Novel Routing Approaches For Wireless Ad Hoc Networks

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Abstract— In wireless ad-hoc networks, a new routing scheme for congestion control is proposed; as called Novel Routing Approach-NRA. This method adopts reinforcement learning framework to route the data from Source to Destination in the absence of detailed knowledge of entire channel. In this method, an every node itself determines the efficient way to transmit data and utilizes the intercommunicate opportunity. This kind of method denotes the network congestion problem and improves the throughput that minimizes the delay. This paper examines the traffic flow of a wireless Ad hoc network; Congestion occurs due to elastic traffic that degrades the performance of the entire network. In order to predict the future congestion situation, a relevant estimation is designed for each forwarder node and our proposed algorithm (ABCC) Agent Based Congestion Control routing protocol which possess the estimation function. Hence our proposed work can minimize the amount of congestion and delay in opportunistic routing models than the existing ones.

I. INTRODUCTION

Wireless ad-hoc network is a special type of wireless network due to its infrastructure. Nodes are communicating with each other without any access point in a network. Many routing protocols may create repeated routes, which will deeply induce the routing updates as well as increase the whole networks overhead. Main aim of this project is to route the packet in the ad-hoc network without delay. Wireless ad-hoc networks consist of a set of nodes that communicate among themselves over a wireless channel. There is no centralized control. The nodes cooperate in routing the data packets from the transmitting node to the intended destination node. In doing so, efficient routing protocols must be chosen respecting the power and delay constraints. Novel Routing approaches for wireless ad-hoc network uses the network self-interference model in to characterize the network throughput. Nodes are randomly distributed in the plane according to a Poisson point process of density. Each node is assumed to transmit at the same frequency “f” with the same power ‘P0’ using a unidirectional antenna. Nodes make independent decisions on whether to transmit or listen. In any given time slot, a node transmits with the attempt probability. Routing protocol to explicitly support multiple simultaneous flows in wireless networks. The following are the four major components to achieve high throughput and fairness:

1. Reflexive promoting path selection to supplement path diversity while minimizing duplicate transmissions
2. Priority timer-based forwarding to let only the best forwarding node forward the packet
3. Local loss recovery to efficiently detect and retransmit lost packets
4. Adaptive rate control to determine an appropriate sending rate according to the current network conditions.

Routing in wireless ad hoc networks is challenging mainly due to unreliable wireless links/channels. Geographic opportunistic routing (GOR) was proposed to cope with the unreliable transmissions by exploiting the broadcast nature and spatial diversity of the wireless medium.

The existing d-adaptor helps to find the optimal node to forward the data to next hop based on acknowledgements reply. Hence it helps to send the data on time and reduces the delay along with throughput performance. But whereas in certain conditions if two or more nodes competes for forwarding data, it results in congestion that degrades the throughput considerably. Also delay in the transmission will be higher.

So, in order to minimize or avoid such congestions we enhance the d-adaptor algorithm by introducing ABCC- Agent based congestion control mechanism where the status of each and every node is considered and selected if and only if they are free.

II. EXISTING SYSTEM

A distributed adaptive opportunistic routing scheme for multi-hop wireless ad-hoc networks is proposed Opportunistic routing , “Biswas. S and Morris” mitigates the impact of poor wireless links by exploiting the broadcast nature of wireless transmissions and the breach diversity. The embedded reflexive relatistic routing scheme utilizes a reinforcement learning framework to opportunistically route the packets even in the absence of reliable knowledge about channel statistics and network model. Ad hoc network is a collection of wireless mobile nodes that dynamically form a temporary network without the use of any existing network infrastructure or centralized administration. To provide a low-complexity, low-overhead, embedded simulation implementation. To achieve the performance of an optimal routing with perfect and centralized knowledge about network topology, the tuning system is measured in terms of the expected per-packet reward. It examines the traffic flow of a wireless Ad hoc network; Congestion occurs due to elastic traffic that degrades the performance of the entire network. Hence our proposed work can minimize the amount of congestion and delay.

