Network Simulation

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NS2 Simulation for Carry Protocol (c-protocol) for MANET

Introduction: The type of network that is used here is called MANET (mobile ad hoc network). A simple MANET topology consists of two nodes far away from each other that behave as a source node that sends messages and a destination node that receives the messages. Between these two nodes, there is a number of mobile intermediate nodes that act as hosts as well as routers. Each intermediate node has a limited range in which it can make a connection to a neighbour node (i.e. two nodes have a range of one meters have to be at least two meters away from each other in order to establish a connection and exchange messages). The message to be sent is then transmitted between those nodes until it reaches the destination. Due to the movement of the nodes and whether or not they are connected to each other, a direct path between the source and the destination is not always guaranteed.

The problem: The problem is that with the braking of direct path between the source and the destination, a message is dropped and lost each time the connection is lost. In order to overcome this problem, a message may be carried by an intermediate node and may have to stay there until the node gets connected to another node. Then, the message is retransmitted again. To do so, the carry protocol (c-protocol) is to be introduced.

Discussion: When designing any protocol, a set of requirement has to be specified like (guaranteed delivery, in-order delivery and packet duplication, etc.). In this particular type of network topology, the movement pattern and density of the intermediate nodes plays a big role in designing the c-protocol.

Possible solution: Introducing a carry protocol solves this problem. The way the c-protocol is designed has two possible approaches. One solution is to introduce a reliable c-protocol that guarantees delivery, in-order delivery and unduplicated received messages. With this approach, the movement of the intermediate nodes should follow a certain pattern. The movement pattern helps producing an effective routing table that could then, help exchanging the messages among the intermediate nodes in a precise way. Another approach is to design a flooding like protocol. In a flooding protocol, a node receives a message and then broadcasts it once. Each node in the network acts as a receiver and a transmitter. In a given time, a node receives a message and immediately resends it to each node connected to it at that given time. What will be done in the c-protocol is that if a node receives a message, the message is carried in that node until the node gets connected to some other node and then, the message gets resend again.

Figure 1: the source sent a message that got received by 2 node and then by 1

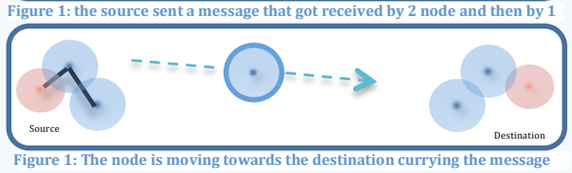


Figure 1: The node is moving towards the destination currying the message

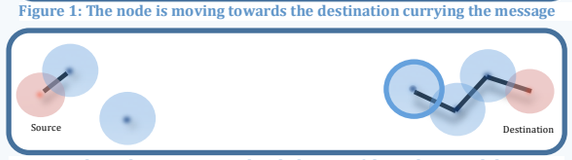


Figure 3: The node gets connected with the rest of the node around the destination and delivers the carried message

Investigate The Intelligent Node Movement Patterns

Introduction: An ad-hoc network is a collection of wireless mobile nodes forming a temporary network without the aid of any stand-alone infrastructure or centralized administration. In an ad-hoc network, the nodes not only act as hosts but also assist in establishing connection by acting as routers that route data packets to/from other nodes in the network.

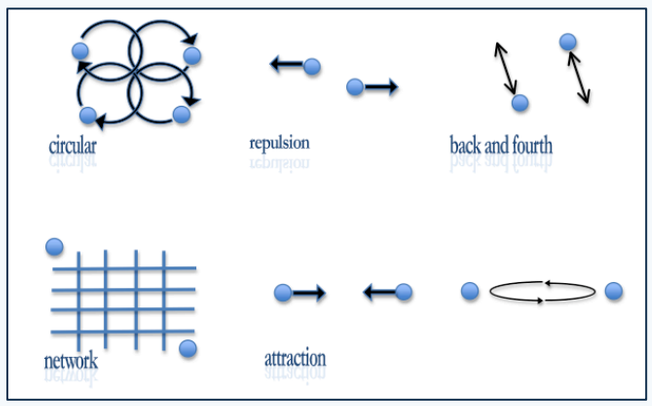
Problem: In order to investigate the intelligent movement patterns we need to propose the possible movement patterns of the nodes such as "going up", "going down", "randomly", "circular", "rectangular" or some combination of them. Movement patterns can be in various scales: a large scale patterns may cover a long period, whereas a small scale pattern usually covers a short time period. The proposed (intelligent) movement pattern should improve network performance.

