Genetic and TEAR based path identification for WSN for the optimization of the life time of nodes in WSN

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Abstract: WSN is wireless sensor network where large number of wireless nodes stationed randomly at specific position. There objective to collect the data from the environment for specific parameter and send that collected data to the sink node. While transmission they have to select the path through leader node to the cluster head and then to the sink node. This path will be selected based on ACO. This technique is genetic based technique, Identifies the optimal path. this network also includes a mobile agent moves on to the circular path. Various performance parameters like dead nodes, Alive Node and Energy Dissipation has shown improvement compare to the base technique. In which mobile agent moves at each node and select the path of movement based on ACO. Each horizontal line will be having moving mobile agent. Each agent collects the data from the sensor nodes and give it to the cluster head. This moving agent collects the data from the sensor nodes and then give it to the base station. Provides better performance in terms of dead nodes, alive nodes, and the energy dissipation compared to other two cases.

Keywords: WSN, ACO, Mobile Agent.

I. INTRODUCTION

WSN is the wireless sensor network where various sensor nodes are having low power and tries to communicate with each other. These sensor nodes has low resources like memory, processing power and the battery power. Under low resources the sensor nodes senses the parameter from its environment and send those sensed data to the memory buffer and then to the cluster head and from the cluster head to the base station. Each sensor node consists of receiver, transmitter, amplifiers and the small memory unit. Each receiver will senses the data

and amplifier will amplify the signal and then resend to the base station. This way the communication using sensor nodes is taking place. Figure 1 shows such scenarios.

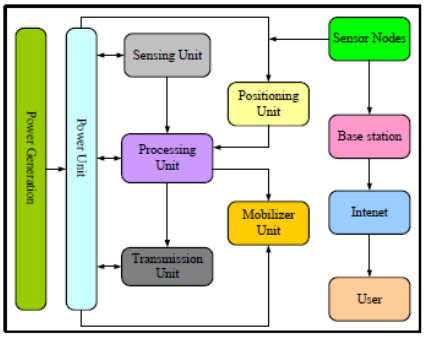


Fig 1: Architecture of WSN [13]

These sensor nodes senses the analog data and then later on convert this sensed data to the digital format. The data sensed by the sensor node is in the form of temperature, pressure, or some other parameter. Once the data will be sensed and then later on using the converter will be converted to the digital format. Data stored into the memory buffer in digital format. These sensor nodes are small powered nodes. But for the communication then uses there battery power and sends the signals. These signals will be in the form of again analog signals. These analog signal are not easy to operate the components.

1.1 MOBILE AGENT ROUTING PROBLEM

It is the network topology where large network area will be sub divided into smaller clusters. Each cluster will be having different no. of sensor nodes. These sensor nodes are distributed in each cluster randomly. Based on the residual energy one node is to be selected as the cluster head. Each cluster head will be selected different on each rotation. Sensor nodes will collect the data and send to the cluster head. In the mobile agent technique various mobile agents moves along the network area. Cluster head will sends the data from itself to the mobile agent when the mobile agent will come closer to the cluster head. This mobile agent path and the time will be repetitive in nature. Such that the nodes are being stationed so that the communication between the nodes can be taken place. This way lower energy model will be prepared. Under this model the communication between the nodes and the mobile agent will be set based on time interval. This communication is low powered and faster to send and receive the data.

1.2 DATA FUSION MODEL

Data fusion is the way to have different levels of easy and energy saving mode. Data fusion model will be having abilities to fuse the data at the different level. There are types of data fusions like one is the decision fusion and other is the value fusion. In data fusion each sensor node collects the data from its environment and sends that data to the cluster head. This cluster head will collect the data and aggregate the data. These aggregated data will be filtered by the cluster head. This filtering is either based on the repetitive data removal or it is to keep only the changing data. This filtering is done wither while data is being collected from the sensor nodes or after the collection of the data. This way the data amount will be reduced. And it will helps in having different ways for the transmission of the lower amount of data will save energy.

Decision fusion is another way for saving the energy. Here different sensor nodes will collect the data. Check the data and decide at its own level whether the data collected will be having requirement or not. If there is requirement then this data will be kept else data will discarded. This way the level of the data collected will be reduced and energy will be saved.

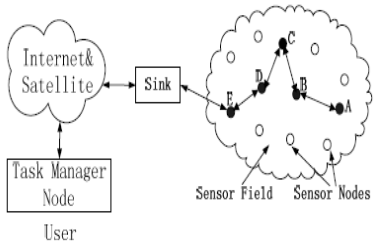


Fig. 2 Wireless Sensor Network[2]

The base station is the central node which will collect the data from various cluster heads or the sensor nodes;. The quality of the data depends upon this thing that how well the data has been collected and how the data will be processed and required format will be generated. Each sensor node will collect the data and transfer the data which is critical or showing any change to the cluster head. This cluster head will collect the data and then transfer the data to the base station. Base station is high powered node has the ability to proves the data and sends that data to the other remote source for the purpose for which the network has been layout.

