

A Localized Algorithm for Bi-Connectivity of Connected Mobile Robots

Ad Hoc Networks- Seminar, WS 08/09

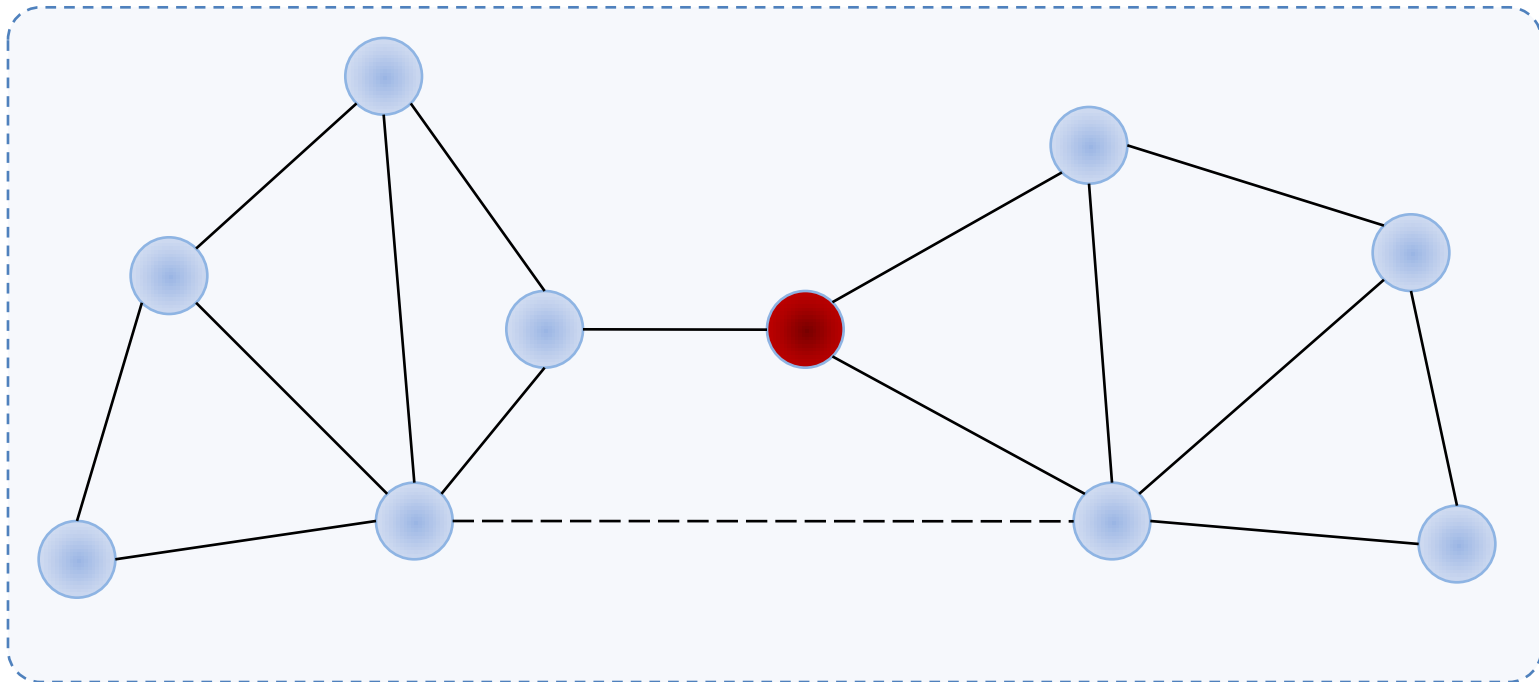
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Computer Networks and Telematics

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Definition

A network is **bi-connected** if there exist two node-disjoint paths between any pair of nodes in the network

➔ **Conclusion:** Networks is still connected if one node fails!

