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Efficient Data Transmission by Adaptive Opportunistic Routing in MANETS with Filtering

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Abstract: **A mobile ad hoc network (MANET) is a self-configuring infrastructure fewer networks of mobile devices connected by wireless. A filtering scheme that addresses both false report appending and attacks in MANETS are enhanced to the distributed adaptive opportunistic routing algorithm, Markov decision theoretic formulation for opportunistic routing is developed. It is shown that the optimal routing decision at any epoch is to select the next relay node based on a distance-vector summarizing the expected-cost-to-forward from the neighbors to the destination. This "distance" is shown to be computable in a distributed manner and with low complexity using the probabilistic description of wireless links (with high delay, Loosing the information). Here the proposed distributed adaptive opportunistic routing algorithm (d-Adapt OR) that minimizes the expected average per-packet cost for routing a packet from a source node to a destination. This is achieved by both sufficiently exploring the network using data packets and exploiting the best routing opportunities. Our proposed reinforcement learning framework allows for a low-complexity, low-overhead, distributed asynchronous, Lossless implementation. Intruders can append the false data reports via compromised nodes and launch many attacks against True reports. so, a number of filtering schemes against false reports have been proposed. However, they either loss strong filtering capability or cannot support highly dynamic sensor networks. Moreover, few of them can deal with attacks simultaneously.**

Keywords: **Opportunistic routing, reward maximization, wireless ad hoc networks, filtering.**

I. INTRODUCTION:

OPPORTUNISTIC routing for multihop wireless ad hoc networks has seen recent research interest to overcome deficiencies of conventional routing [1]–[6] as applied in wireless setting. Motivated by classical routing solutions in the Internet, conventional routing in ad hoc networks attempts to find a fixed path along which the packets are forwarded [7] Such fixed-path schemes fail to take advantage of broadcast nature and opportunities provided by the wireless medium and result in unnecessary packet retransmissions.

The opportunistic routing decisions, 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 broadcast nature of wireless transmissions and the path diversity. The authors in [1] and [6] provided a Markov decision theoretic formulation for opportunistic routing. In particular, it is shown that the optimal routing decision at any epoch is to select the next relay node based on a distance-vector summarizing the expected-cost-to-forward from the neighbors to the destination. This "distance" is shown to be Computable in a distributed manner and with low complexity using the probabilistic description of wireless links.

The study in [1] and [6] provided a unifying framework for almost all versions of opportunistic routing such as SDF [2], Geographic Random Forwarding (GeRaF) [3], and ExOR [4], where the variations in [2]–[4] are due to the authors' choices of cost measures to optimize. For instance, an optimal route in the context of ExOR [4] is computed so as to minimize the expected number of transmissions (ETX), while GeRaF [3] uses the smallest geographical distance from the destination as a criterion for selecting the next-hop.

The opportunistic algorithms proposed in [1]–[6] depend on a precise probabilistic model of wireless connections and local topology of the network.

In a 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 in [8] provide a sensitivity analysis for the opportunistic routing algorithm given in [6]. However, by and large, the question of learning/estimating channel statistics in conjunction with opportunistic routing remains unexplored. In this paper, first investigate the problem of opportunistically routing packets in a wireless multihop network when zero or erroneous knowledge of transmission success probabilities and network topology is available. Using a reinforcement learning framework, The 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. This is achieved by both sufficiently exploring the network using data packets and exploiting the best routing opportunities.

Our proposed reinforcement learning framework allows for a low-complexity, low-overhead, distributed

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asynchronous implementation. The significant characteristics of d-AdaptOR are that it is oblivious to the initial knowledge about the network, it is distributed, and it is asynchronous.

The main contribution of this paper is to provide an opportunistic routing algorithm that:

1) assumes no knowledge about the channel statistics and network, but

2) uses a reinforcement learning framework in order to enable the nodes to adapt their routing strategies,

3) Filtering the both false report appending and attacks in MANETS .