At last we extract the following parameters with some specifications:

1. Throughput
It is the ratio of number of packets sends by the sender and number of packets received by the receiver.

2. Delay
It is the overall execution time from sender to the receiver based on packet size.

ADHOC wireless networks are defined as an autonomous system of nodes connected by wireless links and communicating in a multichip fashion. The possible routing for multichip wireless ad-hoc networks has been a recent research interest to overcome the failure of formal routing [4]–[6] as applied in non-wired setting. Encouraged by humanist routing resolution in the Internet, procedural routing in ad-hoc interwork attempts to find a fixed routing along which the packets are forwarded [6]. Such fixed routing schemes fail to take advantage of broad cast nature and opportunities provided by the wireless medium and result in unnecessary packet retransmissions. One of the fundamental tasks that an ad hoc network should perform is congestion control[12]. The opportunistic algorithms proposed in [16] depend on a precise probabilistic model of wireless connections and local topology of the network. In a feasible setting, however, these opportunistic models have to be “learned” and “maintained.” In other words, a comprehensive study and evaluation of any possible routing scheme requires an integrated approach to the issue of possible estimation. Authors in [8] provide a sensitivity analysis for the opportunistic routing algorithm given in [10]. However, by and large, the question of learning estimating channel statistics in conjunction with opportunistic routing re-mains unexplored. Using a reinforcement learning framework, to propose a distributed adaptive opportunistic routing algorithm (d-Adaptor) that minimizes the expected average per-packet cost for routing a packet from a source node to a destination [1] The reinforcement learning framework allows for a less-complicated, low-overhead, embedded asynchronous bringing in to implementation. The chief purpose of this paper is to provide an opportunistic routing algorithm that: 1) assumes no knowledge about the channel statical and network, but 2) uses an exploration learning framework in order to enable the nodes to adapt their network strategies, and 3) optimally utilizes the statistical opportunities and receiver diversity. In doing so, to build on the Markov decision formulation in [10] and an important theorem in Q-learning proved in [13]. There are many learning-based routing solutions (both heuristic or analytically driven) for conventional routing in wireless or wire [7]–[10]. None of these solutions exploits the receiver diversity gain in the context of opportunistic routing. The authors in [8]–[14] focus on heuristic routing algorithms that adaptively identify the least congested path in a wired network. In wireless network flows can compete even if they don’t share a wireless link in their paths. Thus, in ad hoc wireless networks the contention relations between link-layer flows provide fundamental constraints for resource allocation.

ISSUES IN EXISTING SYSTEM

Wireless ad hoc networks consist of a set of nodes that communicate among themselves over a wireless channel. There is no centralized control. The nodes cooperate in routing the data packets from the transmitting node to the intended destination node. In doing so, efficient routing protocols must be chosen respecting the power and delay constraints. The following are the four major components to achieve high throughput and fairness: (i) Adaptive forwarding path selection to leverage path diversity while minimizing duplicate transportation. (ii) Priority timer-related forwarding to let only the best forwarding node forward the instructions. (iii) General loss recovery to properly detect and retransmit lost packets. (iv) Adaptive rate control to determine an appropriate sending rate according to the current network conditions. The distributed adaptive opportunistic routing scheme utilizes a reinforcement learning framework to opportunistically route the packets even in the absence of reliable knowledge about channel statistics and network model. To achieve the performance of an optimal routing with perfect and centralized knowledge about network topology, where as the tuning is taken place in terms of the expected per-packet reward. Routing in wireless ad hoc networks is challenging mainly due to unreliable wireless links/channels.

