International Journal of Advanced Research in Computer Science & Technology (IJARCST 2014) Vol. 2 Issue Special 1 Jan-March 2014 ISSN : 2347 - 8446 (Online) ISSN : 2347 - 9817 (Print)

Performance Analysis of Scalable Point to Point Routing in Wireless Sensor Networks Using Greedy Forwarding Algorithm

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Abstract

Recent advancements in technology have made low-cost, low power wireless sensors. A network of such nodes can coordinate among themselves for distributed sensing and processing of certain phenomena. In this project a protocol to provide a stateless solution in sensor networks for end-to-end routing has been proposed. The protocol proposes a unique way to maximize the routing performance. Routing performance is one key element in the design of sensor network based surveillance applications. A protocol for node without sleep that guarantees a bounded-delay sensing coverage while maximizing routing performance is proposed. The detection of greedy forwarding, where the network is normally silent, except when an event occurs. The framework is optimized for end-to-end routing performance event and lifetime without sacrificing routing for each point. The resulting of end-to-end routing performance achieves the lowest overall target surveillance delay.

Keywords

Wireless Sensor, Routing and Greedy Forwarding and Topology Aware Routing Algorithm(TAR), Relational Sweep Algorithm, Optimized Link State Routing(OLSR)

I. Introduction

A Wireless Sensor Network (WSN) consists of spatially distributed autonomous sensor to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance, today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring. A wireless sensor networks is a collection of small randomly dispersed devices that provide three essential functions, the ability to monitor physical and environmental conditions, often in real time, such as temperature, pressure, light and humidity, the ability to operate devices such as switches, monitors or actuators that control those conditions. Typical WSN over-the-air data ranges from 20 kbps to 1 mbps. Consequently they can operate with much lower power consumption, which in turn allows the nodes to be battery powered and physically small. WSNs are typically self-organizing and self-healing. Self-organizing networks allow a new node to automatically join the network without the need for manual intervention.

A. Wireless Sensor Network Topology

Wireless sensor networks use three basic networking topologies, point-to-point, star or mesh. Point-to-point is simply a dedicated link between two points and isn't a network at all. Star networks are an aggregation of point-to pint links, with a central master node that manages a fixed number of slave nodes and serves as the conduit for all upstream.

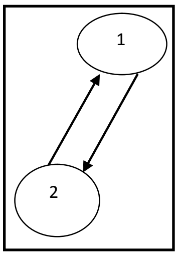

Figure 1. Point-to-point

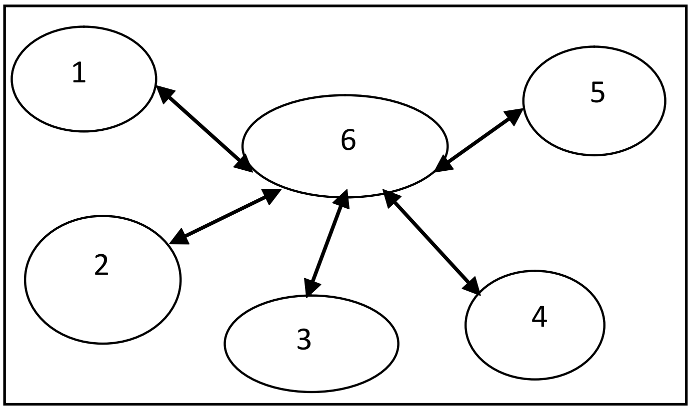

Figure 2. Star

B. Characteristics

Ad-hoc networks are often characterized by a dynamic topology due to the fact that nodes change their physical location by moving around. This favours routing protocols that automatically discover routes over conventional routing algorithms like distant vector and link state. Another characteristic is that a host/node has very limited CPU capacity, storage capacity, battery power and bandwidth, also referred to as a "thin client". This means that the power usage must be limited thus leading to a limited transmitter range. The access media, the radio environment, also has special characteristics that must be considered when designing protocols for ad-hoc networks.These links arise when for example two nodes have different strength on their transmitters, allowing only one of the hosts to ear the other, but can also arise from disturbances from the surroundings. Multi hop in a radio environment may result in an overall transmit capacity gain and power gain. The design of infrastructure based wireless networks is simpler because most of the network functionality lies within the access point, wireless client may remain quite simple. It can be used at different access schemes with or without access point. Infrastructure based wireless networks can loss some of the flexibility of networks.

