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Data Aggregation & Transfer in Data Centric Network Using Spin Protocol in WSN

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Abstract: The advancement in the wireless communications and electronics has led to the growth of low-cost sensor networks. Due to which the sensor networks is part of different application areas now. Low-cost, low-power and multifunctional small-sized sensor devices are the great end-products of wireless sensor network technologies. These sensor nodes together in a group form a sensing network. A sensor network can offer access to data anytime, anywhere by gathering, processing, evaluating and distributing data. The evolution of information sending in wireless sensor networks is boosting to devise newer and more advanced routing strategies. Many strategies have considered data collection and data dissemination. In this project, the data produced by the sensor nodes is aggregated and provide the further guaranteed data transmission to sink node/ base station using clustering mechanism and node concentration with SPIN protocol.

The proposed scheme provides increased network lifetime, better data gathering and period of stability as compared to M-LEACH protocol.

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I. INTRODUCTION

Due to huge number of applications like agriculture, security, automation and monitoring, Wireless sensor networks has been recognized as one of the forerunner technique in 21st century. Wireless sensor networks (WSNs) consists, a group of sensor nodes with capability of recording several types of environmental and physical circumstances, data processing and offers wireless communication.

In WSN, every node ensures a guaranteed data delivery to a destination node after an explicit and distinctive process. Every node present in the network will be having the ability of delivering a data packet from source to sink node; provided it has enough battery power for the data delivery. A huge amount of energy is essential for the data transmission. Afterevery instant transmission, the residual energy of the node drops because of reducing energy of the sensor node. This gradual decrease in the energy of the node leads to failure of the node. The problem observed can be minimized by routing the data in a manner such that average energy consumption is less, instead of data routing in the path that needs more energy. The energy back up of overall sensor networks plays a key role in establishing fault tolerant systems. If the sensor node has adequate energy, it would be able to get rid of itself from failure.

Thispaper is all about clustering mechanism with node density employed in SPIN is presented. In this proposed process, sensor nodes do not send the data packets all over the network but a clustering mechanism is utilized to get an efficient data transferand guaranteed data delivery to base station. For the data transmission, the above said scheme does not send the data packet throughout the network which in turn reduces the total number of packets transmission, thereby a substantial quantity of energy can be saved.

II. OBJECTIVE OF THE PAPER

The advancements in wireless communication and electronics has accelerated the development of low-cost sensor networks. The area of application is vast for these sensor networks. Every application area is prone to one or the other technical issue that researchers are currently rectifying. Low-power, low-cost and multifunctional small-sized sensing devices are the products of wireless sensor network technologies. These sensing devise together in a group gives rise to a sensor network. A sensor network can offer access to information anytime, anywhere by accumulating, processing, analysing and distributing the sensed information. The further advancement in wireless sensor networks gave birth to routing algorithms. Many algorithms are presently in use data gathering and data aggregation purposes in wireless sensor networks.

The main objectives of this project are as follows:

- To provide guaranteed data transmission to a sink using SPIN protocol.
- To minimize the number of transmissions using clustering schemes in order to save energy of the sensor nodes.
- To provide better data gathering, stability period and lifetime than the Modified LEACH protocol.
- To improve the traditional clustering mechanism by employing assistant cluster heads (ACH).

III. LITERATURE SURVEY

In paper [1], the author proposes LEACH (Low-Energy Adaptive Clustering Hierarchy), a protocol based on clustering scheme which randomly selects the native cluster base stations called cluster heads in order to distribute the energy burden equally among all the sensors present in the network.

LEACH reduces the transmitted information to the base station by using data fusion technique and also native coordination that enables robustness and scalability for dynamic networks. Using the proposed scheme, a factor of 8 reductions in energy consumptions can be achieved as compared to other routing protocols. In addition, the proposed scheme evenly distributes the energy consumption among all the sensors, which in turn doubles The Network Lifetime.