III. PROPOSED SYSTEM
To consider the process of ABCC- Agent based congestion control mechanism to avoid over flooding or packet accumulation at the nodes. In ABCC process channel statistics of each and every selected node is examined and if it is underflow then data will be forwarded[1]. Hence traffic or congestion at a specific zone will be reduced considerably. To proposed Agent based Congestion Control routing protocol algorithm[19] whose performance is shown to be optimal with zero knowledge regarding network topology and channel statistics. Also solve the congestion problem and improves the throughput that minimizes the delay.

TECHNIQUES

D-ADAPT-OR IN A REALISTIC SETTING

Loss of ACK and FO Packets: Interference or low SNR-signal-to-noise ratio can cause loss of ACK and FO packets. Loss of an ACK packet results in an incorrect estimation of nodes[21] that have acquired the packet thereby affects the performance of the algorithm. Loss of FO packet negatively impacts the throughput performance of the network. In specifically, missing of an FO packet can result in the drop of data packets at all the potential relays, reducing the throughput performance. Hence, in our design, FO packets are transmitted at lower rates to ensure a reliable transmission.

INCREASED OVERHEAD

As it is the case with any opportunistic scheme, d-AdaptOR adds a modest additional overhead to the standard due to the added acknowledgment/handshake structure. This overhead increases linearly with the number of neighbors. Assuming a physical layer operating at 11 Mb/s with an SIFS time of 10 s, preamble duration of 20 s, PLCP-Physical Layer Convergence Protocol header duration of 4 s, and 512-B frame payloads, Table 7.1.1 compares the overhead in the data packet due to piggybacking and the control overhead due to ACK and FO packets for unicast genie-aided opportunistic scheme, and d-AdaptOR. D-AdaptOR requires communication overhead of 4 extra bytes for EBS per ACK packet compared to the genie-aided opportunistic scheme, while unicast does not require such overhead. Adhoc wireless networks are networks which do not reply on a pre-
existing communication infrastructure. The reinforcement learning framework allows for a low complexity, low overhead, distributed asynchronous implementation[14]. The most significant characteristics of the proposed solution are: It is oblivious to the initial knowledge of network and It is distributed each node makes decisions based on its belief using the information obtained from its neighbors.

INITIALIZATION STAGE

It is the starting process. All the existing nodes are connected to the network and the connection and node link information is updated. Then the data to be transmitted is given by user. Data is partitioned into packets and forwarded to next any neighbor node based on adaptive calculation. Score for the node i, at time 0, when the node received the packet and decision is taken value should be zero. Number of time up to time nodes s have received the packet to be zero. Estimated best score i to be zero.

IV. MODULES DESCRIPTION

- Transmission stage module
- Congestion stage module
- Reception and Acknowledgement stage module
- Relay stage module
- Update stage module

TRANSMISSION STAGE

Here a node has to transmit the packets is posses. For that it has to take the routing decision. Assume a node x having the data to be transmitted, and then it sends the set of sample packets to the neighbors and waiting for reply. Here a node sends the data as soon as it receive the packet. Transmission stage occurs at time in which node transmits if it has a packet.

CONGESTION STAGE

NODE AGENT- NA

A Node Agent (NA) starts from every node and moves to an adjacent node at every time. A node visited next is selected at the equivalent probability. The NA brings its own history of movement and updates the routing table of the node it is visiting. Each NA has its own history which consists of its source node S, the current time Tc, the number of hops NH from the starting node, the adjacent node AN that the NA has last visited and the number of multiple packets NP on AN at Tc. When an NA visits a node, it puts the information (S,Tc,NH,AN,NP) in the routing table of that node. Every node have a routing table that stores k fresh routing information records from itself to every node S: ([S,NHi,ANi,NPi)] , where Tc1 > Tc2 > Tm. We call m the number of entries. For each i≤m , Tci is a time of visiting the adjacent node ANi, NHi is the number of hops and NPi is the number of NAs on ANi. When NA with the history (S,Tc,NH,AN,NP) visits a node N, the routing information on that node [S: (Tc, NH, AN, NP)] is updated to [S: (Tc, NH, AN, NP), (Tc1, NH1, AN1, NP1), … (Tcm, NHm, ANm, NPM)] .