C. Applications

Possible applications of sensor networks are of interest to the most diverse fields. Environmental monitoring, warfare, child education, surveillance, micro-surgery, and agriculture are the few examples.

1. Flexibility

Sensor networks should be scalable, and they should be able to dynamically adapt to changes in node density and topology, in the case of the self-healing minefields. In a self-healing minefield, a number of sensing mines may sleep as long as none of their peers explodes, but need to quickly become operational in the case of an enemy attack.

2. Maintenance

The only desired form of maintenance in a sensor network in the complete or partial update of the program code in the sensor nodes over the wireless channel. All sensor nodes should be updated, and the restrictions on the size of the new code should be the same as in the case of wired programming. Packet loss must be accounted for and should not impede correct reprogramming. The portion of code always running in the node to guarantee reprogramming support should have a small footprint.

II. Wireless Ad-Hoc Network

A wireless ad-hoc network is a collection of mobile/semi-mobile nodes with no pre-established infrastructure, forming a temporary network. Each of the nodes has a wireless interface and communicates with each other over either radio or infrared. Laptop computers and personal digital assistants that communicate directly with each other are some examples of nodes in an ad-hoc network. Nodes in the ad-hoc network are often mobile, but can also consist of stationary nodes, such as access pints to the internet. Semi mobile nodes can be used to deploy relay points in areas where relay. The outermost nodes are not within transmitter range of each other. However the middle node can be used to forward packets between the outermost nodes. Over the last few years ad-hoc networking has attracted a lot of research interest. MANETs and mobile IP as s source of many parameters, such as an IP address, MANET research is responsible for developing protocols and components to enable ad-hoc networking between mobile devices. It should be noted that the separation of end system and router is only a logical separation. It contain a neighbour table with a list of link quality to each neighbour table. Each node updates local routing table according to distance vector algorithm.

III. Literature Review

Z.zaho et.al., suggested that [14] geographic routing protocols are widely used in micro sensors networks, however, they can't directly apply to distributed mobile sensor systems as mobile sensors often do not know their neighbours exact physical locations. In this paper the geographic routing address the problem by introducing the light weight and distributed and virtual coordinate assignment protocol. It mainly focus on the effectiveness of routing algorithms for distributed data several routing algorithms.

Ben Ali Bindra et.al., suggested that [15] wireless sensor network are believed to be the enabling technology for ambient intelligence. Cognitive agents are capable of making proactive decisions based on learning, reasoning and end-to-end goals of the network even in the presence of multiple constraints and optimization objectives.

Jang-Ping Sheu et.al., suggested that [16] cognitive radio technology enables the opportunistic use of the vacant licensed frequency bands, thereby improving the spectrum utilization. A cooperative routing protocol has in ad-hoc network has been proposed. Routing protocol is used to find an end-to-end minimum cost path between a source and destination.

Longxiang Gao et.al., suggested that [17] Human associated delay tolerant networks (HDTNs) are new networks where mobile devices are associated with humans and can be viewed from multiple dimensions including geographic and social aspects. The combinations of the different dimensions enable to comprehend delay tolerant networks and use this multidimensional network to improve overall network efficiency

IV. Geographic Routing

Geographic routing is a routing principle that relies on geographic routing position information. It is mainly proposed for wireless networks and based on the idea that the source send a message to the geographic location of the destination instead of using the network address. The idea of using position information was first proposed in 1980s in the area of packet radio networks and interconnected networks. Geographic routing requires that the each node can determine its own location and that the source is aware of the location of its destination. It has two types Greedy Forwarding and Face Routing.

A. Greedy Forwarding

Greedy forwarding tries to bring the message closer to the destination in each step using only the local minimum information. Each node forwards the message to the neighbour that is most suitable form a local point of view. Greedy forwarding can lead into a dead end, where there is no neighbour closer to the destination.