Problem Definition

- Communication links in mobile Networks can easily fail
(e.g. hardware damage, energy depletion, harsh environments, malicious attacks)


- ➔ There should be at least **two node-disjoint paths** between any two nodes
- ➔ Network should be **bi-connected**

Task: Given a *connected* but not *bi-connected* network
move the robots such that the network becomes *bi-connected*


Objective: Minimize total movement of robots

Lokal vs. Global

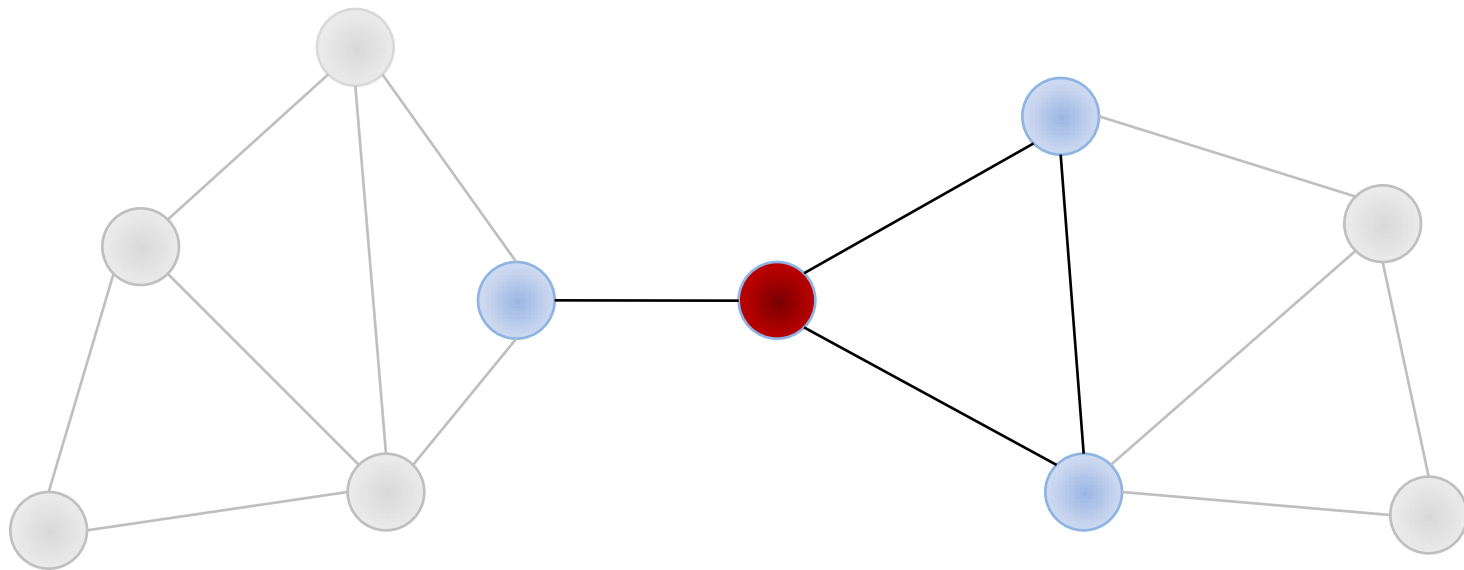
- so far only **globalized** Algorithm exists
- at least one node has to know the entire topology of the Network

 Applicable only for small size Networks

- **localized** Algorithm is executed on each node of the Network
- uses only *p-hop* neighbor information

