Position-based Routing Strategies

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Position-based routing is the task of delivering a message to a geographical position in a network. Such routing protocols are used in wireless networks where the nodes can determine their position (e.g. by GPS). If a node knows the position of the destination and the positions of the neighbors, a message can be forwarded in the direction of the destination by choosing the neighbor that provides the most forwarding progress. The drawback of such a greedy strategy is that it fails in case of a local minimum. In wireless networks local minima exist at the border of void regions that cannot be bridged because of restricted transmission ranges. Local minima have to be circumvented by constructing an alternate path that can contain a long detour. If a routing strategy uses multiple paths instead of a single one, the chances of getting into a local minimum can be decreased. Known approaches for position-based routing are either single-path strategies or flooding algorithms, which are time-optimal but produce a high traffic overhead. In this thesis a multi-path algorithm is presented that delivers a message asymptotically as fast as flooding, but uses much less traffic. It matches the lower bound for time and approaches the lower bound for traffic of deterministic online algorithms by a poly-logarithmic factor. The thesis includes the definition of appropriate performance measures for time and traffic of position-based routing algorithms and the analysis of different strategies.