Disadvantages

- Energy consumption should be reduced.
- Network lifetime should be increased.
- Energy efficient data acquisition has to be obtained.

In paper [2], A wireless network scenario is considered where in, it contains micro-sensor nodes, equipped with batteries and capable of wireless communications. The sensor nodes here monitors the surrounding environment and periodically, transmits the sensed information to the base station. The limited battery-powers of the sensor devices are consumed in both transmission and computation – specifically in transmission. To minimize such power dissipation, this paper [2] presents a novel data collection scheme based on the hypercube topology for micro sensor networks. By transmitting data packets from all the sensor nodes to the base station through the communication tree in the constructed hypercube, the new approach is capable of shortening the communication delay by parallel communications and network reconfiguration that replaces the dead sensor nodes.

Simulation results depicts that in comparison with other data collection schemes, the proposed hypercube-based scheme gives most favourable results, including balanced energy loads, minimized transmission delay, satisfying system scalability and as a result prolonged network lifetime. To complete the analysis, the scattered approach for developing a hypercube and a binary tree for data collection are also proposed.

Disadvantages

- Should reduce power consumption.
- Should reduce the transmission delay
- Should improve scalability.
- Network life time has to be prolonged.

In paper [3], one of the major challenge in wireless sensor network (WSN) is the data transmission. In order to reduce the energy consumed during data packet transmissions in WSN, a huge number of routing protocols have been recommended. The routing protocols that employs data-centric approach are most suitable in this context, as they perform in-network data aggregation to yield energy savings.

In this paper [3], the author has proposed a modified version of SPIN protocol called M-SPIN and its performance is compared against the traditional SPIN protocol. The TOSSIM simulator is used here, to evaluate the M-SPIN protocol. From the simulation results, it is confirmed that the M-SPIN shows significant performance gains than traditional SPIN protocol.

Disadvantages

- Performance of the algorithm has to be improved.
- Data transmission has to be increased.

In this paper [10], the author presents the simulation results of SPIN (Sensor Protocol for Information via Negotiation), a wireless sensor routing protocol, with the aid of TinyOS and nesC. TinyOS is an operating system used in present-day wireless sensors as it provides a highly modular system which is powerful and flexible. The programming in TinyOS requires a new language called nesC, which is difficult to learn for beginners. The SPIN protocol is a routing protocol with data-centric approach for Wireless Sensor Network (WSN). SPIN comes under event-driven delivery model. The implementation of SPIN protocol is divided into three stages. These are Initialization stage, Data gathering stage and Negotiation stage. The TOSSIM simulator is

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used for simulating the SIN protocol.

Disadvantages

- ➢ The network system must be more flexible and powerful.

IV. EXISTING SYSTEM

The primary objective of wireless sensor networks (WSN) is to reduce the power depletion of sensor nodes as all these nodes are usually powered with portable batteries. This basic concern can help in extending the network lifetime to reasonable times. The energy consumption by the components of a typical sensor node can be reduced by choosing the best communication protocol possible. The chosen communication protocol must have a substantial effect on the total power depletion of any WSN network under consideration.

In the existing system, LEACH (Low-Energy Adaptive Clustering Hierarchy) is employed. The traditional communication protocols of point-point transmission, minimal transmission energy, multi-hop routing and static clustering is not sufficient for the present WSN scenarios, the LEACH protocol is proposed in the existing system. The LEACH protocol is a clustering mechanism based routing protocol, which uses a mechanism wherein the role of cluster head is changed in a random fashion. This mechanism helps in distributing the overall power of the system in even manner. The LEACH uses native coordination in a cluster to enable robustness and scalability for non-static network environments, and includes data gathering process into the routing protocol to minimize the volume of data that is routed to the base station.

Disadvantages

- ➢ The amount Energy consumption should be minimized.
- ➢ The Network lifetime has to be increased.

