A Robust Opportunistic Exchanging Through Wireless Ad Hoc Network

Zilani khan Pathan and V.Revathi

Abstract: Routing in a multi-hop wireless ad-hoc network is not straightforward, simply due to the unreliability of a wireless link. A new routing paradigm termed routing opportunistic routing has recently been proposed by researchers, to cope with this unpredictability. Opportunistic routing is based on the use of broadcast transmission to expand the potential forwarders that can assist in the retransmission of the data packets. This scheme utilizes a reinforcement learning framework to opportunistically route the packets even in the absence of reliable knowledge about channel statistics and network model. A consequence of these latter two is that incremental increases in offered load lead either only to small increase in network throughput, or to an actual reduction in network throughput. This scheme jointly addressed the issues of learning and routing in an opportunistic context, where the network structure is characterized by the transmission success probabilities. Our proposed reinforcement learning framework allows for a low complexity, low overhead, distributed asynchronous implementation.

Keywords: Opportunistic Routing, Routing Algorithm, Reward Maximization, Wireless Ad-Hoc Network.

1. Introduction

A wireless ad hoc network is a decentralized type of wireless network. The network is ad hoc because it does not rely on a preexisting infrastructure, such as routers in wired networks or access points in managed wireless networks. Instead of each node participates in routing by forwarding data for other nodes, so the determination of which nodes forward data is made dynamically on the basic of network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding the data. Opportunistic routing for multi-hop wireless ad hoc networks has seen recent research interest to overcome deficiencies of conventional routing in ad hoc networks attempts to find a fixed path along which the packets are forwarded. Such fixed path schemes fail to take advantages of broadcast nature and opportunities provided by the wireless medium and result in unnecessary packet transmission. The opportunistic routing decision in contrast, are made in an online manner by choosing the next relay based on the actual transmission outcomes as well as a rank ordering of neighboring nodes. Opportunistic routing mitigates the impact of poor wireless links by exploiting the broadcat nature of wireless transmission and the path diversity.

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Fig.1.1 wireless ad-hoc network

The opportunistic algorithms proposed in [1], [6] depends on a precise probabilistic model of wireless connections and local topology of the network. In practical setting, however, these probabilistic models have to be learned and maintained. In other words a comprehensive study and evaluation of any opportunistic routing scheme requires an integrated approach to the issue of probability estimation. Authors provide a sensitivity analysis in which the performance of opportunistic routing algorithm is shown to be robust to small estimation errors.

The idea of reinforcement learning has been previously investigated for conventional routing in Ad-hoc networks, a ticket based probing scheme is proposed for path discovery in MANETs to reduce probe message overhead. As discussed in the conclusion, the issue of congestion control remains open and entails further research.

2. Related work

Opportunistic routing in mobile network has drawn a lot of research interest about the routing algorithm, emerges with special emphasis to overcome difficulties in MANET. S. Biswas and R.Morris focused on ExOR, an integrated routing and MAC technique that realize some of the gains of cooperative diversity on standard radio hardware such as 802.11. ExOR choose each hop of a packet's route after the transmission for that hopes. S.Yang et al proposed a novel protocol called position based Opportunistic Routing (POR) which takes full advantage of the broadcast nature of wireless channel and opportunistic forwarding. The MANET allows more nodes to participate in the opportunistic data forwarding even the node is not presented in the forward list. It was an extension work of ExOR and also they tackles the problem of opportunistic data transfer in Manet. Our solution is called Cooperative Opportunistic Routing in Mobile Ad hoc Network. A Light weight

proactive source routing protocol is used for gathering the neighboring node information, so that each node has complete information about its neighbors. Opportunistic data forwarding to another level by allow nodes that are not listed as intermediate forwarders to retransmit data if they believe certain packets are missing.

3. Opportunistic Routing

In many MANET application environments, nodes from a disconnected network due to nodal mobility, node sparseness, lossy link of signal attenuation or shut down the transmission to conserve energy and etc. Traditional MANET and internet routing techniques are not available because they implicitly assume that the network, even if sparse is connected and an end to end path always exists between any source destinations. Constitute the category of ad hoc network where diverse system, not originally employed as components, join in dynamically to exploit the resources of separate networks according to the needs of specific application tasks.