However, for the sake of completeness, this provide a brief overview of the existing approaches. If the network congestion, hence delay, were to be replaced by time-invariant quantities,

1.The heuristics in would become a special case of **d-Adapt OR** in a network with deterministic channels and with no receiver diversity.

2.In this light, In analytic results for routing are obtained in wired networks without opportunism. Ant routing uses ant-like probes to find paths of optimal costs such as expected hop count, expected delay, and packet lossprobability.

3. Filtering scheme that addresses both false report appending and attacks in MANETS.

In our scheme, each node has a hash chain of verification keys used to endorse reports; meanwhile, a legitimate report should be authenticated by a certain number of nodes. First, each node disseminates its key to forwarding nodes. Then, after sending reports, the sending nodes disclose their keys, allowing the forwarding nodes to verify their reports.

II. RELATED WORK

1. ELIZABETH M. ROYER, University of California, Santa BarbaraChai-Keong Toh, Georgia Institute of Technology “A Review of Current Routing Protocols forAd Hoc Mobile Wireless Networks”

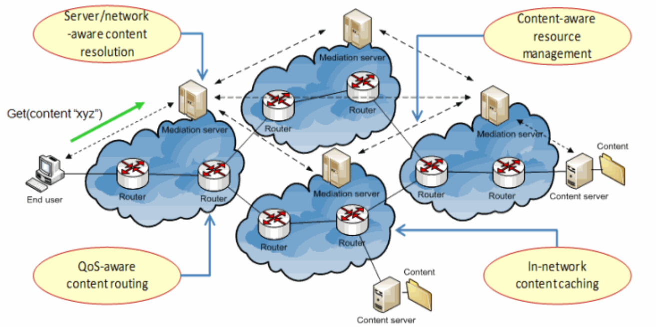
2.Shweta Jain and Samir R. Das State University of New York at Stony Brook”Exploiting Path Diversity in the Link Layer in Wireless Ad Hoc Networks”

3. JOHN N. TSITSIKLIS: Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, Cambridge, ”Asynchronous Stochastic Approximation and Q-Learning”

4. Sanjit Biswas and Robert Morris M.I.T. Computer Science and Artifical Intelligence Laboratory biswas” ExOR: Opportunistic MultiHop Routing for Wireless Networks”.

5.Justin A. Boyan School of Computer Science Carnegie Mellon University Pittsburgh, “Packet Routing in Dynamically Changing Networks: A Reinforcement Learning Approach”.

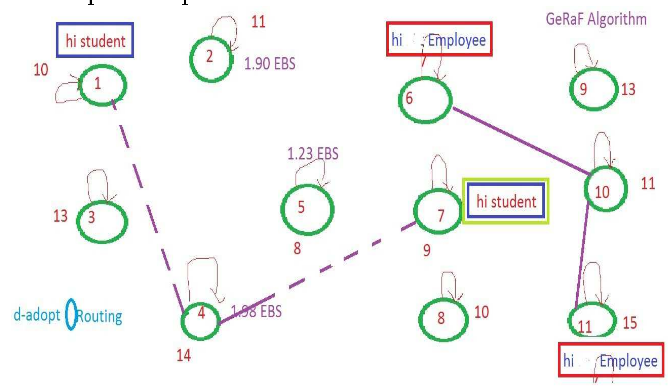
III. SYSTEM DESIGN: ROUTING SCHEME WITH AN ADAPTIVE NODE:



Routing protocols between any pair of nodes within an ad hoc network can be difficult because the nodes can move randomly and can also join or leave the network. {the network structure is not fixed,Each every time the Network connection is changed} thus need to show Dynamically formed Routing among the nodes (That is Adptive Routing) Opportunistic Routing (ExOR), a new unicast routing technique for multi-hop wireless networks. ExOR forwards each packet through a sequence of nodes, deferring the choice of each node in the sequence until after the previous node has transmitted the packet on its radio.

ExOR then determines which node, of all the nodes that successfully received that transmission, is the node closest to the destination. That closest node transmits the packet.