V. PROPOSED SYSTEM

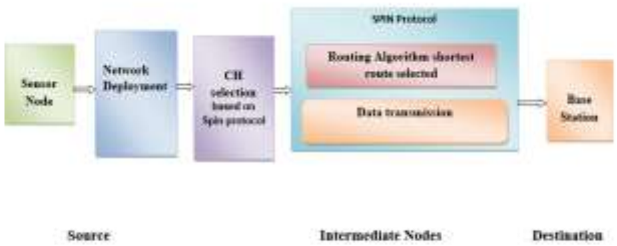
The SPIN protocol is an efficient cluster head scheme. In the proposed scheme, the intercommunication among the nodes and distance between the cluster heads is reduced using route shorten method. The proposed scheme provides the best way of data delivery from source node to sink node using clustering mechanism which in turn reduces the total number of data packet transmissions. A substantial quantity of overall energy is hold back. Before and after transmitting the data packets, the negotiation is carried out. In the proposed scheme, the packet delivery ratio (PDR) is improved by taking into account of the traffic density. The network lifetime and PDR is improved with a node having maximum power and maximum traffic density. The Proposed system is divided into three different phases. The first phase includes the election of cluster head and assistant cluster head between the sensor nodes present in respective clusters based on distance and energy-content of the sensor nodes. The remaining two phases includes the data gathering and data transmission. In the data gathering phase, the data from the remaining sensor nodes in a cluster is routed to and collected by the respective cluster heads. In the data transmission phase, the data collected at the cluster head is processed and sent to their assistant cluster heads, which in turn chooses the optimal path to the sink node via other assistant cluster heads to transmit the data packets.

Advantages

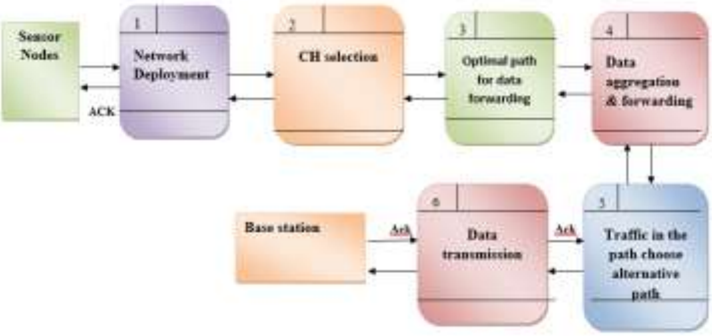
- ➢ Improvement in network life time.
- ➢ Improvement in network performance.
- ➢ Achieving guaranteed data transmission.
- ➢ Packet Delivery Ration is maximized.
- ➢ Reduction in the intercommunication among the nodes and the distance between cluster heads.

