International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 11 | Nov -2016 www.irjet.net p-ISSN: 2395-0072

TYPES OF METHODS FOR MONITORING ENERGY BUDGET IN WIRELESS SENSOR NETWORKS

Shruti .Suryakant.Jadhav , Prof.Vaishali Bodade

Shruti .S.Jadhav ,Computer Engineering,Bharti VidyaPeeth College Of Engineering NaviMumbai,Maharashtra,India

Prof.Vaishali Bodade, ,Computer Engineering,Bharti VidyaPeeth College Of Engineering,NaviMumbai,Maharashtra,India

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Abstract - *Neighbor Discovery is a primary function of any wireless sensor network enabled devices. While discovering new contacts energy consumptions should also be monitored of wireless sensors networks equipped devices at different parameters. Different parameters are mobility conditions of devices, adopted Discovery Algorithm, stochastic characteristics of encounters. The main goal is finding an optimal solution for discovering new contacts in limited energy budget of devices. The one way introduction of duty cycle to make radio interfaces active according to need while neighbor discovering. The second way can be minimizing the packet delivery time there by conserving the energy of devices..*

***Key Words*:** Neighbor Discovery, Packet Delivery Time,,duty cycle,cluster head,mobile sink,energy .

1.INTRODUCTION

Unnecessary energy expenditure is a very critical issue in wireless sensor networks [2]. A main reason for this, is the selection of long paths for data transmission. Short range wireless interfaces such as WIFI, Bluetooth Smart phones can communicate with each other and other devices which are there in their range of communications. Interest is there is no special infrastructure require for communication. But real world conditions are different. Among this conditions the very basic condition is energy budget of device. High Cost is needed every time for process of discovering new nodes. Periodically checking for new nodes is an extremely energy consuming operations(Polling)[1].Every time there is less chances that interested nod is taking part in process. Keeping every time radio interfaces on also impacts on energy budget of devices. Introduction of duty cycle s good but most of the times encounters of nodes are unpredictable. Introduction of packet delivery[4] time concept yet another approach so that if packet delivery time is less the energy saving can be enhanced greatly.

1.1Natural Optimization

Natural optimizing consist of two states[1] .

1.ALWAYS ON:When radio interface are active during this state.

2.ALWAYS OFF:When radio interfaces are inactive during this state.

1.2 Duty cycle**:**Duty cycle is defined as a period of time in which device is operated in one complete set of predefined time.

1.3Packet delivery time**:**Packet delivery time is defined as the time taken by packets to reach from source to destination.

1.4Different methods**:**In this paper various methods are described in which the duty cycle and time to deliver the packet are seen respectively. This two factors are major concern for any wireless sensor network devices which effects the energy budget of the devices.

2. PROBLEM STATEMENT

What is better:A longer discovery processes with high contact loss probablity or shorter discovery processes with low contact loss probality and energy budget of this used methods.Answer clearly depends upon stastics of various methods.[3]

2.1MAIN CONTRIBUTION

1. Formalizing the number of contacts to be discovered.

2. Formalize the amount of energy budget and consumption required for discovering new contacts.

3.Analysis of various methods used for making duty cycle of mobile devices for communication efficient so that in less amount of energy more peers can be discovered.

4.Analysis is based on the experiments done on the mobile devices using various duty cycle algorithms.

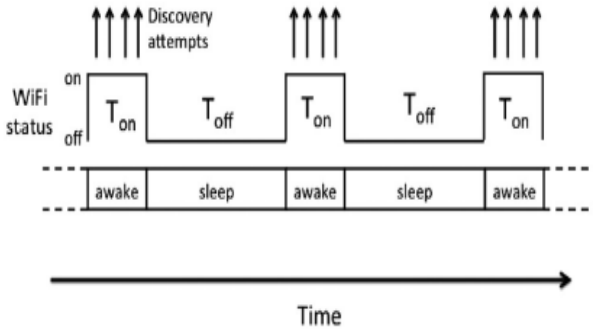
5.Analysis of different packet delivery protocols.

3. LITERATURE SURVEY

DIFFERNET TYPES OF METHODS FOR NEIGHBOUR DISCOVERY IN MINIMUM ENERGY BUDGET USING DUTY CYCLE

3.1ALWAYS ON

Wifi radio interface is kept on.The ALWAYS ON method of evaluations give cellular devices the concept of state Ton where radio interfaces are active during on state where number of newly discovered contacts happens to be more probably ,but with a great loss of battery .



DIGRAM OF NATURAL OPTIMAZTION

All nodes in the network are synchronized and that they periodically turn their wireless interfaces on and off.

During the on period all the devices can discover their neighbors by sending and receiving presence data packets. Each node stays on for[3] Ton seconds for each cycle.[2] During the off period, a node can neither transmit nor receive packets.