Data fusion which is the important activity of the network to save the energy. It reduces the amount of data that requires to be transmitted from the sensor node to the cluster head and then to the base station. Data fusion can be done at two different levels one is the sensor node level or at the cluster head level or at the base station level.

1.3 Data fusion algorithm

- There are n number of sensor nodes this runs from N_1 to N_n.
- Last node will be considered as the base station.
- The data is to be transmitted is of fixed size. This is called packet size.
- Each node has initial energy level. ε_i
- Each node can works as receiver that means delay node having $RX_i = \varepsilon_{elec} * k$
- Each node transmit the data to the relay node and then to the base station $TX_{i,j} = \varepsilon_{elec} *k + \varepsilon_{amp}*d^2_{i,j}*k$

Mobile agent is the node which moves along the network area. This mobile agent has to move after the fixed interval of time. And collect the data from the cluster head. It goes closer to the cluster head. When mobile agent is closer to the cluster head or the sensor node they transmit the data to the mobile agent. This mobile agent is high powered node. So has larger capacity to transmit the data and the receive the data. There are two ways the mobile agents moves along the network area. One is moving on the fixed path or one is moving along the random path. For it genetic based optimal identification technique is used. Where the optimal path will be identified which moves near to the optimal number of nodes. Every time the data is to be transmitted will be received at the mobile agent. It will be optimal if it covers max. no. of nodes.

II. LITERATURE SURVEY

[1] WSN-Enhanced Human Experience: Author in this paper focus on the issue of WSN and its different application in the people daily life. As we are moving towards the information era more and more devices are coming up which are automating our those things which we are using every day. This will helps in making our life more easy. This WSN is used for various devices connectivity inside our home and outside of our home. This types of system can be used for the vehicle safety on the road. This can make various types of warnings while driver is driving the car. So that driver can be aware about the situation.

[2] A Detailed Analysis of WSN Platform Architectures: Concepts, Similarities, and Differences: Author in this focus on the issue of WSN based network or devices communication mechanism. This shows that the various sensor devices senses the real time data. Because each sensor node consists of the receiver and the transmitter. The collected data later on be translated to the required format in which the WSN application stands. Similarly this types of scheme can be used for the vehicles to have sensors on the dashboard. They can be used for sensing the distance between the vehicle and helps in maintaining the safe distance.

[3] Perceptive Car Parking Booking System With WSN Technology: Author in this paper has used the WSN based technology for the integration of the android based app to reserve the parking lot. This type of the system will helps in saving large amount of fuel for the vehicle. In the traditional system parking lot will be identified while standing the parking. But using android and WSN enabled application the parking lot can be reserved while vehicle is on the way. This will helps in saving the time. This type of technology is relevant for the vehicle safety. Only those number of the vehicle will come into the parking as many people have reserve the parking lot. Further it will save large amount of time and fuel.

[4] Traffic load minimisation using WSN: Author in this paper has proposed WSN enabled traffic control system. Each road has various number of sensor nodes stationed at various locations. These sensor nodes will count the vehicle on the road. The collected data will send to the base station. Base station will take a decision for more vehicle to pass on the road or has to stop the new vehicle move into the road. This paper also has proposed a scheme for the identification of the stolen cars. Each car has RFID card attached on the vehicle front wind screen. Using RFID reader the vehicle identification will be managed. Any suspicious vehicle will be located and picked up. The scheme for the traffic control will helps in managing the safe distance between the vehicle. Because in specific stretch of the road there should not be more than specific number of vehicle.

[5] POLLUTION MONITORING SYSTEM BASED ON WSN: Author in this paper has proposed a scheme for the pollution control for the indoor and outdoor area using WSN. Various sensor nodes are positioned at different location to measure the different gases. the collected data will be sent to the base station. At the base station the data will be processed to drive 0new conclusive facts. The parameters which are measured can be various gases like Co, Co2. Temperature and humidity. This will helps in having controlled action for reducing it timely. In current time due to the increase in the vehicular traffic there is biggest problem of the pollution. This type of pollution can reduced using proper management of the traffic and also maintaining the integrity of the roads.

[6] Need of WSN for Smart Cities : Author in this paper has proposed a scheme for smart cities using WSN. In different cities there are different end points which are needed to be connected to share the data. This will fasten up the availability for the citizen. In cities there are various applications like buses, metro, traffic light, accident control, pollution control, keeping driver warning on high speed, keeping safer distance between the vehicle, traffic lights control water management etc. Automation of these application will helps the user to have easy access for these facilities. In coming future more and more devices will be coming into the existence for the remote connectivity.

III. ALGORITHM

Step1 construct a network with different number of nodes in the small area

Step2 use the cluster based technique for the communication. So sub divide the total network into smaller parts. Each sub part is called cluster.

Step3 Distribute the nodes randomly in each cluster.

a. While sub division the total network area is sub divided into smaller parts. Each sub part is called as the cluster.
b. There are 3*3 clusters network. 3 clusters are along x-axis and 3 clusters along y-axis.

Step4 Position the sink node out of the network area. Where whole data will be collected and processed.