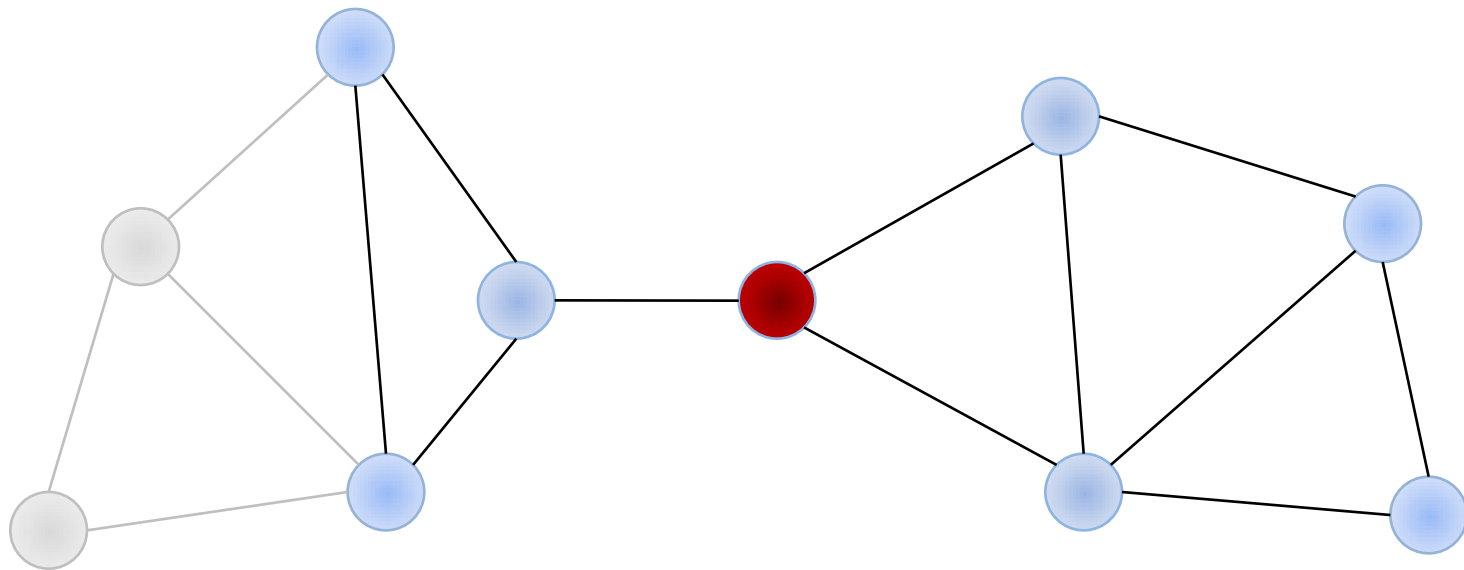
 more practical for large size Networks

p-Hop Neighborhood



$p = 1$

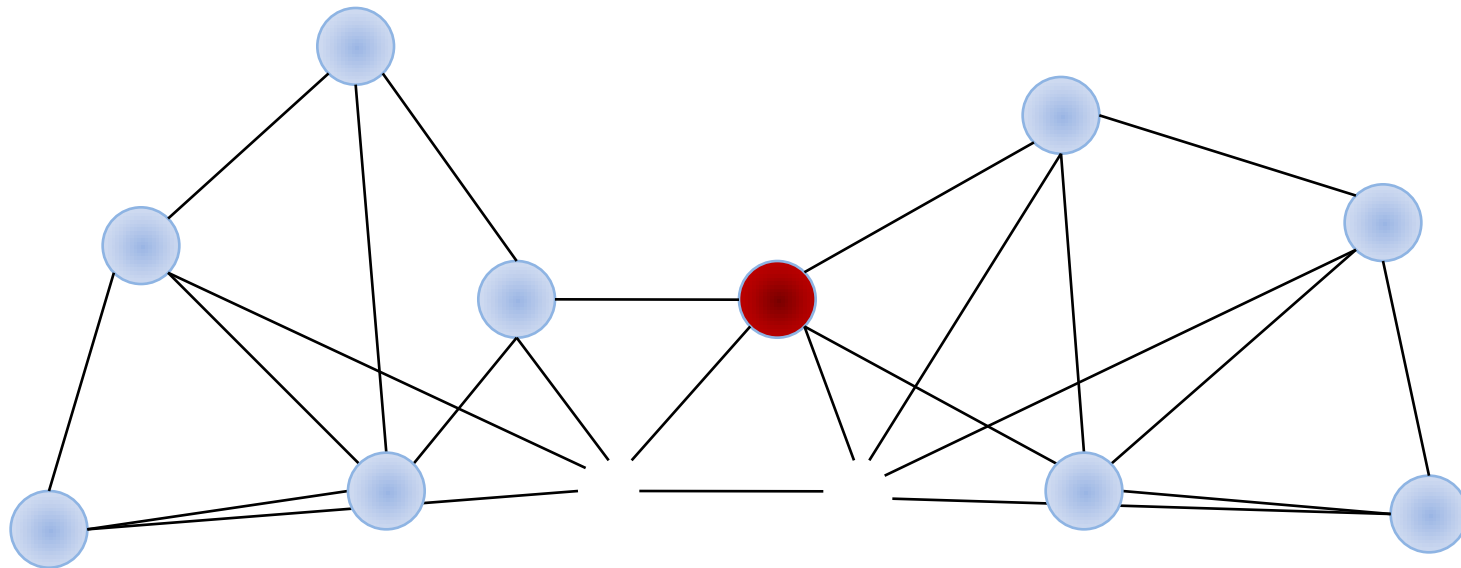
p-Hop Neighborhood



$p = 2$

Basic Idea

- identify **critical nodes**, i.e. nodes that disconnect the Network when failed
- select two nodes in the neighborhood that move toward each other
- repeat Iteration until the Network is bi-connected



Final Presentation

- **Details** of the localized Algorithm
- **Assumptions** and possible **Problems**
- How to detect **critical nodes**?
- Performance Analysis
- Comparison with the globalized Algorithm

Thank you for your attention!