Master Thesis

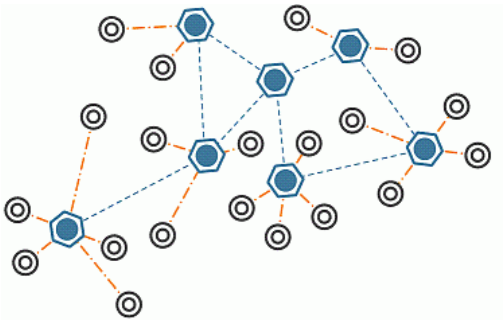
Chair for Theoretical Information Technology | RWTH AACHEN UNIVERSITY

Power Allocation for Sensor Networks
An Approaches Toward Smart Meter Planning in Power Grids

Research Area
Sensors Networks, Power Grids

Keywords
power allocation, sensor placement planning, smart grids

Description
It is known from the field of sensor networks that increasing the number of sensors reduces total estimation error. Nevertheless, the estimation error is always bigger than zero due to measurement and communication noise. This means, even if there exist infinitely many active sensors, the error is never less than some lower bound. Moreover, increasing the number of sensors beyond some certain number does not noticeably reduce the estimation error. The immediate result of this fact is as follows: to achieve a given estimation quality, we do not need to increase the number of sensors beyond a certain number of sensors. Being motivated by this knowledge, we intend to decide upon the minimum number of smart meters and their best locations for voltage measurement in smart power grids. This thesis consists of two different stages:



- coming up with suitable optimization problems that select the best nodes in a sensor network to act simultaneously as sensors,
- applying the achieved results from the first stage to a power grid such that voltage estimation error is minimal. This requires appropriate modeling of the given power grid.

Goal
The final goal is to develop and solve different optimization problems for placement of measurement units among a power grid such that the total voltage estimation error is minimal.

Requirements
To conduct this thesis successfully, one needs basic knowledge in

- statistical signal processing
- optimization theory
- linear algebra
- MATLAB

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