

Bachelor/Master Thesis

Simulation of GPSR with Highly Mobile Nodes

Motivation

Routing protocols such as Ad-hoc On-demand Distance Vector (AODV) and B.A.T.M.A.N. Advanced work well for Wireless Multi-Hop Networks (WMHNS) consisting of nodes with static geographical position. Even though nodes can join and leave the network, updated information is only propagated slowly to keep overhead minimal to meet the resource constraints of the devices. However, as of today, nodes tend to be more and more mobile in their nature. Unmanned Aerial Vehicles (UAVs) and Vertical Take-Off and Landing (VTOL) aircraft, forming Flying Ad-hoc Networks (FANETs), can drastically change their position from one second to another, and with complex trajectories.

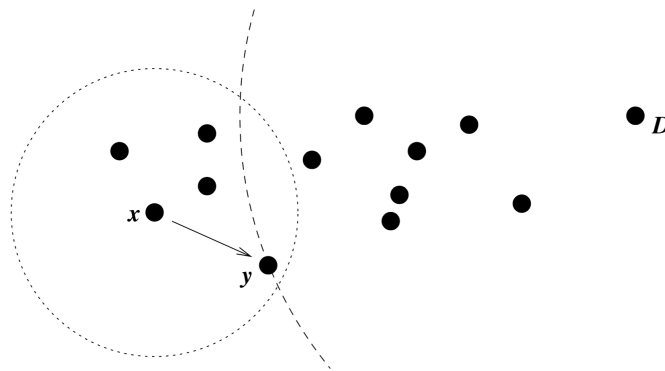


Figure 1. Greedy selection of node nearest to destination D still in range of source x , in this case node y [1].

Routing algorithms take traditional routing metrics such as delay or bandwidth into account to choose an appropriate path from sender to receiver. Greedy Perimeter Stateless Routing (GPSR) is a routing protocol for Mobile Ad-hoc Networks (MANETs) that uses geographical (positional) information for routing decisions instead [1]. Figure 1 sketches the greedy approach primarily used in GPSR of selecting a node in range that is closest to the destination. The question is how well GPSR works with highly dynamic nodes, or in other words, how well it works for the transition of MANET to FANET.

Goal

The goal of this thesis is to simulate GPSR on highly dynamic nodes in a network simulator and evaluate its performance.

Depending on the type of the thesis (Bachelor or Master) the scope can be adjusted accordingly.

Project type Bachelor/Master Thesis
1 Term
Language(s) English, German
Field Computer Science



Contact M.Sc. Jon-Mailes Graeffe
E-Mail jgraeffe@ovgu.de
Room G29-314
Tel. +49 391 67-52673

Tasks

- design and configure a network simulation with GPSR routing and highly mobile nodes
 - network simulator e.g. OMNeT++ [2] or maybe ns-3 [3]
 - usage of existing GPSR and mobility model modules¹
- evaluate the simulation
 - collect performance metrics such as throughput, propagation time, execution time of path selection algorithms
 - compare with existing solutions
- write a thesis about it

References

- [1] B. Karp and H. T. Kung, “Gpsr: Greedy perimeter stateless routing for wireless networks,” in *Proceedings of the 6th Annual International Conference on Mobile Computing and Networking*, ser. MobiCom '00, Boston, Massachusetts, USA: Association for Computing Machinery, 2000, pp. 243–254, ISBN: 1581131976. DOI: 10.1145/345910.345953. [Online]. Available: <https://doi.org/10.1145/345910.345953>.
- [2] *OMNeT++ Discrete Event Simulator*, Apr. 2026. [Online]. Available: <https://omnetpp.org/>.
- [3] *ns-3 | a discrete-event network simulator for internet systems*, Apr. 2026. [Online]. Available: <https://www.nsnam.org/>.

¹You do not need to implement GPSR by yourself. This is too much work. However, it is possible that changes to an existing implementation need to be done.

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