In routing phenomena the data packets are successfully routing from the source node to the destination node without any delay. A successful routing pattern of an opportunistic routing network is shown in fig 3.1. A node which is considered as the source node s, which will transmit the data packets to the neighboring node, so on finally the data packets reached destination node D and send acknowledgment back to the source node.

The proposed routing scheme jointly addresses the issues of learning and routing in an opportunistic context, where the network structure is characterized by the transmission event for packet to be the event that packet is either received by the destination or is dropped by a relay before reaching the destination.

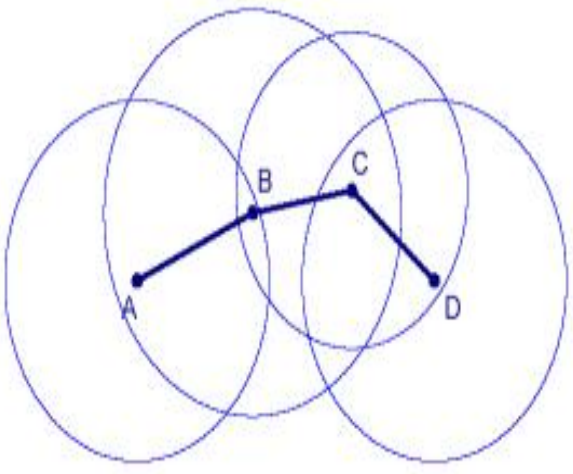

Fig.3.1 Opportunistic routing network basic structure.

The routing decision at any given time is made based on the successful outcome and involves retransmission, choosing the next relay, or transmission.

Routing algorithm

As discussed before, the routing decision at any given time is made based on the successfully outcomes and involves retransmission, choosing the next relay, or termination. Or proposed scheme makes such decisions in a distributed manner via the following three way handshake between node I and its neighbors N(i).

- ✓ At time n node i transmit a packet.
- ✓ Set of nodes who have successfully received the packet from node i, transmits acknowledgement (ACK) packets to node i. In addition to the nodes identity, the acknowledgment packet of node includes a control message known as Estimated Best Score (EBS).
- ✓ Node I announces node as the next transmitter or announces the termination decision f in a forwarding (FO) packet.
- ✓ The algorithm used is adaptive opportunistic routing algorithm. The data packets are routed to the nodes even in the absence of reliable knowledge about channel statistics and network model.
  The operation of routing algorithm can be described in terms of initialization and four stages of transmission, reception and acknowledgement, relay, and adaptive computation as shown in fig.3.2.

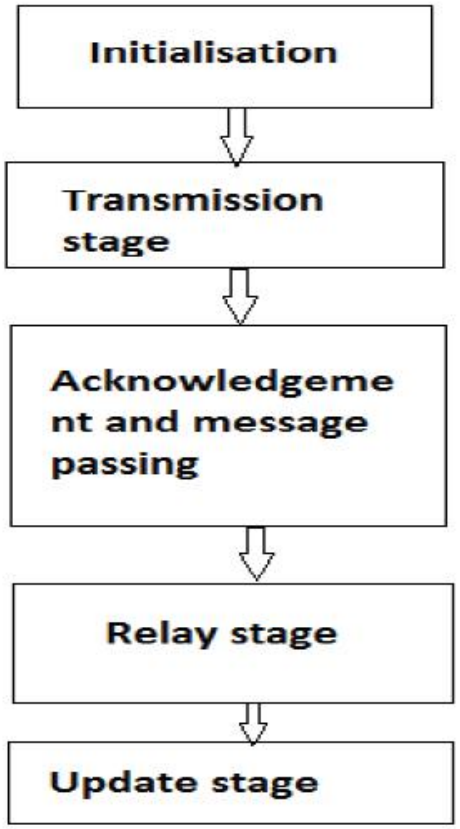

Fig.3.2 Flow of the algorithm

Step1: Initializing all the number of nodes in the network. In this article we are using 26 nodes. In initialization stage initializing all the nodes.

