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ENERGY EFFICIENCY WIRELESS SENSOR NETWORK BY ADDING OPTIMISED POWER CYCLE

A.Selvaraj*, B.V.Ashwin**, M.Kamalakannan***, A.R.J.Kumar****

*(Information Technology, K L N College of Engineering, Madurai)
Email: selva25x@gmail.com

**(Information Technology, K L N College of Engineering, Madurai)
Email: bvashwin5@gmail.com

***(Information Technology, K L N College of Engineering, Madurai)
Email: kamalakannanmuthu@gmail.com

****(Information Technology, K L N College of Engineering, Madurai)
Email: arjkumar08@gmail.com

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Abstract:

Wireless Sensor Network(WSN) means a group of spatially unorganised and dedicated nodes to sense, monitor and record the physical conditions of the environment where they are deployed and organizing the collected data at a central location. The main challenge in wireless sensor networks is energy constraints of sensor node. The energy efficiency and load delay are the two main issues in WSN. To reduce this network energy consumption and delay, an optimized power cycle approach is proposed. Only a small number of nodes adopt the power cycle mode. The power cycle based wireless sensor network can greatly reduce the energy consumption of node mainly in network where the data generation is delayed. In order to reduce the energy consumption and delay of a network more efficiently, only a set of nodes is selected for data transmission in the network. When this node have data to send, they turn on the radio transmitter and send the data to node in the dominating set and then node in dominating set transfer the data and then to sink. As a small number of nodes adopt the power cycle mode, the energy efficiency of network becomes high.

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I. INTRODUCTION

Sensor Nodes are powered and their energy is restricted. Energy consumption of sensing element nodes is especially caused by data transmission. Energy potency has forever been a vital analysis issue of wireless device networks. The facility cycle primarily based wireless device network will greatly scale back the energy consumption of the node. Wireless device networks are composed of energy forced device nodes. Whereas sensing the surroundings, the speedy transmission of information to the sink is important for varied applications. So as to avoid wasting energy, the power cycle primarily based mode is adopted in most studies; however this methodology will increase the information transmission delay. Wireless device network, which mixes the technology of sensors, embedded computing, and wireless communications, is that the most vital component within the web of Things. We think about the big scale Wireless device Network that consists of sensor nodes and sink nodes. The sink node among device nodes can play the central management function; the management data and transmission signal are going to be transferred through the sink node. Considering the work load and potency of the sink node, varied sink nodes are going to be deployed within the network. The network with non-power cycle operating mode is that the earliest studied network. In such a network overall nodes within the network are forever active. The nodes are forever active, their energy consumption is comparatively massive and also the network life is comparatively short. Once multiple information packets meet, information aggregation technology may be wont to scale back the information quantity that must be transmitted, thereby reducing the energy consumption of the network. Within the OPC rule, the network is 1st divided into multiple clusters by clump rule. Every cluster encompasses a node known as cluster head (CH), that is accountable for collection information within the whole cluster, whereas different nodes within the cluster are known as cluster member nodes. All member nodes send their own information to the cluster head. After the cluster head collects all the information within the cluster, it aggregates the information, so sends the aggregative information to the sink directly the cluster head. Within the network supported the facility cycle mode, the nodes are periodic sleep or wake. Since the energy consumption of nodes within the sleep state is far under that within the active state. In such a network, any variety of packets may be aggregative into one packet once they meet. For delay-sensitive packet loss networks, that every node to transmit information packets by broadcast, in order that the packet is lost on condition that none of the sender's folks has with success received it, and as long mutually parent node receives the information packets, the information packets are broadcast once more. However (the information) quantity contained within the data packet can increase, thus as long because the packet containing the information of this node reaches the sink, the sink collects this is the knowledge of this node.