B. Face Routing

Face routing helps to recover from that situation and find a path to another node, where greedy forwarding can be resumed. A recovery strategy such as face routing is necessary to assure that a message can be delivered to the destination.

V. Existing System

Geographic routing uses location information for packet delivery in multihop wireless networks neighbours locally exchange location information obtained through GPS. Since nodes locally select next hop nodes do not base on this neighbourhood information and the destination location, route established nor is per-destination. As large-scale sensor networks become more feasible, properties such as stateless nature and low maintenance overhead make geographic routing increasingly more attractive. Packets may get routed to where no neighbour is closer to the destination. Many recovery schemes have been proposed to route around such voids for guaranteed packet delivery as long as a path exists. These techniques typically exploit planar sub graphs and packets traverse faces on such graphs using the well known right hand rule. The complexity and overhead required for a distributed location database service is a disadvantage of geographic routing.

VI. Proposed Algorithm

Topology aware routing algorithm is proposed in which, each hop take the closest node in the physical space. Choosing close node greedily can result in more jumps than necessary.

ISSN : 2347 - 8446 (Online)
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A. Network Formation

The structure of interactions between individuals is best described as a network. Network architecture with nodes of 100 is simulated. Node size, position, color in the network are initialized. Network densities ranging from 4 to 12 and the set of nodes coincide with the set of agents. Arc between two nodes indicates the existence of bilateral interaction between the corresponding agents.

B. Route Discovery

Every node in a network needs to be aware of its geographic position. During packet dissemination, source node needs to be aware of the destination position. With the source and destination position information in a packet header is helpful to establish next hops. Several individual processors are computing in parallel and can communicate with each other more nodes can communicate and can make the broadcasting of data.

C. Protocol Implementation

The protocol is to be provided with a self-audit tool through which management can assess the efficiency of the health and safety management systems. Protocols presenting the potential for serious risks and adverse events may include clinical trials and can be used in investigational agents. Protocol is implemented that makes the topology aware routing algorithm easy to implement.

D. Next Hop Finding

Node broadcast the packet to all of its neighbours and chooses the next node. It eliminates the remaining nodes from forwarding the packets. Once neighbour nodes receive packets it starts its timer and node timer which expires first is chosen as the next hop node. Timer value depends on respective distances to the destination.

E. Route Maintenance

Relational sweep algorithm is used to identify next hop in anti-clockwise direction. It maintains the void region and generates the traversal path. In case of local minima relational sweep is quite hard to implement so it can be done using geographic routing. It maintains the node that are closer to the destination and it prevents a secure transaction of the nodes.

VII. Performance Evaluation

Performance of the through put will be varied based on packet size. Packet delivery ratio can be achieved. Variation is over the air transmission time of packets and transmission overhead. The results are obtained using topology aware routing algorithm in which the performance of packets may be higher it also gives higher ratio of loss of packets. The simulation time of packets is also performed that is closer to the destination.

A. End To End Delivery of Packets

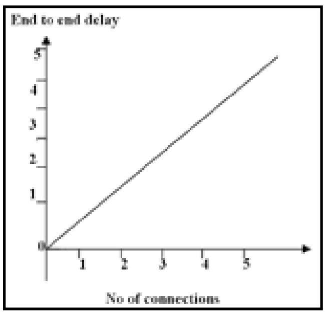

Figure 3.End To End Delivery Of Packets

In Figure 3 the graph shows the end to end delivery of packets. In which, when the packet size is increased the number of connections also increases.The number of connections shows the nodes used.