VI. SYSTEM DESIGN

6.1 SYSTEM ARCHITECTURE



6.2 DATA FLOW DIAGRAM



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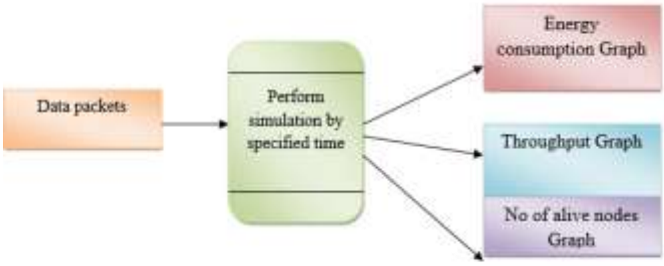
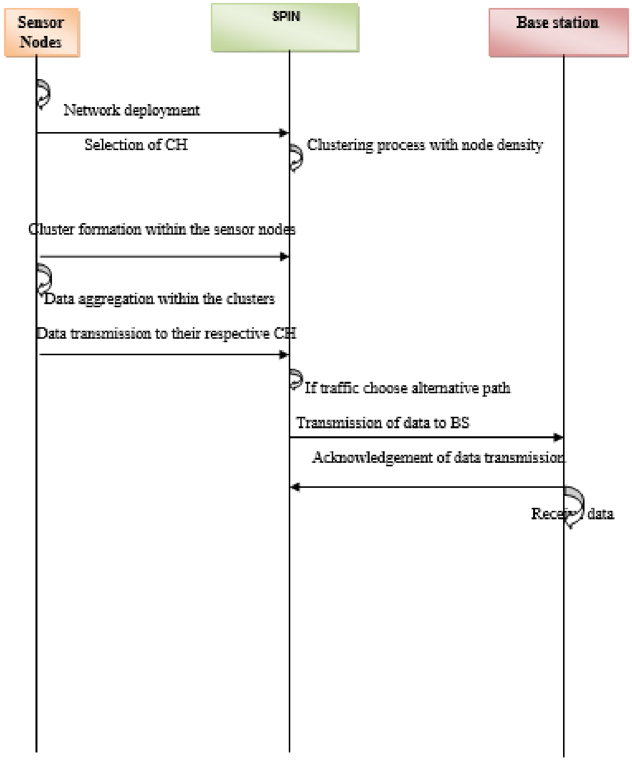
6.3 PERFORMANCE ANALYSIS

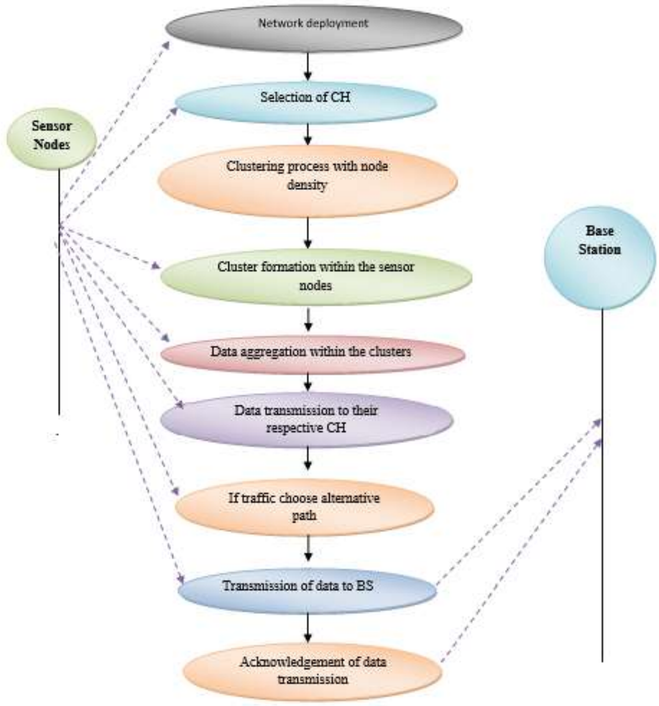


6.4 FLOW DIAGRAM

6.5 SEQUENCE DIAGRAM



6.6 USER CASE DIAGRAM



VII. RESULTS

7.1 PERFORMANCE ANALYSIS

The network parameters employed for the performance analysis of proposed methodology and Modified LEACH and their simulation results are discussed below,

i) **Packet Delivery Ratio (PDR)**: The PDR can be defined as the ratio of total number of packets delivered to the sink node to the total number of packets actually sent by the source. The performance of the protocol is high, when the value of PDR is high.

The figure 6.1, depicts the comparison of proposed scheme and Modified LEACH with respect to value of PDR.