II. RELATED WORKS

The rapid development of micro sensors enables them to have minimum size, multiple functions and higher reliability, so they are widely used in the Internet of Things (IOT) to realize the perception of the surrounding environment. Data collection is the most basic function of the internet of things we can control and optimize the monitored environment by collecting data from the network. In addition, with the collected data it can play a greater role. In wireless sensor networks, the two most important factors affecting network monitoring are energy consumption and data transmission delay. Since the sensor nodes are powered by batteries, their energy is much esteemed. Improving the energy efficiency of WSNs has always been one of the core issues of researchers. The delay of data transmission also seriously impacts the monitoring effect of the network. Large data transmission delay may cause unpredictable loss. The following is a discussion of some data collection work related to the work of this paper, and we mainly focus on the energy consumption and data transmission delay in the data collection processed by wireless sensor networks. The network with non-power cycle working mode is the earliest studied network. In such a network, over all nodes in the network are always active. Under the circumstance of no channel conflict, the sender transmits data to the node nearest to the sink within its communication range, which is the classic shortest routing algorithm. The pros of this kind of network are that the delay of data transmission is minimal. However, since the nodes are always active, their energy consumption is relatively large and the network lifetime is relatively short. Since there is generally a correlation between the data collected by the wireless sensor network, when multiple data packets meet, data aggregation technology can be used to reduce the data amount that needs to be transmitted, thereby reducing the energy consumption of the network. In previous studies, a variety of data aggregation strategies have been proposed, among which the well-known data aggregation collection strategy is clustering algorithms such as OPC algorithms. Adopting the above method can effectively reduce the energy consumption of the network, but compared to the previous research, the end to end delay of the data packet reaching the sink is not reduced. Therefore, we propose a method to reduce transmission delay of the network as follows: In WSNs. We found that nodes in the near sink area consume higher energy during data collection, while the energy consumption in the far sink area is low and there is energy remaining. Therefore, in this paper, we increase the node's power cycle of the connected dominating set in the far sink area, which can effectively reduce the delay of data transmission. WSN based on power cycle mode can also collect data by clustering method. Unlike the WSN of non-power cycle mode, in the non-power cycle mode, each member node adopts the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) method to compete for the channel when transmitting data to the cluster head. After the contention channel succeeds, the data is sent to the CH, the channel competition results in higher energy consumption and data transmission delay due to conflicts and other factor.

III. REQUIREMENTS

A. Hardware specification

- Hard Disk : 160 GB
- Monitor : 15 VGA colour
- Mouse : Logitech.
- Keyboard : 110 keys enhanced

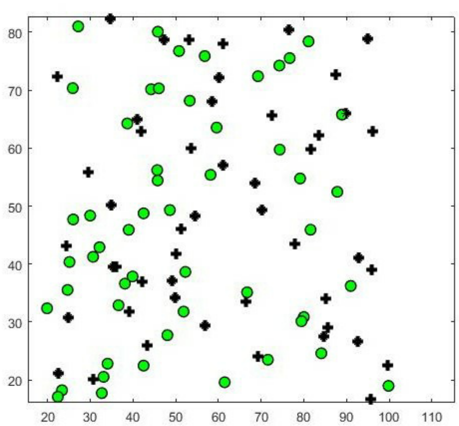
B. Software specification

- Operating System : Windows 10
- Language : MATLAB
- IDE : MATLAB

IV. IMPLEMENTATION

A. Formation of Wireless Sensor Network

Wireless sensor networks (WSN) are composed of a finite set of sensor devices geographically distributed in a given indoor or outdoor environment (usually predefined). A WSN aims to gather environmental data and the node devices placement may be known or unknown a prior. Network nodes can have actual or logical communication with all devices; such a communication defines a topology according to the application. For instance, there can be a WSN with both types of topologies being the same However, this may not be the case for all applications. The logical topology is mainly defined based on the nodes logical role (tasks, etc.). It can be either ad hoc or strategy based. The strategy is defined based on the network available resources.

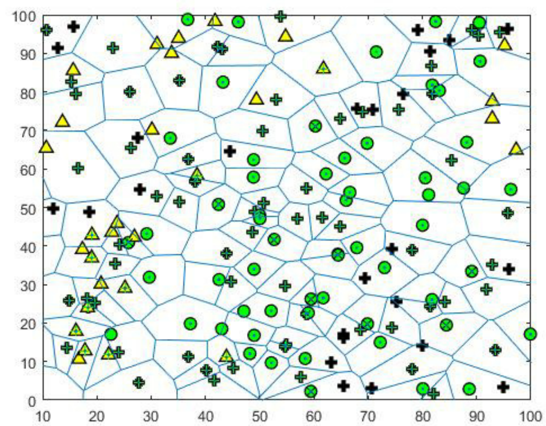


B. Dominating set formation:

Dominating nodes consists of three different types of nodes, they are classified as normal nodes, Advanced nodes which plays major role in the transmission of the data. Set has another node which has energy level equal to zero, which is also known as dead nodes. The goal is to reach the sink node with shortest distance by the route that a sending node establishes, in order to transmit data.

C. Implementation of OPC:

Optimised Power Cycle Algorithm which is a modified LEACH based Algorithm that is used to reduce the energy conception of individual nodes. OPC algorithm employs with Formation of Dominating set of node in-order to reach to sink node as fast as possible. By effectively reducing energy consumption of each individual nodes, the lifetime of entire network is increased.



