

Abstract of the PhD dissertation

“Using Mobile Relays for Ensuring Connectivity in Sparse Networks”

by

Jarosław Kutylowski

We are considering a wireless network deployed in vast terrain. In this scenario the distances between network parts are expected to be large and thus we assume that parts of the network inevitably become disconnected. We are looking for methods which actively prevent these disconnections. For this purpose we employ mobile robotic relay stations, which form chains in the terrain and forward network communication between its disconnected parts. In particular, we are looking for local and distributed strategies which allow those relay stations to effectively organize into the chains. From a global perspective we also propose algorithms which manage whole chains, minimizing the number of relay stations necessary and their energy consumption. Thereby, we lay an algorithmic foundation for the usage of mobile relay stations to enable communication in sparse networks.

The problem is considered on two layers. On the one hand we are concerned with the organization of such communication chains using simple, local and distributed strategies. These are employed by the relays in order to keep up a connected chain with their neighbors. The goal of the relays is to keep the chain as short as possible, although one of its endpoints may move on the terrain. We are able to show that relays which are restricted to measure the relative positions of their neighbors can maintain a chain of length only by a constant factor longer than the optimal one.

In the second part of the dissertation we are dealing with the question where to deploy communication chains and how to assign relays to those chains. In this considerations we are aiming at minimizing the energy consumed by the relays to move between different chains.