An Adaptive Opportunistic Routing Scheme for Wireless Ad-hoc Networks

ABSTRACT

A distributed adaptive opportunistic routing scheme for multi-hop wireless ad-hoc networks is proposed. The proposed scheme utilizes a reinforcement learning framework to opportunistically route the packets even in the absence of reliable knowledge about channel statistics and network model. This scheme is shown to be optimal with respect to an expected average per packet reward criterion. 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 success probabilities. In particular, this learning framework leads to a stochastic routing scheme which optimally "explores" and "exploits" the opportunities in the network.

Existing System

Such fixed path schemes fail to take advantages 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.

Proposed System

We investigate the problem of opportunistically routing packets in a wireless multi-hop network when zero or erroneous knowledge of transmission success probabilities and network topology is available. Using a reinforcement learning framework, we propose an adaptive opportunistic routing algorithm which minimizes the expected average per packet cost for routing a packet from a source node to a destination.

Our proposed reinforcement learning framework allows for a low complexity, low overhead, distributed asynchronous implementation. The most significant characteristics of the proposed solution are:

- It is oblivious to the initial knowledge of network.
- It is distributed; each node makes decisions based on its belief using the information obtained from its neighbors.
- It is asynchronous; at any time any subset of nodes can update their corresponding beliefs.

IMPLEMENTATION

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be considered to be the most critical stage in achieving a successful new system and in giving the user, confidence that the new system will work and be effective.

The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods.

Modules:

Algorithm used d-Adaptor

Initialization stage

We consider the problem of routing packets from a source node o to a destination node d in a wireless ad-hoc network of d + 1 nodes denoted by the set _ = fo; 1; 2; : : : ; dg. The time is slotted and indexed by n _ 0 (this assumption is not technically critical and is only assumed for ease of exposition). A packet indexed by m _ 1 is generated at the source node o at time _m s according to an arbitrary distribution with rate _ > 0.

Transmission Stage

We assume a fixed transmission cost ci > 0 is incurred upon a transmission from node i. Transmission cost ci can be considered to model the amount of energy used for transmission, the expected time to transmit a given packet, or the hop count when the cost is equal to unity.

Acknowledgement Message Passing

We discriminate amongst the termination events as follows:We assume that upon the termination of a packet at the destination (successful delivery of a packet to the destination) a fixed and given positive reward R is obtained, while no reward is obtained if the packet is terminated (dropped) before it reaches the destination.

Relay Stage

Given a successful transmission from node i to the set of neighbor nodes S, the next (possibly randomized) routing decision includes 1) retransmission by node i, 2) relaying the packet by a node j 2 S, or 3) dropping the packet all together. If node j is selected as a relay, then it transmits the packet at the next slot, while other nodes k 6= j; k 2 S, expunge that packet. We define the termination event for packet m to be the event that packet m is either received by the destination or is dropped by a relay before reaching the destination.

H/W System Configuration:-

Processor	**-**	**Pentium –III**
Speed	-	1.1 Ghz
RAM	-	256 MB(min)
Hard Disk	-	20 GB
Floppy Drive	-	1.44 MB
Key Board	-	Standard Windows Keyboard
Mouse	-	Two or Three Button Mouse
Monitor	-	SVGA

Software Requirements:

- Operating system :- Windows XP Professional
- JDK :-1.5/ 1.6 and above
- Front End :- JAVA, Swing(JFC),