B. Loss of Packets

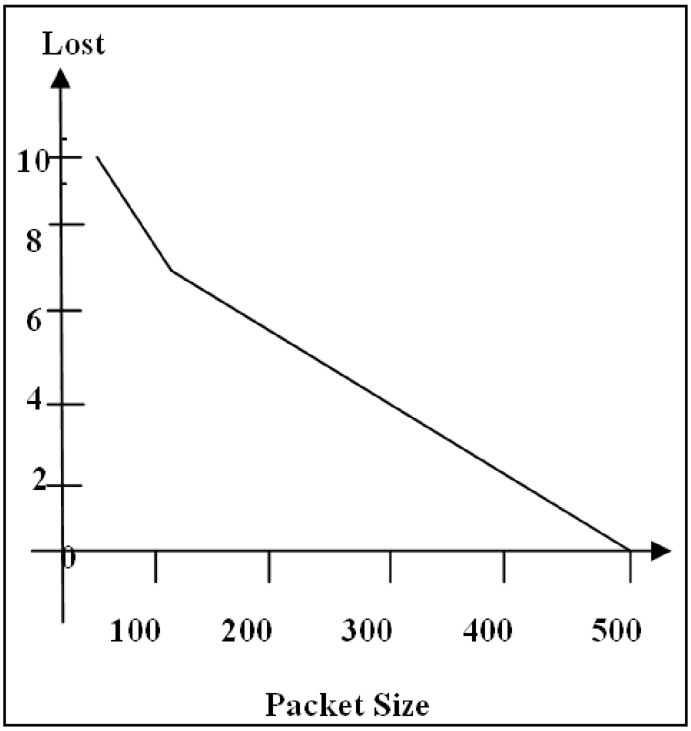

Figure 4. Loss of Packets

In Figure 4 it shows the loss of packets in which, when the loss get decreased the packet size increases. This shows when there are high number of loss ,the packet size can be high. When the packet size increases the data can be easily transfered.

C. Packet Delivery Ratio

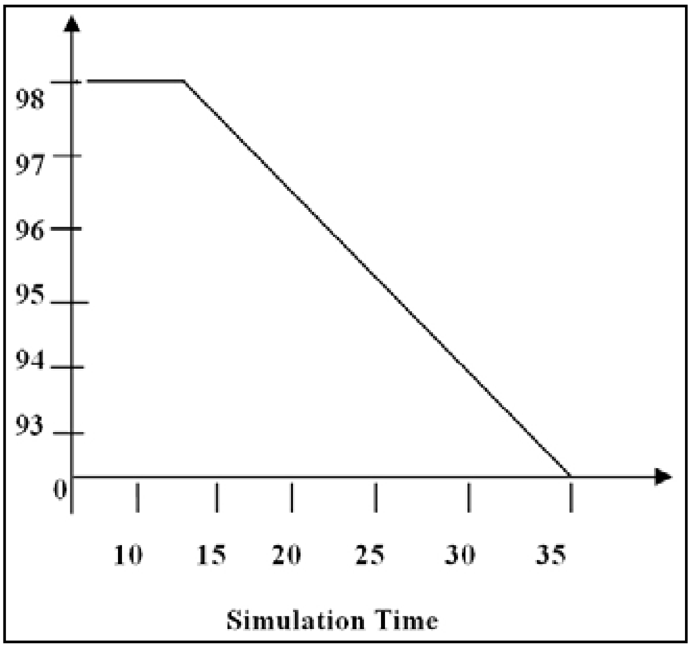

Figure 5. Packet Delivery Ratio

In Figure 4 determines PDR vs Simulation time and when the simulation time gets increased the PDR % achieves low target. But when simulation time is less and packet delivery ratio can be higher.

VIII. Conclusion

The method to improve the routing performance with small routing states has been introduced. Based on accurate hop distance comparison between neighbouring nodes, the greedy forwarding can find the shortest path between two nodes. By improving the routing quality the sleeping node can be recovered by a network topology and it can be simulated and it can give high success ratio, and find the node that is closer.

IX. Future Enhancement

In the future enhancement the forwarding node to begin with is uncertain about the number of delays, their wake up times, reward values, but knows the probability distribution of these quantities. At each relay wake up instant, when a relay reveals its reward value, the forwarding nodes problem is to forward the packet or to wait for further relays to wake up the routing performance. Optimized link state routing algorithm will be used in which it verifies the initial path and makes the packet to transfer secure and faster, to the node that is closer to the destination

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