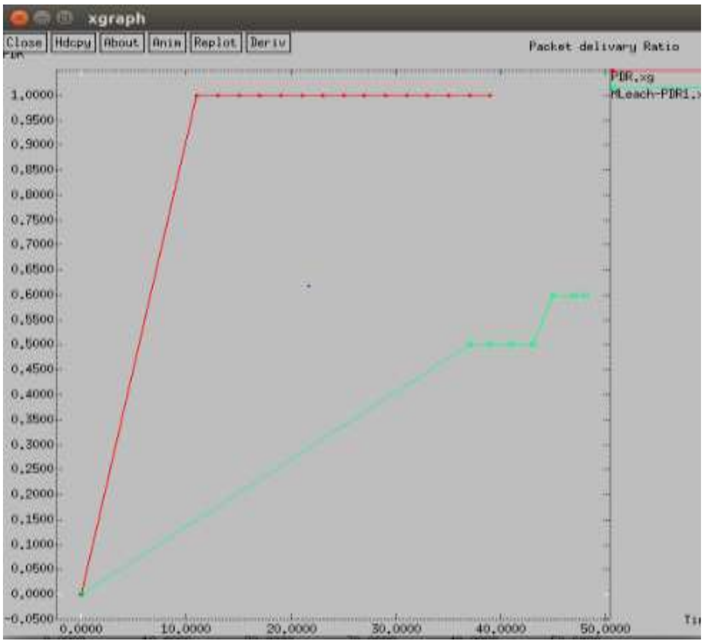


Figure 7.1: Comparison of Proposed scheme and M-LEACH with respect to PDR.

The Figure 7.1, shows that the performance of proposed scheme is high as compared to M-LEACH as the PDR of proposed scheme rises quickly and remains constant, also its value is more as compared to M-LEACH.

ii) Throughput: It is defined as the rate at which data packets are sent over the network. In other words, it is the total number of data packets sent to sink over the total simulation period. Throughput is measured in bits per second or bps.

The throughput can be maximised with increase in node density and it helps in evaluating the performance and efficiency of a given scheme or protocol. The figure 7.2, shows the graph of throughput versus time for the proposed scheme and M-LEACH.

Figure 7.2: Comparison of proposed scheme and M-LEACH with respect to throughput.

It is evident from the above figure 7.2, that the throughput of the proposed scheme is high as compared to the existing Modified LEACH protocol.

iii) Packet Drops: The total number of packets transmitted by the network minus the total number of packets received at the sink node gives the amount of packet drops.

This parameter, gives the number of packets lost due to collisions and other network discrepancies. The figure 7.3, depicts the graph between the number of packet drops and time.

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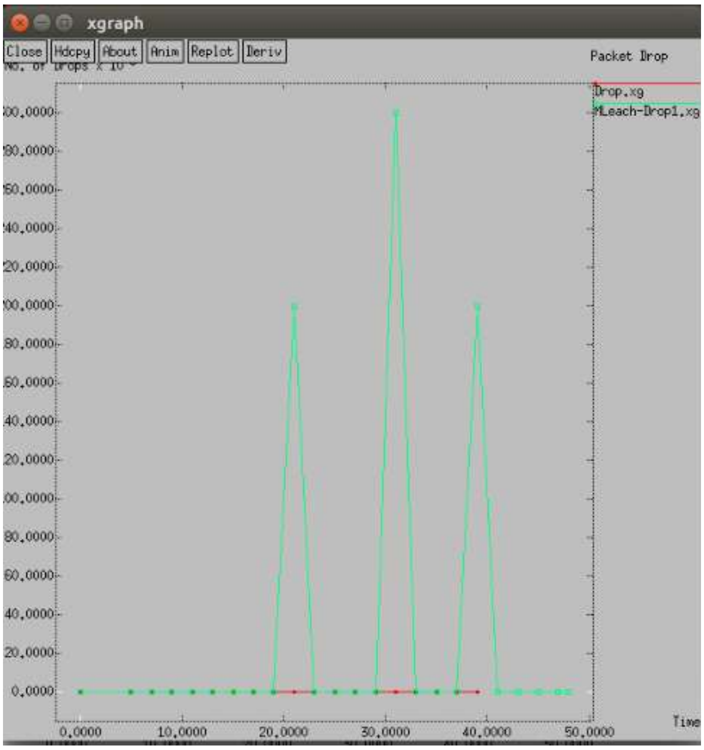

Figure 7.3: Comparison of proposed scheme and M-LEACH with respect to Packet Drops

It is clear from the above figure 7.3, that the number of packet drops for Modified LEACH protocol is more as compared to the proposed scheme. It also shows that, the proposed scheme is highly robust to network collisions and hence more time-efficient and cost-effective.

iv) Average Energy Consumption: This parameter denotes the average of the total energy consumed by the sensor nodes in a given network at specific intervals.