A node remains in this state for Toff seconds.The system period is then T= Ton + Toff , hence the duty cycle D=T/Ton.

3.2OPTIMUM METHOD

[1]Method in which optimum use of duty cycle is done .In this method node selects one particular duty cycle under which maximum number of contacts can be discovered in a given environment.

For this method there is a need of dedicated infra structure every time which is not possible as every time environment would be different.

For this reason there is a need of adaptive distributed algorithm to track the optimum cycle. Because mobility conditions varies as the user moves

Suppose the wifi is on during the night time when there is no need to discover a neighbor .

Hence the node must be adapted to work in different duty cycle so as when one of the node wakes up it can see available subset of contacts because some of its neighbor nodes can be asleep.

3.2.1 ADAPTIVE DISTRIBUTED ALGORITHM

CATNAP

It is a Adaptive duty cycle algorithm. Detecting and tracking the nodes in an unstable environmental.

Conditions in CATNAP Let Tj be the intial cycle

Three rules for CATNAP

1. Estimate a score E[n(Tx)]/ αTon+βToff for All $Tx_{\geq}Tj$.

2.Find the cycle Tk corresponding to maximum score SCORE =E[n(Tx)]/ αTon+βToff.

3.set the node cycle as Tk-1.

α β percenatge of battery drains during ON and OFF state

n is nodes E is Energy of this nodes.

3.3RBTP

RECURSIVE BINARY TIME PARTITIONING METHOD

Duty cycle is chosen dyanamacily .

Allow devices to adapt their number of wake up instance independently based on their respective[5] energy limitations but in they give no clue as to how a device should choose the number of wake up instances .[1]improved version is use of RBTP.

RBTP VERSION WHOSE DUTY CYCLE CHANGES ACCORDING TO BATTERY LEVEL:

1.Devices with high battery level have high duty cycle.[6]

2.Device running low on battery power increase the sleep time .

4.PERFORMANCE ASSESMENT

TABLE I RESULTS OF METHODS

DISCUSSED ABOVE.

METHOD	NUMBER OF DISCOVERED CONTACT	ENERGY
1.ALWAYS	400	REDUCES BATTERY LIFE BY 12.8H
2.CATNAP	2000	CONSUMES MORE BATTERY THAN OPTIMUM IN 90 H
3.OPTIMUM	2100	LIFE OF BATTERY 125 H
4.RBTP	1150	The average life of a device, around half the nodes collected by the OPTIMUM and the CATNAPs

.

The above table is drawn from the paper[1]

Experimental results .

5. RENDEZEVOUS POINT METHOD(RP)

Mobile sink can reduce energy consumption of nodes and increase lifetime of wireless sensor networks[7] The data should be collected in minimum delay together with minimum energy expenditure. Concept of rendezvous point is used which visits only desired mobile sink.

Each sensor node is assigned with a weight that depends on its hop distance from the sink and the number of its neighbors Highest weighted nodes will be selected as RPs. Nodes will send their data to cluster heads and they will forward it to the nearest RPs[7]. Some static nodes in the sensor network will be selected as RPs and it will aggregate the data originated from their member nodes Cluster based method is used for creating RP.

In a network model consist of N static sensor nodes one base station within a circle C and Radius R Base station is made mobile.

Neighbor nodes of the sink changes over a time.TSPN(TRAVELLING SALESAMN PROBLEM OF NEGHOBOR) the sink node has to visit only the neighborhood of sensor nodes for collecting data MASP(MAXIMUM AMOUNT SHORTEST PATH) improving the amount of data collection together with reducing energy consumption .

Working models[7]

1.WSN consist of a graph G(V,E) V=Set of sensor nodes E=Set of sensor nodes connecting through this edges.

2.Sensor nodes m energy consumption is calculated when it sends b bits to another node n.

$$E_{TX(m,n)}=b(\alpha 1+\alpha 2+d^{\gamma}{}_{m,n})$$

α =Power consumption factors

γ=Path loss exponent

dm,n=distance between two nodes

$$E_{RX}(m,n)=b\beta$$

β = energy consumption per bit of receiver

3.RP are selected based on clustering methods.

CLUSTERING:

3.1Closet RP of a sensor nodes are selected minimum hop distance for RP is:

$$H(m,A)=\{|v_{a\ K\varepsilon A,}h_{m,aj}\leq h_{m,}n_{k}\}$$

A=SET OF RP Hm,a=minimum hop distance

3.2 for each selected RP data forwarding tree is constructed which consist of its closet sensor nodes.

3.3Number of data packets is directly depend on number of neighbors .

3.4 Therefore total number of packets send by a node is =own datapackets+number of data packets send by its neighbor nodes.

3.5 Sensor nodes with highest weights will be selected as RP in cluster Heads.

3.6input is G(V,E) and ouput is set of RP.

$$W(m)=(N(m)+P(m))/D(m,s)$$

N=number of neighbor nodes P=Path to sink in m D=Distance between m and n nodes.