Step5 this base station is fixed outside the network area.

Step6 based on the residual energy select one cluster head. So that each cluster head can have data from the sensor node and aggregated at the cluster head.

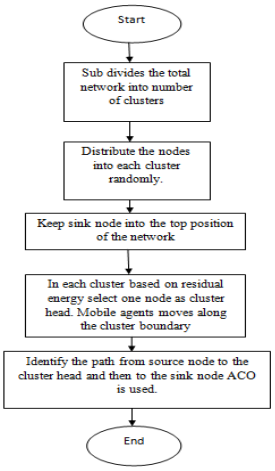
Step7 there can be different parameters that can be used for the selection of the cluster head.

Step8 Each sensor node transfer the data to the cluster head and cluster head will transfer the data to the mobile agent. This mobile agent will collect the data and send to the base station.

Step9 This process of fusion of the data is done at two level. one is at the cluster head level and other is the base station. This base station will be having ability to transact the data.

Step10 end.

IV. FLOWCHART



V. RESULTS

5.1 Parameters Taken

a. Alive Nodes: It is the count of Alive nodes which remains after the whole communication. It depends upon how much energy is left after total communication is taken place.
b. Dead Nodes: It is the count of the nodes which will be dead after the whole communication. These are those nodes whose energy will get depleted to zero after the whole communication.
c. Total Energy Dissipation: it is the total energy dissipate after the total communication.

5.2 Alive Nodes

While communication large number of nodes energy will get depleted. A efficient and optimized technique can protect the nodes from depletion. In Proposed technique(fig. 4.1) Number of alive nodes will remain more till 1600 iteration. After that Alive node count starts decreasing. But compare to it in base technique the alive nodes count starts decreasing after 400 rounds. For the Alive node with Grid ACO-chain based with

mobile agent has shows better performance compared to other two cases.

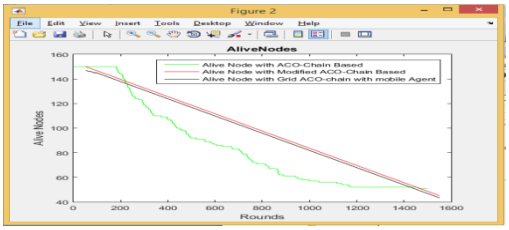


Fig. 3 Alive Nodes

5.3 Dead nodes

In case of dead node count the graph shows the reverse trend. In proposed technique (fig. 4.2) the dead node count will starts increasing after the 1600 rounds. But in base technique the dead node count starts increasing after 400 round. That means energy depletion is more in case of base technique. Dead node count for the Grid ACO-chain with mobile agent shows better performance compared to other two cases. The proposed technique has less dead node. The performance in terms of the dead nodes count is better compared to the other two techniques.

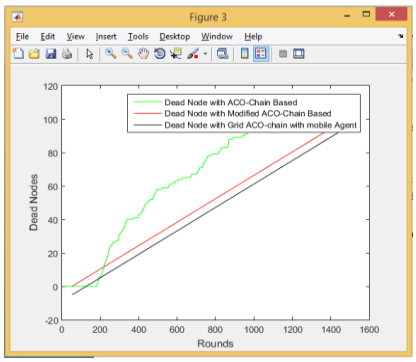


Fig. 4 Dead Nodes

5.4 Energy Utilization

In this graph the energy depletion in case of proposed technique(fig. 4.3) is slow. After the round 1600 this become stable at a point. But in base technique the energy depletion is very fast compared to proposed technique. Energy dissipation for the proposed Grid ACO-chain based with mobile agent has shown better performance compared to the other two techniques.

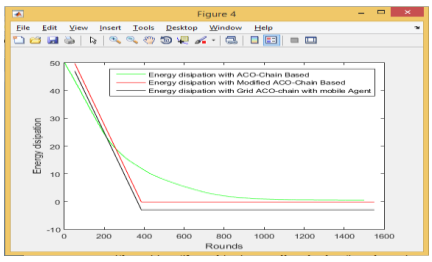


Fig. 5 Energy utilization

VI. CONCLUSION

WSN is wireless sensor network where large number of wireless nodes stationed randomly at specific position. There objective to collect the data from the environment for specific parameter and send that collected data to the sink node. While transmission they have to select the path through leader node to the cluster head and then to the sink node. This path will be selected based on ACO. This technique is genetic based technique, Identifies the optimal path. this network also includes a mobile agent moves on to the circular path. Various performance parameters like dead nodes, Alive Node and Energy Dissipation has shown improvement compare to the base technique. In which mobile agent moves at each node and select the path of movement based on ACO. Each horizontal line will be having moving mobile agent. Each agent collects the data from the sensor nodes and give it to the cluster head. This moving agent collects the data from the sensor nodes and then give it to the base station. Provides better performance in terms of dead nodes, alive nodes, and the energy dissipation compared to other two cases.

VII. FUTURE WORK

Current research work has taken ACO as genetic based approach. It identifies the optimal path. In future more refinement in cluster building and leader node selection can be done. Because some energy get wasted in selection of Cluster head.

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