The figure 7.4, depicts the graph for average energy consumption versus time.

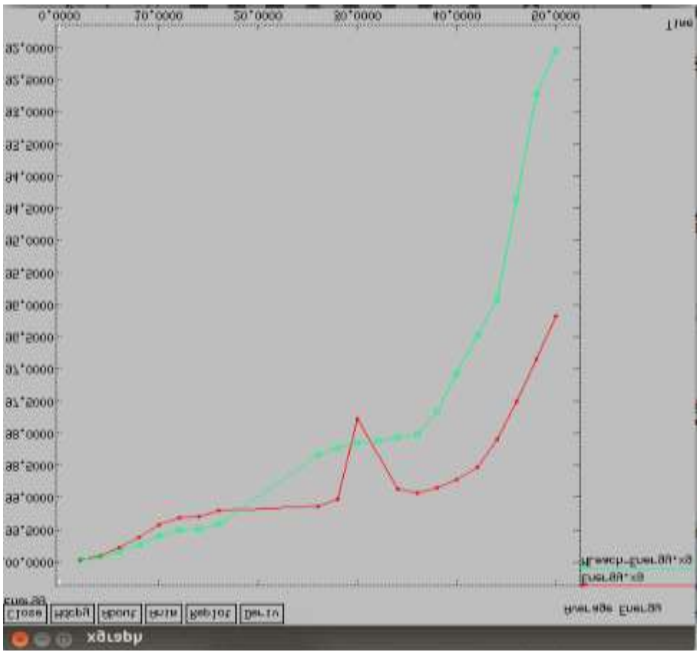

Figure 7.4: Comparison of proposed scheme and M-LEACH with respect to Average Energy Consumption

Initially, the each node is assigned with an energy of 100 Joules. It is apparent from the above graph that, the energy consumption by sensor nodes with proposed scheme is less as compared to the existing M-LEACH protocol. Hence, the proposed scheme is highly energy-efficient protocol as compared to the existing one.

7.2 THE SNAPSHOTS OF NAM SIMULATION RESULTS

The NAM simulation results for the proposed system are as follows:

Step 1:

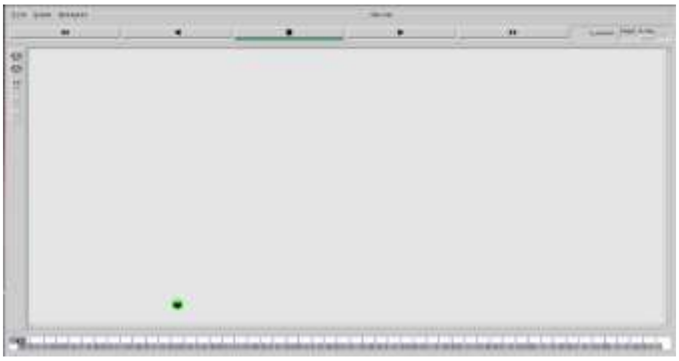

Figure 7.5: Node deployment – Initial Stage.

The Node deployment for the proposed scheme starts with all the 82 sensor nodes initializing at the (0, 0) position, as shown in the above figure 7.5.