$D(m,n)=\sqrt{(x_2-x_1)^2+(y_2-y1)^2}$ Less is the distance choose that point as neighbor.

3.7Shortest Path Routing is used .

3.8 After the cluster formation each cluster head will find their nearest RP from the RP set Then the RP set will become small and the number of RPs will be equal to the number of clusters. All nodes will send their sensed data to its cluster head and the cluster head will forward it to the nearest RP. Now the mobile sink will find a path through this RPs for collecting data from them.[8]

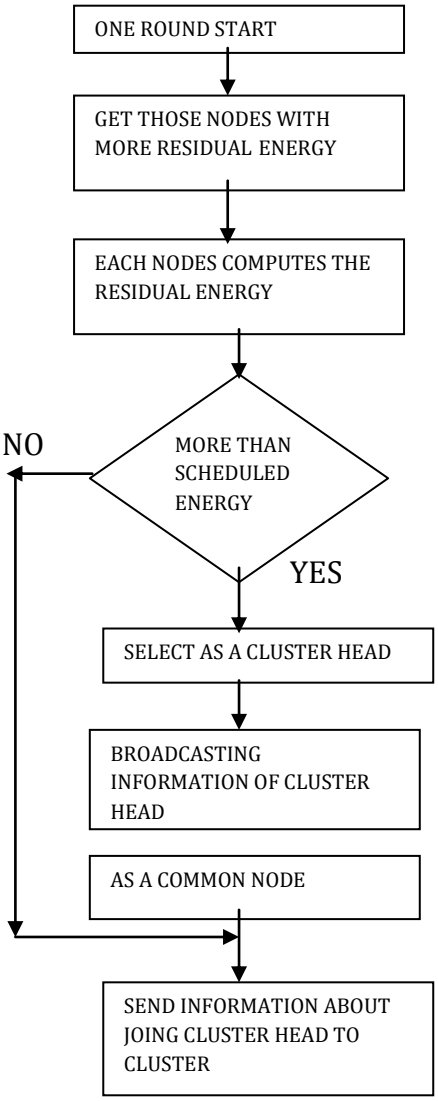
6.LEACH METHOD: LOW ENERGY ADAPTIVE CLUSTER HIERACHY

Protocol works for distributing , adaptive cluster forming and cluster header position changing .
WORKING LEACH provides concept of round,there are many rounds ,each round contains two states. [10]
Two states are:
Cluster setup state –It forms cluster in self adaptive mode.
Steady state-It transfers data in steady state.

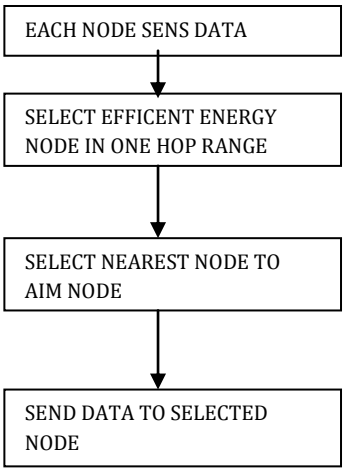
IMPROVEMENT OF LEACH [11]
1. Critertion of Selection Cluster Head:In earlier LEACH the protocol use to select randomly any node as a cluster head at each round..Modified protocol gives the concept of in which Node with more residual energy chose that node as cluster head. It prevented whole network from dying due to more energy consumptions.

2.Multihop communications among Cluster Heads in network:In LEACH protocol the Cluster Head use to directly communicate with sink.Hence Energy Consumptions between Cluster Heads and sink is greater than energy consumptions between cluster heads.

FLOW CHART I ENERGY LEACH PROTOCOL



FLOW CHART II ROUTING OF MULTI HOP PROTOCOL



CONCLUSION

ALWAYS ON,RBTP,CATNAP works on the concept of duty cycle . Other two are RENDENZEVOUS POINT METHOD and IMPROVED VERSION OF LEACH USES cluster method.To enhance energy efficiency of wireless sensor networks devices minimize the packet delivery time so that fast transmission can occur there by saving battery life of wireless sensor networks and hence neighbor discovery to discover more contacts in less time is also possible.CATNAP is adaptive distributed algorithm that is it can work in variable environments .RBTP works on the terms of wake up instances of radio interfaces of nodes. RENDENZEVOUS POINT METHOD works on the cluster head format shortest path is chosen in the group of cluster so as to achieve minimum packet delivery time and IMPROVED VERSION OF LEACH USES CLUSTER METHOD gives the idea about calculation the residual energy of nodes so that node which is being repeatedly used should be avoided to be as cluster head as it prevents network form dying and due to this method energy is saved very effectively of wireless sensor networks.

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