Step2: transmission stage occurs at time n which node I transmit if it has a packet.

Step 3: the reception and acknowledgment is a set of neighboring nodes that have received the packet transmitted by node, successful reception of the packet transmitted by node i is acknowledge to it by all the nodes in. we assume that the delay for the acknowledgment stage is small enough such that node i infers by time n+.

Step 4: Node i selects a routing action in according with the EBS value received. Node i transmits FO, a control packet which contains information about routing decision.

Step 5: After being done with transmission and relaying, node I updates score vector for the further routing. As we seen before by using adaptive opportunistic routing algorithm the routing of data packets are successfully achieved even in the absence of reliable knowledge about the channel statistics and network model. The data packets will send to the nearest neighbor without knowing the channel statistics and network model. By using this algorithm we cannot reduce or control congestion occurred in the network in the case of opportunistic routing algorithm, consider the nodes N_0 (source), N_1, N_2, N_3 shown in the fig 3.3. When a data packet is send from node N_1 to node N_2, an acknowledgement is sent back to the node N_1 and also to the node N_0 after the data packet is successfully reached at the node N_2, and next to the node N_3(destination).

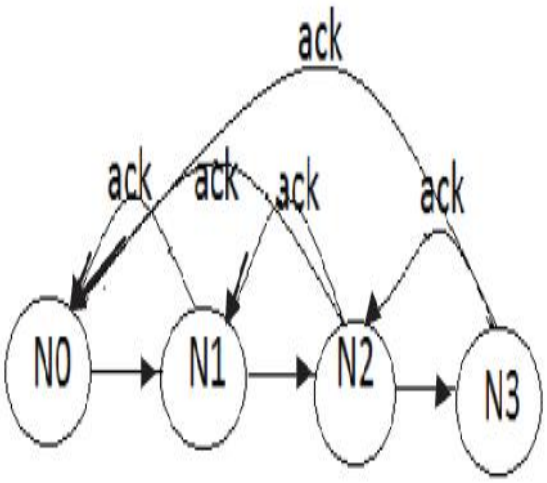

Fig.3.3 Node transmission and acknowledgement passing

From the above figure it is well known that increasing the number of acknowledgment leads to congestion in the network. In order to overcome the congestion problem we are reducing the number of acknowledgment. So we are proposing a new scheme for packet exchange in wireless ad-hoc network by reducing the number of acknowledgment to control the congestion in the network.

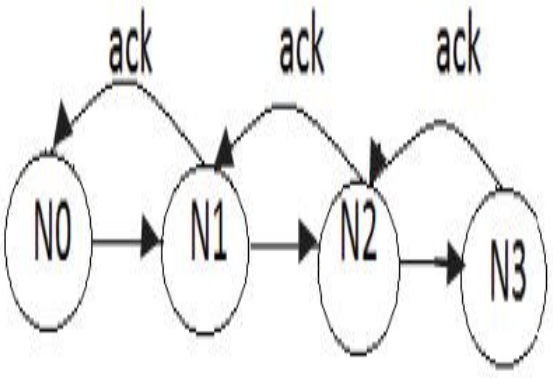

Fig 3.4 Node transmission and acknowledgment

The node transmission and acknowledgement passing by using the proposed scheme is shown in the fig 3.4 by reducing the number of acknowledgment in the existing scheme we can able to control the congestion in the overall network.

4. Conclusion

Opportunistic routing protocols present a promising scheme to improve the wireless network performance by exploiting the broadcast nature of the medium. In this article we are proposed a new scheme for packet exchange in wireless ad-hoc networks which maximizes the expected average per packet reward from a source to a destination by control the congestion in the wireless ad-hoc networks by reducing the number of acknowledgments.

Other realizations to our opportunistic scheme can be made in the future. Towards more realism a practical lab setup for a wireless ad-hoc network using routers can be established where cooperative multipoint can be implemented to test and analyze the performance of the opportunistic scheme. An important area of future work comprises of developing fast converging algorithm which optimize the regret as a performance measure of interest.

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