Objective: We need to investigate and evaluate the various of movement pattern that we have and then find the optimal pattern among them. We will documents an effort to investigate the intelligent node movement patterns for ad-hoc networks of mobile nodes, based on local and global constraints taking into account some factors such as attraction, repulsion and GPS.

Example case when an intelligent movement patterns are applied in real life:

- Searching for goods at a grocery store.
- Searching for someone who lost in the forest.
- Searching for a lost item at home or an office.

Possible solutions: Introducing a different type of the movement patterns and study their movement in some aspect such as the period of time that needs to send and receive a packet. Also, simulate the movement patterns in Java (with simple connectivity condition, and perhaps with c-protocol), and in ns-2 (movement file generated in java and applied to ns2 simulation with some protocol) as a possible tool for studying the movement patterns. NS-2 enables the user to create and modify the wireless topology, number of nodes and their mobility, data traffic, and various other parameters. Analyze the node movement patterns from simulation results. Check the impact of a new movement pattern on the performance of the network.



Movement Generator in Mobile Network Simulation

Problem: Studying and evaluating the network performance using some simulations such as network simulation, protocol simulation, and movement simulation and movement generators. First, starting with understanding the network simulation that help us to know exactly how the real networks work and understanding exactly the networks behavior either by representing observations from the network product or using some mathematical formulas to calculate the interactions that might happen between some of a different network entities. Second, realizing the parameters that each protocol has considering mobility model and communicating traffic pattern. Finally, getting the idea of movement simulation and knowing how does it work and then continuing creating the movement generators that will help experimenting with the data transfers from one place to another using the other nodes.

In order to evaluate the network performance we do not only need to simulate the network behavior but we also need in case of mobile networking to simulate the node movement itself. This requires generating the node's trajectories and movement, which can be accomplished with a movement generator. Every mobile network simulation requires such generators, as result we need a variety of movement generators to study different mobile network scenarios.

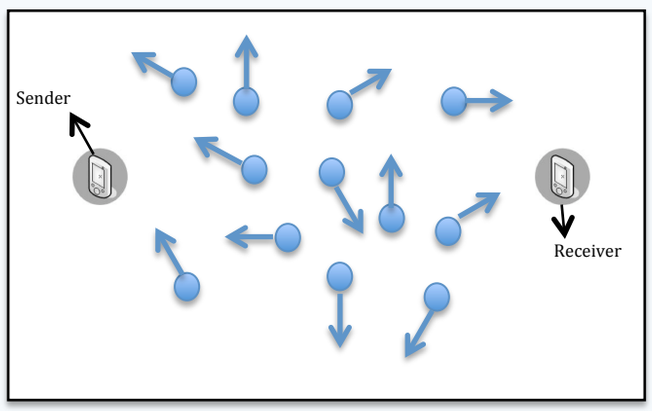
Objectives: Studying verity number of related and different topics such as fully understanding how the movement generators are used in a network simulation (e.g. in ns2 simulator), how to generates random moves for the node in the network, and how to consider more than one way of generating movement such as (free movement, with obstacles, with memory, without memory, and more). Furthermore, building a number of movement generators, which are going to be used by my colleagues Ahmed and Mohammed in their work.

Example case:

- Random movement in a city especially if there are many roads or one-way streets in this city.
- Random movement that requires a special generator to keep these mobiles connected with the network all the time.

Possible solutions:

- We can program a new generator outputting a movement file using rnd number gen to generate the next move by using ns2.
- By using a Java, we can build new random movement generators that keep the nodes connected as much time as possible.



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