RECEPTION AND ACKNOWLEDGEMENT STAGE MODULE (AGENT BASED CONGESTION CONTROL ROUTING)

Step 1: The source S look into the number of availability one hop neighbors and clones the Node Agent (NA) to that neighbors.

Step 2: The Node Agent pick out the truncated path of the route to move towards the destination.

Step 3: The NA1 moves towards the destination in a hop-by-hop manner in the path P1 and NA2 in P2 and NA3 in P3 respectively.

RECEPTION AND ACKNOWLEDGEMENT STAGE:

Let denote the (random) set of nodes that have received the packet transmitted by node i. In the reception and recognition stage, successful acceptance of the packet transmitted by node is acknowledged to it by all the nodes in. We assume that the delay for the acknowledgment stage is small enough (not more than the duration of the time slot). For all nodes, the ACK packet of node to node includes the EBS message. Upon reception and acknowledgment, the counting random variable is incremented.

RELAY STAGE

Before transmission node x announces its routing decision to all its dwell. The transversal log of x is also updated based on current transmission. Then X is waiting for acknowledgement from destination.

UPDATE STAGE

In times, after being done with transversal and relaying, node updates score vector.

IMPLEMENTATION

Case 1: To consider the problem of routing packets from a source node 0 to a destination node d in a wireless ad hoc network of node k+1 along a sequence of routing packets set denoted as x = {1, …, k}. The time is slotted and indexed by n (this assumption is not technically critical and is only assumed for ease of exposition). The routing scheme can be viewed as selecting a (random) sequence of nodes for relaying packets m=1,2,…,k. As such, the expected average per-packet reward associated with routing packets along a sequence of up to time N is

\[ J_m = E \left[ \sum_{n=1}^{\infty} \frac{1}{n} \sum_{i=1}^{m} \gamma^i \right] \]

\[ \gamma^i \]

denote the number of packets terminated up to time m and the expectation is taken over the events of transmission decisions, successful packet receptions, and packet generation times. Problem (A) Choose relay nodes in the absence of knowledge about the network topology such that is maximized as. N→∞ and the performance of the routing protocol are affected by the service types of the traffic carried by the intermediate nodes. The proposed Wireless Agent Based Congestion Control Adaptor routing algorithm, which solves Problem. (A) The nature of the algorithm allows nodes to make routing decisions in distributed, asynchronous, and adaptive manner.

ABCC ROUTING ALGORITHM

Case 2: First explain the notation that used in the Adaptor algorithm. The notations are follows. Let the set of neighbors of node i. Let the set of potential reception outcomes due to a transmission from node i to S. To refer as the state space for ’s transmission. To denote A(S) = SU T{ the space of all allowable actions available to node ‘i’ upon successful reception at nodes in S. Finally, for each node I and define a reward function on s and potential decisions arA(S) as
In the scheme makes such decisions in a distributed manner via the following three-way handshake between node and its neighbors: 1) at time, node transmits a packet. 2) The set of nodes who have successfully received the packet from node, transmit acknowledgment (ACK) packets to node. In addition to the node’s identity, the acknowledgment node, transmit acknowledgment (ACK) packets to node. In addition to the node’s identity, the acknowledgment packet includes a control message known as estimated best score (EBS). 3) Node announces node as the next transmission announces the termination decision in a forwarding (FO) packet.