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Step 2:

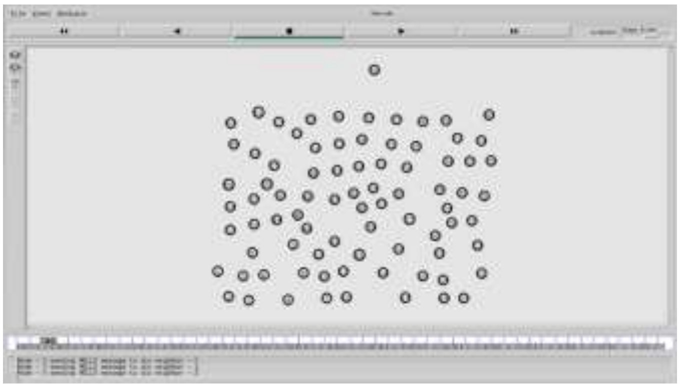

Figure 7.6: Node Deployment – Final Stage.

In figure 7.6, all the sensor nodes acquire the predefined fixed position in the wireless network environment. The 81st node is assumed as the sink node.

Step 3:

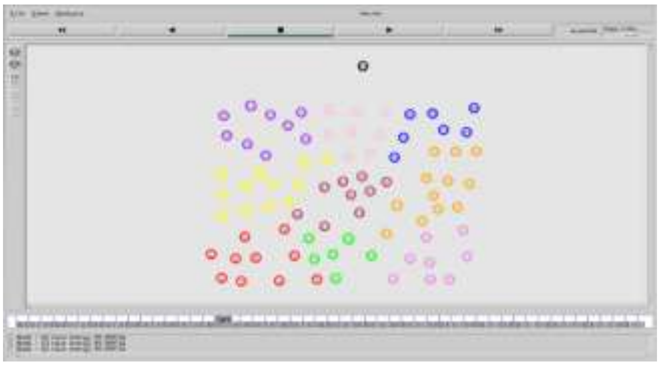

Figure 7.7: Cluster formation

In figure 7.7, after the node deployment in the WSN environment, the cluster formation mechanism is applied. Based on the node density and distance (50 meters), the clusters are formed. For the present network scenario, a total of 9 clusters are formed.

Step 4:

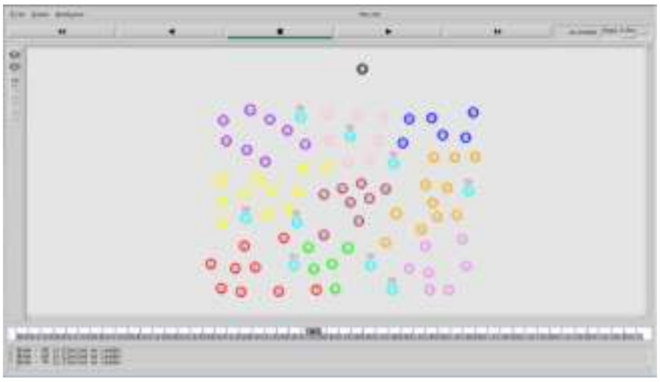

Figure 7.8: Cluster Head Selection.

As shown in the above figure 7.8, the cluster heads are elected to each cluster formed based on the energy and distance weights of each sensor node.

Step 5:

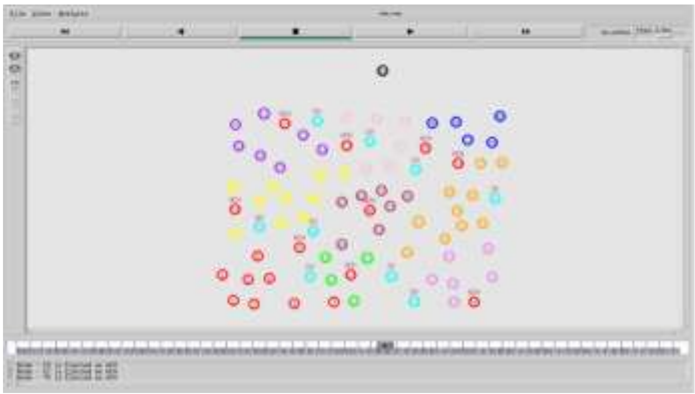

Figure 7.9: Assistant Cluster Head Selection.

