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Control the movement of nodes for sensor networks and simulate the state of contract failure

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ABSTRACT

In sensor networks, the data is transmitted through a set of nodes spread over a specific area where the sensor is monitored and the specific state of the nodes is assembled to be in a fixed position. Because of the development and widespread spread of Wireless communication and robot, the nodes in sensors networks became moving, The research represents to control the movement of nodes using broadcast push and communication among nodes.

The problem of failure to bind to some nodes has also been demonstrated when sensing a particular situation of the control area of the sensor network environment.

This research deals with the study of the stages of the development of the motion methods of nodes in the sensor networks, suggesting a method for the main station to predict the failure of the contract and the use of simulation to evaluate the results using Matlab, where the sensor network environment in which the contract is malfunctioned is handled through the time of node sharing in the network.

Keywords: Wireless Sensor Networks, the nodes Failure, SR-N

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I. INTRODUCTION

Increased interest in the field of Wireless Sensor Networks (WSN) because of its growing importance in remote control and the collection of information related to the environment and monitoring of weather conditions and the examination of the safety of industrial

II. WIRELESS SENSORS NETWORK (WSN)

Consists of devices equipped with wireless communication functions called nodes are widely distributed, these devices have sensors that have the ability to efficiently process and exchange information and wireless communication with other nodes in a dynamic environment, and sent to a main monitoring station, which is a computer that collects data then processing and analysis. [3] See Figure (1) It also contains small broadcast push transmitters used for point-to-multipoint (broadcast) communication and sends documents from the server to customers in the absence of explicit customer requests (payment). Adding new clients does not change the server workload or customer response time. [9]

WSN is used in a variety of areas to monitor weather conditions, detect hackers and traffic, and are often used in areas where the presence of the human element is difficult, such as hazardous areas [8] and building facilities and the detection of fires and border security and military applications, and the transfer and treatment of various physical events such as heat Sound and pressure by wireless sensitive devices scattered in a limited area, which may be known parameters or random spread. Most of the research was limited to fixed networks, but the broad development of wireless communications and robot

technology contributed The study of the dynamic environment and the movement of nodes in sensor networks [4].

The aim of this research is to study the stages of developing the control of the movement of the sensor nodes and Portability move using Push-based broadcast and communication among nodes [10]. And to propose a way to control the failure of the connect with nodes . The simulation of the proposed method was also attempted and each node collects the sensor data to the main station even if the contract fails. and with Using the Matlab program where it provides an easy environment for technical computing such as GUI building, modeling, simulation patterns, algorithm development, and data analysis.

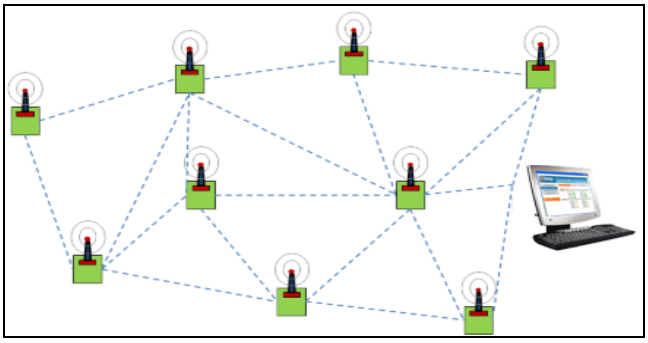


Figure (1) Sensor Wireless Netwok

III. SUGGESTED VIRTUAL ENVIRONMENT

Assume that there is a control area for a sensor network consisting of a number of sensor nodes and a main broadcasting station where the broadcast range covers the entire control area and as in Figure (2).

The main station has a sensor position for each node where each node performs the sensor process and moves the sensor node to the position where it can communicate with the main station and move inside the control area to transfer data and form a network referred to as an assembly network of to communicate with all nodes involved, And move it from the node, be back to the sensor point and continue to sensor.

