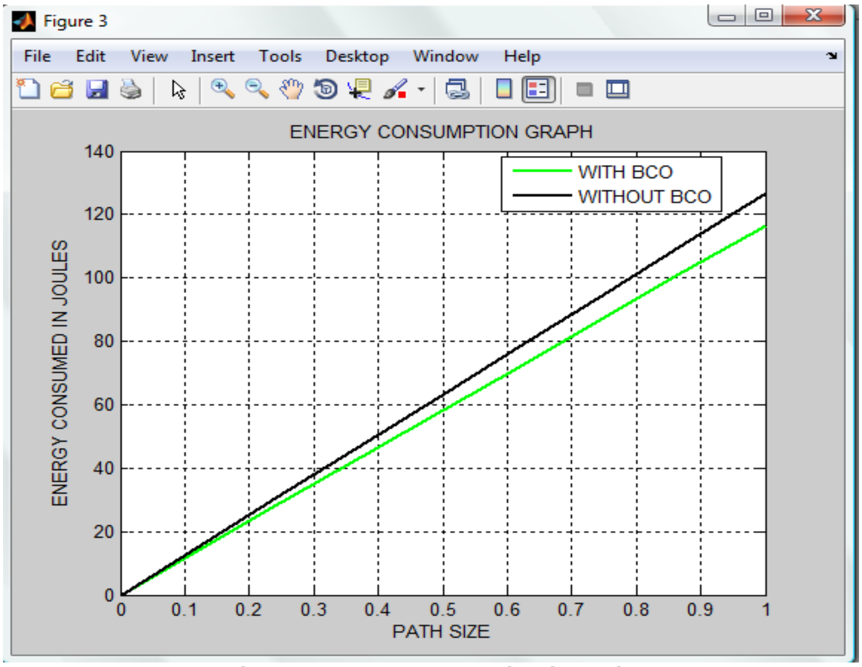


Fig. 9 shows energy consumption graph with or without BCO

VIII. CONCLUSION

The deployment of sensor nodes in an unattended environment makes the networks vulnerable. Wireless sensor networks are increasingly being used in military, environmental, health and commercial applications. Sensor networks are inherently different from traditional wired networks as well as wireless ad-hoc networks. Security is an important feature for the deployment of Wireless Sensor Networks. This concludes that DDOS attack is a Sevier problem in the terms of server security. This paper presents a recovery prevention method of the DDOS attack using BCO algorithm and also measures the performance of WNS in terms of energy consumption and throughput after adding of BCO.

IX. FUTURE SCOPE

In future for the recovery of DDOS attacks ACO algorithm can be used to check the performance of the WSN system. The current system is also only applied on speed protocol. The future research workers might try different protocols of WSN like LEACH, MM SPEED protocol and can perform a comparative analysis of the same. Also the future aspects might also involve the calculation of end to end delay before and after the implementation of BCO.

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