The figure 7.9 depicts the assistant cluster head selection. The ACHs are selected based on the same procedure followed for the selection of CH.

Step 6:

Figure 7.10: Date Gathering Stage.

The figure 7.10, illustrates the data gathering process at cluster – 1. Here, the cluster members send their sensed information (data) to their respective cluster heads (CH).

Step 7:

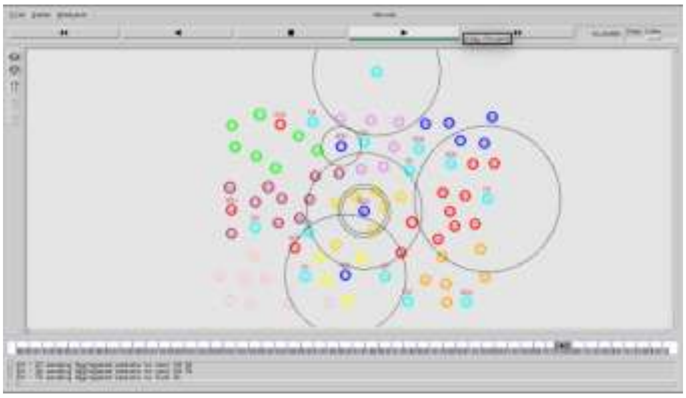

Figure 7.11: Data Transfer Stage.

In figure 7.11, the data transfer stage is depicted. In this stage, the data gathered by the individual cluster heads is transferred to their corresponding assistant

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cluster heads, which in turn routes the data to the sink node.

VIII. CONCLUSION

The proposed scheme provides a guaranteed data delivery to sink node using SPIN protocol with clustering mechanism. In this scheme, there is a substantial drop in the quantity of data packet transmissions. Thereby, a substantial amount of overall energy can be saved.

In addition, the inclusion of assistant cluster heads (ACH) further increases the network lifetime of sensor nodes.

In future, it may be possible to work on dynamic replacement of node and cluster head in network after the dead and provide better solution.

REFERENCES

[1] Wendi RabinerHeinzelman, AnanthaChandrakasan, and Hari Balakrishnan, "energy efficient communication protocol for wireless micro sensor networks" Massachusetts Institute of Technology Cambridge, MA 02139.

[2] G Anastasi - 2009May 1, 2009" energy conservation in wireless sensor networks" wireless sensor networks (WSNs) have gained increasing attention from both the research community and actual users.

[3] ZeenatRehna School of Mobile Computing and Communication, JadavpurUniversity,Kolkata - 700 032, India

[4] F. AkyildizWeilian Su " a survey on sensor networks" IEEE communication magazineMalik Tubaishat and Sanjay Kumar Madria "sensor networks an overview" Dept. of Comput. Sci., Missouri Univ., Rolla, MO, USA

[5] Z. Shen et al., ``Energy consumption monitoring for sensor nodes in snap," Int. J. Sensor Netw., vol. 13, no. 2, pp. 112_120, 2013.

[6] G. K. Shwetha, S. Behera, and J. Mungara, ``Energy-balanced dispatch of mobilesensors in hybrid wireless sensor network with obstacles," IOSR J.Comput. Eng., vol.2, no. 1, pp. 47_51, 2012.

[7] M. Zhao, Y. Yang, and C. Wang, ``Mobile data gathering with load balanced clustering and dual data uploading in wireless sensor networks," IEEE Trans. Mobile Comput., vol.14, no. 4, pp. 770_785, Apr. 2015.

[8] M. Dong et al., ``Mobile agent-based energy-aware and user-centric data collection in wireless sensor networks," Comput. Netw., vol. 74, pp. 58_70, Dec. 2014.

[9] Po-Jen Chuang 03 December 2010 "efficient data gathering scheme for wireless sensor networks" springer

[10] Krishnukumar 17 February 2011 IEEE computing "A modified spin for wireless sensor networks"