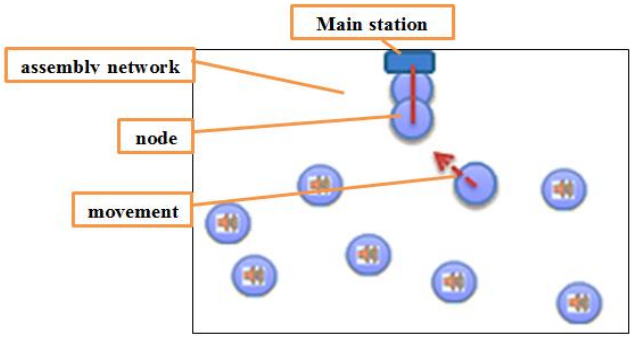


Figure (2) Suggested Virtual Environment

All nodes are of a mobile type, moving on the basis of information on the transmit able position transmitted by the main station and the number of nodes known and their current location can be known in real time.

When the sensor state of the node moves within the control area for data transmission and communication to the main station, Impossible to return to the sensor when not all nodes in the control area join the network.

The main station broadcasts the location of the node to which the multihop is connected to all nodes. At the time of data transfer, each node moves to the nearest location where multicast is possible. It is possible to form a network nodes for data transfer called assembly network.

IV. STAGES OF DEVELOPMENT THE CONTROL IN MOTION OF THE SENSOR NODES

The sensor network consists of a mobile nodes, through which the data is transferred to the main station by multhop to the nodes based on the incoming information to be a set of temporary network nodes, to determine the motion only for a particular contract in order to reduce energy.

In the course of the mobile nodes of a sensor network, scattered and important data are collected in a particular case study. Has been studied motion the nodes of the mobile sensors, by proposing multiple methods and algorithms to add new improvements to the sensor networks in reducing the moving distance and the rate of more accurate data collection, As well as reducing energy The following is a summary of the proposed algorithms or methods:

First stage: **Minimum Spanning Tree(MST)**

Is a routing protocol by adapting the minimum of the extended tree, where the crossing node moves from its sensor location to in advance specific position to join an assembly network that can communicate withThe main station is via a multi-directional connection [12]

A new model has been introduced to calculate each processing unit with a value independent of the network size and to provide a fully distributed algorithm for building the minimum extension tree with a specific degree in the network. In this algorithm, the calculation and exchange of messages for each node is O (d) where d is the degree of the node and is therefore independent of the network size, and the rounding ratio was constant and is about 1.2 on average. [13]

Second stage : **Low-Energy Adaptive Clustering Hierarchy (LEACH)**

Is the first hierarchy routing protocol, Which proposed the data merge to reduce power consumption by aggregating data and reducing transmissions to the main station. The main objective of this protocol is to improve the age of wireless sensor networks by reducing power. [14]

The Leach protocol consists of two phases: 1) Set-up phase 2) Steady phase: As in Figure (3). [15]

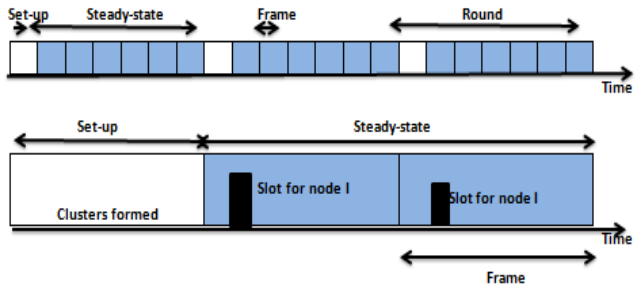


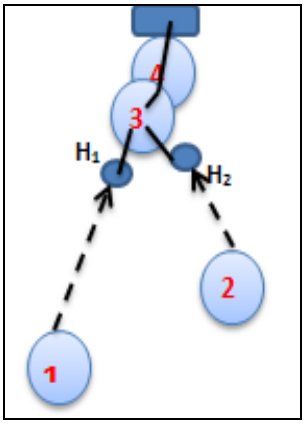
Figure (3) Leach protocol phases

Third stage: Shortest Route(SR)

The node motion is controlled based on the broadcast information only and obtained using payment broadcast distribution type . Where the node dynamically moves with a multiple connection to the nearest node, forming a temporary network to collect data for the main station as the transition distance is reduced and thus reduce the energy required for the movement. [5]

In order to efficiently formation the assembly grid, the main station Broadcast the location information of the node involved in the assembly grid, and moves the node based on the information, as shown in Figure(4) , the nodes move 1 and 2 Which ended from the sensor to the two situations H1 and H2 to Connect node 3 closest to them From the nodes in the aggregation network based on the information to be broadcast as destinations, also in the figure the dotted arrow points to the moving path.

