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TRANSMISSION POWER CONTROL METHODS FOR WIRELESS NETWORKS

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Abstract

Mobile Adhoc network is an infrastructure-less multihop network where each node communicates with other directly or indirectly through intermediate nodes. As most of the today's routing protocol are based on fixed power for transmission. We take an alternative approach of variable range transmission .Transmit power control is important in wireless Adhoc network as it can impact on battery life and the traffic carrying capacity of the network. We can investigate the effect of common power and the impact of variable range for signalling overhead of a routing protocol as a function of transmission range which maximizes the capacity available to nodes .we compare how routing protocols based on common range and variable range impact number of system performance metrics such as connectivity, traffic carrying capacity and power conserving properties of wireless networks. For simulation NS2 is used.

Key words-MANET,power control, traffic capacity.

1. Introduction

The problem in wireless network is the choice of power level as power has multidimensional effect on the performance of the whole system. Power levels affect the connectivity of network and consequently the ability to deliver the packets .The transmission power control approach can be extended to determine the optimal path that minimizes the total transmission energy required to deliver data packets to the destination,in contrast to simply establishing correct and efficient routes between pair of nodes ,one important goal of routing protocol is to keep the network functioning as long as possible .This goal can be achieved by minimizing mobile nodes energy not only during active communication but also when they are inactive. Communication energy required to transmit and receive data packets or energy during inactive periods. The active communication energy can be reduced by adjusting each node's radio power just enough to reach the receiving node but not more than that. This transmission power control approach can be extended to determine the optimal routing path that minimizes the total transmission energy required to deliver data packets to the Destination .Another approach to save the inactive energy is by switching its mode of operation into sleep/power-down mode or simply turn it off when there is no data to transmit or receive .Another important approach is load distribution where it is required to balance the energy usage among the nodes and to maximize the network life time by avoiding over utilized nodes when selecting a routing path. The following table shows approach and the suitable protocols.

Table I: showing Protocols for different approach

Approach		Protocols	Goal
Minimum active communication Energy	Transmission Power Control	MER COMPOW	Minimize the total transmission energy
	Load Distribution	LEAR	Distribute the load to energy rich nodes
Minimize Inactive Energy	Sleep/power Down Mode	SPAN	Minimize energy consumption during inactivity

2. Proposed work

We review the protocol which aims to operate all nodes at a common power level which is chosen to be the smallest power level at which the network is connected .Now the question is what should be the common power ?choosing an excessively high power level causes excessive interference and low power results in fewer links and hence network partitioning. The power has to be just right, the network is still connected and there is no excessive interference. In [2] the authors suggest that, when considering the physical layer only, reducing the transmission power is a better approach because this increases the traffic carrying capacity of the network second, power control affects the Connectivity of the resulting network. By a connected network, we mean a network in which any node has a potential route of physical links (or forwarding nodes) to reach any intended receiver node. A high transmission power increases the connectivity of the network by increasing the number of direct links seen by each node, but this is at the expense of reducing network capacity. In [3] the authors assume that all nodes use the same common transmission power. This power is varied until a connected tree is constructed. We show that the use of a minimum spanning tree can lead toward a lower total weight than a tree based on common-range transmission links that minimally avoids network partitions .The type of power control used can also impact the connectivity and performance of the network layer. Choosing a higher transmission power increases the connectivity of the network. Routing protocols can take advantage of fully connected networks to provide multiple routes for a given source-destination pair in cases where some nodes or links fail however; this goal is achieved at the expense of reducing network capacity and energy-savings. In addition, power control impacts the signalling overhead of routing protocols used in mobile wireless ad hoc networks. Higher transmission power decreases the number of forwarding hops between source-destination pairs, therefore reducing the signalling load necessary to maintain Common-Range Transmission Control. We analyze the case where all nodes use a common transmission range (R_{com}) to communicate with peer nodes in the network. This case is of particular importance because a common transmission range approach is the foundation of most routing protocols in ad hoc networks