The result is that each hop moves the packet farther (or average) than the hops of the best possible pre-determined route. The ExOR design addresses the challenge of choosing a forwarding node after transmission using a distributed algorithm. First, when a node transmits a packet, it includes in the packet a simple schedule describing the priority order in which the potential receivers should forward the packet. The node computes the schedule based on shared measurements of inter-node delivery rates. ExOR then uses a distributed slotted MAC protocol for acknowledgements to ensure that the receivers agree who the highest priority receiver. The efficacy of ExOR depends mainly on the rate at which the reception probability falls off with distance. Simulations based on measured radio characteristics suggest that ExOR reduces the total number of transmissions by nearly a factor of two over the best possible pre-determined route.



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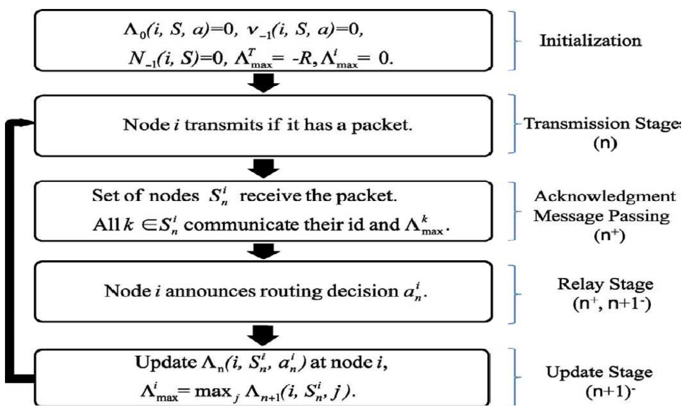
IV.MODULES DESCRIPTION:

1.*Network Formation* In this module we can construct a topology to provide communication paths for wireless adhoc network. Here the node will give the own details such as Node ID through which the transmission is done and similarly give the neighbor nodes details.
2.*Packet Transmission* In this module the node has transmit the packet from source to destination. Transmission stage occurs at time in which node transmits if it has a packet.
3.*Acknowledgement Module* In this module the nodes send acknowledgement details. Set of nodes that have received the packet transmitted by node. In this module nodes send acknowledgement packet who received the packet from the source. In the reception and acknowledgment stage, successful reception of the packet transmitted by node is acknowledged to it by all the nodes. We assume that the delay for the acknowledgment stage is small enough (not more than the duration of the time slot) such that node infers by time. The acknowledgment packet of node includes a control message known as estimated best score (EBS).
4.*Relay Module* In this module the node select the routing action according to the randomized rule. Node transmits FO (forwarding), a control packet that contains information about routing decision at some time strictly between times. If termination action is chosen, i.e. all nodes in expunge the packet. Upon selection of routing action, the counting variable is updated.
5.*Update Module*In this module the node update the following details. After finishing the transmission and relay the node will update the score Vector. The node updates EBS Message for future acknowledgements.

IV. PROPOSED ALGORITHMS:

The routing decision at any given time is made based on the reception outcome and involves retransmission, choosing the next relay, or termination. Our proposed scheme makes such decisions in a distributed manner via the follow in three-way handshake between node and its neighbors N(*i*)



Symbol	Definition
S^i_n	Nodes receiving the transmission from node i at time n
a^i_n	Decision taken by node i at time n
$A(S)$	Set of available actions when nodes in S receive a packet
$\mathcal{N}(i)$	Neighbors of node i including node i
$g(S, a)$	Reward obtained by taking decision a when set S of nodes receive a packet
$\nu_n(i, S, a)$	Number of times up to time n, nodes S have received a packet from node i and decision a is taken
$N_n(i, S)$	Number of times up to time n, nodes S have received a packet from node i
$\Lambda_n(i, S, a)$	Score for node i at time n, when nodes S have received the packet and decision a is taken
Λ^i_{max}	Estimated best score for node i