**Notations used in the Description of the Algorithm**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
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<tbody>
<tr>
<td>$S^t_n$</td>
<td>Nodes receiving the transmission from node $i$ at time $t$</td>
</tr>
<tr>
<td>$a^t_n$</td>
<td>Decision taken by node $i$ at time $t$</td>
</tr>
<tr>
<td>$A(S)$</td>
<td>Set of available actions when nodes in $S$ receive a packet</td>
</tr>
<tr>
<td>$N(i)$</td>
<td>Neighbors of node $i$ including node $i$</td>
</tr>
<tr>
<td>$g(S,a)$</td>
<td>Reward obtained by taking decision $a$ when set $S$ of nodes receive a packet</td>
</tr>
<tr>
<td>$v_n(i,S,a)$</td>
<td>Number of times up to time $n$, nodes $S$ have received a packet from node $i$ and decision $a$ is taken</td>
</tr>
<tr>
<td>$N_n(i,S)$</td>
<td>Number of times up to time $n$, nodes $S$ have received a packet from node $i$</td>
</tr>
<tr>
<td>$A_n(i,S,a)$</td>
<td>Score for node $i$ at time $n$, when nodes $S$ have received the packet and decision $a$ is taken</td>
</tr>
<tr>
<td>$N^t_{max}$</td>
<td>Estimated best score for node $i$</td>
</tr>
</tbody>
</table>

The routing decision of node at time is based on an adaptive (stored) score vector. The score vector lies in space, where, and is updated obtained from neighbor node using the EBS messages. Furthermore, node uses a set of counting variables and a sequence of positive scalars to update its score vector at time. Table I provides notations used in the ABCC routing protocol algorithm.

**Fig 1. Performance Analysis for overall delay**

The above plot compares the packet size which is in multiple of 1000’s with the overall delay (in seconds).

The delay gets increase with the increase in packet size and the proposed ABCC scheme reduces delay up to 50% than the existing scheme.

**Fig 2. Performance Analysis for overall throughput**

The above plot compares the packet size which is in multiple of 1000’s with the overall throughput (in %).

The Throughput gets decrease with the increase in packet size and the proposed ABCC scheme enhances throughput up to 2% than the existing scheme.

**V. SYSTEM ARCHITECTURE**

A system architecture or systems architecture is the conceptual design that defines the structure and/or methods of a system. A system description is a formal description of a system structured in a way that reliable reasoning about the structural properties of the system. It explains the system architecture or building blocks and provides a plan from which products can be secured and systems maintained, that will together as a joint venture to implement the complete system. This may activate one to manage system in a way that meets business needs. The fundamental organization of a system, embedded in its components, their relationships to each other and the surroundings and the rules governing its functions and changes. The complex of the system design for products and their life cycle processes. A representation of a system in which there are mapping of functionality into hardware and software components and a mapping of the software architecture onto the hardware architecture and human interaction with these contents. An designated arrangement of physical components which provides the design solution for a consumer product or life-cycle process intended to satisfy the requirements of the functional architecture and the necessary baseline. System is the most vital, pervasive, distributive, top-level, decisions, and their colligate rationales about the overall structure (i.e., essential elements and their relationships) and associated characteristics and behavior.
VI. SYSTEM REQUIREMENTS
SOFTWARE REQUIREMENTS
A). Hardware Requirements
SYSTEM : Pentium IV 2.4 GHz
HARD DISK : 40 GB
MONITOR : 15 VGA colour
RAM : 1 GB
KEYBOARD : 110 keys enhanced.

B). Software Requirements
Operating system : Windows XP or Above
Front End : Visual Studio 2010
Back End : Microsoft Sql Server 2005
Frame work : C# 4.0

VII. CONCLUSION
Congestion occurs due to elastic traffic that degrades the performance of the entire network. In order to predict the congestion situation, a relevant estimation is designed for each forwarder node and our proposed algorithm Agent Based Congestion Control- ABCC Routing Protocol which possess the estimation function. Hence our proposed work can minimize the amount of congestion and delay in opportunistic routing models than the existing ones. To proposed Agent based Congestion Control routing protocol algorithm whose performance is shown to be optimal with zero knowledge regarding network topology and channel statistics. Also solve the congestion problem and improves the throughput that minimizes the delay.

VIII. SCREENSHOTS
Senders Source Node:
FUTURE WORK

Our future work relies in the direction of providing safety and security to the network from the external threat.

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