2.1 Common Range Transmission :we investigate the case where all nodes use a common transmission range(Rcom).it is not possible to arbitrarily reduce Rcom to any value there is a lower bound which is defined as R_{com}^{min} the critical transmission range for connectivity of '**n**' randomly placed nodes in '**A**' square meters is

$$(1+\varepsilon)\sqrt{A\ln n/n\Pi} \quad . \qquad (1)$$

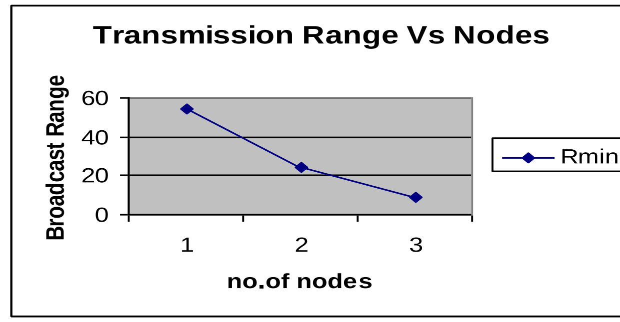

Fig 1: Transmission Range Vs Nodes

From the figure we come to the conclusion that value of R_{com}^{min} decreases as the density of nodes increases .The traffic carrying capacity of the network is bounded by the value of range which motivates the study of variable range.

2.2 Variable Range Case

In this the transmission power is varied and the effect of this variance is compared with signalling load and network partition

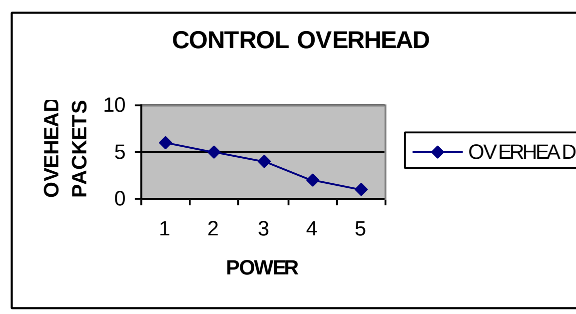

Fig.2: Signalling Load Vs Power

Fig.2 shows the signalling overhead of the routing protocol versus the transmission power and node speed. As shown in Fig.2 the number of signalling packets is low for high transmission power values and grows in an exponential manner when the transmission range approaches the minimum common transmission range

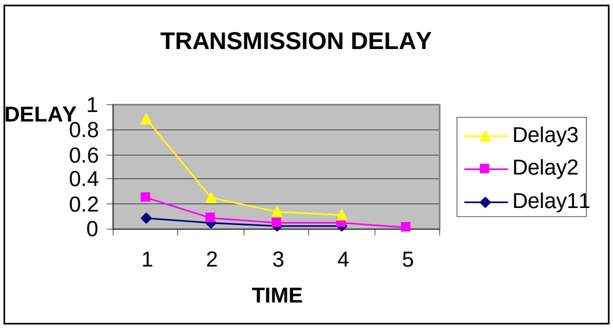

Fig.3: Transmission Delay Vs Time

As shown in fig 3 the Delay is reduced with respect to time .

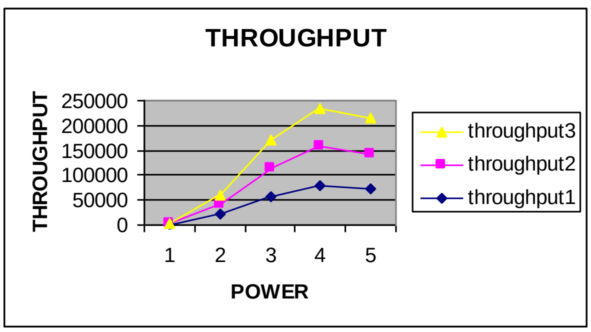

Fig.4 :Throughput Vs Power

As shown in figure 4 the throughput considerably increases with the variation in transmit power which is a good option to constant power transmission

3) Conclusion

Power control improves network throughput. It reduces the retransmission Probability or increases the network spatial reuse ratio .Results indicate that a variable-range transmission approach can outperform a common-range transmission approach in terms of power savings and increased capacity. We can balance the power consumption over the network .firstly with common range and then we can go for the variable range transmission.

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