BEGIN
1: number of nodes (n);
2: ElecInit(s)=E0, s=1,2, …, n;

PREPARATION PHASE

1: if (ElecInit(s)>0 & ranmod(1/pset)≠0) then //pset can set≥0.5
2: r←random(0,1) and compute T(s); //given by (1)
3: if (r < T(s)) then
4: CClusterHead{s}=TRUE; //node s be a ADVANCED CH
5: else
6: CClusterHead{s}=FALSE; //node s be a normal CH
7: end if
8: end if
9: SendToBS(IDu, (xu,yu), CCH(u)) ← All nodes send messages to BS;
10: GAinBS(popt) ← Optimal probability is determined;
11: BroadCast (popt) ← BaseStation broadcasts a message back to all nodes;

SELECTION PHASE

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1: do { //repeat for r rounds
2: r←random(0,1);
3: if (ElecInit(s)>0 & ranmod(1/popt)≠0) then
4: compute T(s); //given by (1)
5: if (r < T(s)) then
6: ClusterHead{s}=TRUE; //node s be a CH
7: else
8: ClusterHead{s}=FALSE; //node s not be a CH
9: end if
10: end if
11: if (CH{s}=TRUE) then
12: BroadCast (ADV) ← broadcast an advertisement message;
13: Join(IDi); //Noraml head node i join into the closest CH
14: Cluster(c); //form a cluster c;
15: end if
```

TRANSMISSION PHASE

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1: If (CH(s)=TRUE) then
2: ReceiveD(IDi, DataPCK) //receive data from members;
3: AggregateD(IDi, DataPCK) //aggregate received data;
4: TransToBS(IDi, DataPCK); //transmit received data;
5: else
6: If (TimeSlot=TRUE) then
7: TransToCH(IDi, DataPCK); //transmit sensed data;
8: else
9: SleepMode(i)=TRUE; //node i at a sleep state
10: end if
11: end if
12: } // one round is completed
END
```
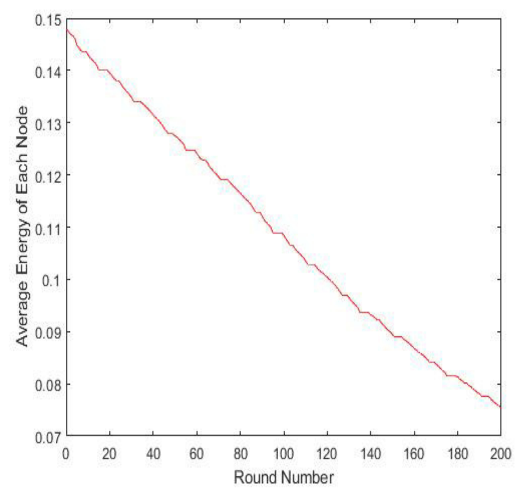

V. PERFORMANCE ANALYSIS

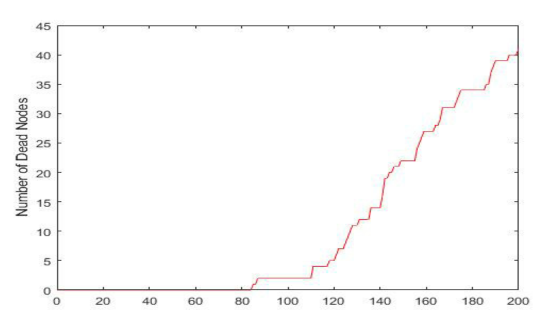
A. Analysis of energy consumption

The results are consistent with our previous analysis, that is, the nodes in the near sink area need to forward more data packet, so the energy consumption is higher, while the situation in the far sink area is completely opposite. The reason is that when the communication radius of the node is relatively large, the forwarding amount of data packets in the network is relatively less, which leads to the reduction of network energy consumption. However, no matter how the communication radius of nodes changes, the network energy consumption. When the probability of event generation is high and the node radius is small, the number of data packets to be forwarded in the network is increased, which causes the total energy consumption of the network is higher.



B. Analysis of dead node:

Since the power cycle of nodes is dynamically adjusted, the power cycle of the dominator nodes is greater than or equal to the initial power cycle, so the network delay is low. In addition, we found that as the number increases, the delay of the three schemes is reduced. The reason is that when the radius increases, the node needs less relay hops to transfer data to sink, which undoubtedly causes a



reduction in network latency and consume lot of energy lead nodes to dead.

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