Ad Hoc Mobile

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Problem Statement:
The most common routing protocols for Mobile Ad Hoc Networks, such as DSR and AODV, perform poorly in large-scale networks with variable connectivity. The Efficient Spreading with Backtracking Protocol (ESPB) was developed to solve these problems by using a geographic/geometric routing approach, which improves routing performance in densely-populated regions.

Objective and Approach:
Assist in the testing of a delay-tolerant Routing Protocol for a large-scale Mobile Ad Hoc Network (MANET).
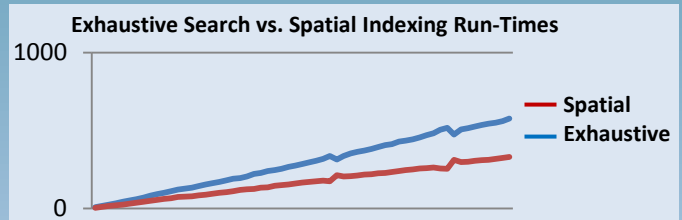
Task 1: *Spatial Indexing Neighbor Search*
- Develop a R-Tree data structure which encompasses a function to determine the neighbors of a specified node
- Compare its performance with that of an Exhaustive Neighbor Search over a wide range of population sizes.
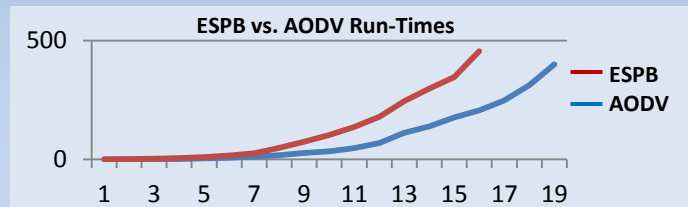
Task 2: *Simulation using OPNET Modeler*
- For increasing N x N grids consisting of stationary nodes, test the ESPB Routing Protocol against the AODV Routing Protocol using the Riverbed OPNET Modeler Discrete Event Simulation Tool
- Ensure that packets are successfully transferred from Source to Destination
- Record the plots of the various traffic, the traffic delay, and the simulation run time.

Results:

Exhaustive Search vs. Spatial Indexing Run-Times

- Generated results for the AODV protocol up to N = 17, and for the ESPB protocol up to N = 20
- Found inconsistencies in the required choke point for each NxN grid size

ESPB vs. AODV Run-Times

N = 7 MANET Traffic Received for Destination Node

Impact and Benefits:
The R-Tree data structure's efficient method for determining the neighbors to a specified node can be utilized by the ESPB team to improve their algorithm.

The OPNET Modeler simulations :
- Demonstrate the correctness of the ESPB algorithm
- Offer a point of comparison against other Discrete Event Simulation Tools.

We can compare our generated plots with those of more-powerful Discrete Event Simulation tools to ensure consistency.