When a new node shares an assembly network, for example, the broadcast data is updated. In Figure (5) , when node 2 joins a new assembly network, node 1 becomes closer to node 2, to reduce power consumption by moving while changing the destination so that the traffic distance is shorter.



Figure(4) before the nodes moves

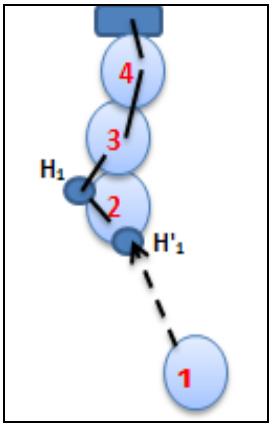


Figure (5) SR method

But in SR mode when forming a network, the state of convergence of nodes is unnecessarily necessary, and the problem of strike and contention arises. [1]

Forth stage : Shortest Route with Negotiation (SR-N)

The researchers proposed to expand the SR method to system SR-N Using radio broadcast type distribution [6] , which is the shortest route in the modulation mode. Based on a broadcast that tells information about nodes that have already been connected to the main station, the node can connect to another node while it is transmitting and exchange information by moving to a location where it can communicate With the destination of the other node through the multi-port connection, it is mean join an assembly network for data transfer [7], when the transition distance becomes shorter than the transition to the current destination, this makes it possible to make multiple gate connections with nodes that maintain an appropriate distance at the time of the assembly network configuration, and may reduce the power required for node motion. [2]

Here is an explanation of how to face the node in the SR-N method of another node:

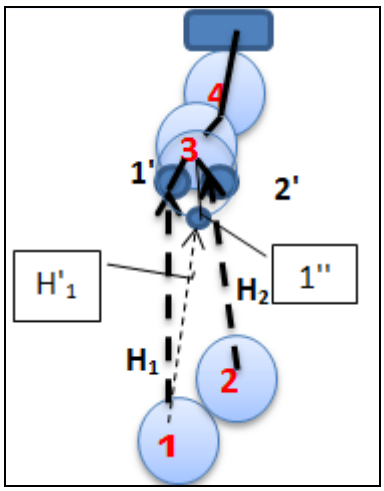


Figure (6) The SR-N method faces a node for a node

Figure (6) shows an example to Operation Run of node when the nodes meet each other, as nodes 1 and 2 converge within the communication range during the move to connect to node 3 in the assembly grid. The coordinates 1 and 2 , Then calculate the moving distance H1 and H2 to the current position of each node and destination, then considered as The node with a shorter distance is a candidate for connecting the long node, and here H2 < H1, so node 2 becomes a contact point for node 1 and moves to site 1, Then Determine the H'1 motion distance in the case of H1 <H'1 The change is being from node 3 to node 2, Thus, node 1 is connected to node 2 and its own connection destination as node 2 and its own connection location with it , then, If node 2 changes the destination it will notify node 1 of the new destination, node 1 will modify its destination based on the information received and the destination will not change by broadcast road , When three or more independent nodes can communicate at the same time, it is judged whether the destination change is effective in the order of the shortest distance to the destination.

V. PROPOSED ALGORITHM

It is clear from the previous methods that the distance between the nodes at the time of the formation of the assembly network is not spread sufficiently and the failure of the contract and thus suggested a method to know the failed contract and an action against the failure of the contract, the description of its operation as follows:

When you share in the node group as a sub node, if the main node is in a state of pause or if the distance from the main node is shorter than the maximum connection distance, it stops there, and when the distance to the main node reaches the maximum connection distance, The movement is resumed , Stops when the distance to the original node is shorter than the maximum distance of the connection, the motion is resumed from the stalled state, and its new node is notified in this sense, either when the motion notification from the main node is received in the suspended state, the animation is restarted when the distance to the main node is the maximum distance of the connection.