.
To formulate and identify the optimal routing strategy, MDP formulations rely on the availability of probabilistic (Markov) models. However, a perfect probabilistic model of channel qualities and network topology is restrictive in practical network settings. In the second part of the talk, we provide an adaptive algorithms to deal with the estimation aspect of the problem when imperfect probabilistic model of channel qualities and network topology is available. Specifically, we build on our earlier work where the robustness of the proposed algorithms to modelling errors is investigated. then use a reinforcement learning framework to propose an adaptive opportunistic routing algorithm which minimizes the expected average cost per packet independently of the initial knowledge about the channel quality and statistics across the network. Lastly and time permitting, then touch upon the issue of congestion and throughput optimality under various traffic conditions. The propose a combination of the previous MDP framework and backpressure routing to arrive at policies with significantly more desirable delay/throughput performance. In MANET'S, Intruders can append the false data reports via compromised nodes and launch many attacks against True reports.so, a number of filtering schemes against false reports have been proposed. , each node has a hash chain of verification keys used to endorse reports; meanwhile, a legitimate report should be authenticated by a certain number of nodes.
First, each node disseminates its key to forwarding nodes. Then, after sending reports, the sending nodes disclose their keys, allowing the forwarding nodes to verify their reports.
The main contribution of this paper is to provide an *opportunistic routing algorithm that*
1) assumes no knowledge about the channel statistics and network, but
2) uses a reinforcement learning framework in order to enable the nodes to adapt their routing strategies, and
3) optimally exploits the statistical opportunities and receiver diversity

VI.PERFORMANCE ANALYSIS IN BETWEEN OF EXISTING SYSTEM AND PROPOSED SYSTEM

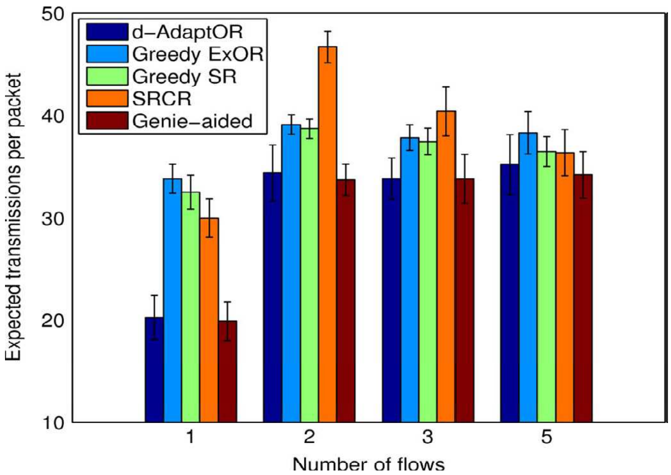


Chart clears the idea of d-AdaptOR versus distributed SR, ExOR, and SRCR performance for multiple flows.

Performance is distance vector routing is completely different to d-adopt R algorithm.

1.It is oblivious to the initial knowledge of the network

2.It is distributed ;each node makes decisions based on its belief by using the information obtained from its neighbor nodes

3.It is asynchronous ,at any time, any subset of nodes can update their corresponding beliefs

4.A filtering scheme that addresses both false report appending and attacks in MANETS.

VII.CONCLUSION AND FUTURE WORK

Here the proposed d-Adapt OR, a distributed, adaptive, and opportunistic routing algorithm whose performance is shown to be optimal with zero knowledge regarding network topology and channel statistics More precisely, under idealized assumptions, d-AdaptOR is shown to achieve the performance of an optimal routing with perfect and centralized knowledge about network topology, where the performance is measured in terms of the expected per-packet reward. The design of routing protocols requires a consideration of congestion control along with the throughput performance Our work, however, does not consider this closely related issue. Incorporating congestion control in opportunistic routing algorithms to minimize expected delay ithout the topology and the channel statistics knowledge is an area of future research. In MANET'S, Intruders can append the false data reports via compromised nodes and launch many attacks against True reports.so, a number of filtering schemes against false reports have been proposed. However, they either loss strong filtering capability or cannot support highly dynamic sensor networks. Moreover, few of them can deal with attacks simultaneously. Thus filtering scheme are addresses to disable both false report appending and attacks in MANETS.

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