VI. THE CASE OF NODE FAILURE

In the control methods for the motion of the above sensor nodes and after all the nodes are joined to the assembly network, since it is not necessary that the node transfer the data and transmit it to the assembly network, The motion to the sensor point is supposed to have started, When the node fails happen , because all the nodes cannot join the assembly network, the node cannot leave the assembly network, so the main station predicts the time each cluster node will share, so that the node that does not share even exceeds the expected time It is specifically allowed to leave the other nodes of the assembly network. A node that has not joined the assembly network twice is considered a failure.

The time of participation of the node is assumed to assume that the time at which the sensing process begins with the sensor is to be reported by radio and that this time is the same as the start of the sensor at the nearest point to the sensor point in the added node, The time to join the assembly network and the time of withdrawal

The time, sensor time and movement time should be used from the sensor point to the contact point with the main station.

VII. SIMULATION

To evaluate the results of the proposed algorithm, a two-dimensional area was used. A main station was placed in the middle of one of the ribs. Various nodes of the sensor were distributed. The targeting points were assigned to each node randomly and not changed. Suppose that the sensor point is the initial position of the node.

The node begins with the sensor at the same time as the simulation begins. Data transfer begins. The movement of the sensor nodes is recorded and their coordinates are recorded within a table in the databases. The distance of the transmitter is calculated the first time when the data is sent between the nodes.

In this simulation, we ignored the cost required for transmitting, receiving, moving and sensing data [11] because they were very small and assumed that the transmission and reception process at the same time was also considered the amount of transmitter and receiver data is known and The simulation has been run 10 times .

In the simulation environment, the performance of the proposed algorithm was compared with the four methods mentioned above using a number of evaluation elements:

- Average cost represents the cost of traffic, the transmission cost per node, and the total average reception costs.
- Average duration includes sensor time per node during simulation, traffic time, connection time (the time at which the data is transmitted), and the average waiting time where the waiting time represents the time when it is connected to the aggregation network but the data is not transferred.
- Movement distance: total transport distance of all nodes
- Capacity: The amount of data per unit of time acquired by the main station.
- The number of failed nodes: which are governed by the failed contract and are not failed when the main station allows the contract to leave the assembly network.
- wasted waiting time: when Involved all not failed nodes in assembly network , the node in the case can be removed from the assembly network, until the withdrawal of the main station, and the total time to wait offline is allowed.

Figure (7) shows the number of failed nodes at each stage of the development of sensor nodes movement control :

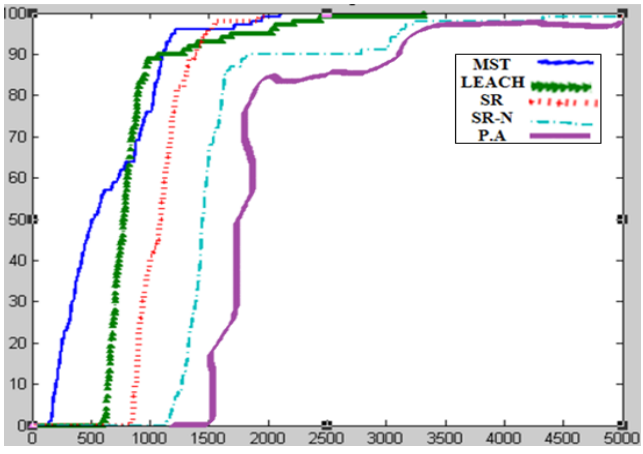


Figure (7) The number of failed modes at each stage

VIII. DISCUSSION

In a sensor network Consists of the number of moving nodes that represent sensors moving cooperatively while maintaining the distance of communication and mobility at the lowest cost, and in this research was proposed to conduct against the failure of the node to develop methods of movement and transmission nodes in the network sensor, the most recent expansion and improvement of the transfer rate of the method SR-N, by predicting the expected arrival time of the node using the time required for sensor and movement, the node failure can be responded to, and the conversion rate is higher when the forecast time is set to slightly longer than the maximum for the past period, The optimization of the proposed algorithm, when node failure occurs, allows the node to leave the assembly grid more appropriate.

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