technische universität dortmund

AG Datentechnik Information Processing Lab

Master Thesis

Real Time Dynamic Aggregation and Model reduction of Transmission Power Systems through Investigation of Adequate Cluster and Reduction Techniques

Power System Modeling of power systems allows the reduction of real system complexity and makes specific system analysis and simulations possible. Therein, the electrical components are modeled in such a way that the model approximates the real system and deviations are limited. In order to model and simulate large-scaled transmission power systems such as the ENTSO-E power system, a large amount of data is necessary and it is denoted with longer simulation times, which make it impractical for real time analysis. From this perspective, power system aggregation and model reduction techniques deliver important keys to reduce model's order and to allow fast and online dynamic simulations of transmission power systems, which is of high interest for real time applications.

One possibility for the aggregation is given by using suitable and adequate cluster algorithms and reduction techniques (e.g. SVD, BT, MT[1]), which can be used to aggregate and cluster the power system into similar coherent regions. The reduction is then applied by selecting appropriate node representatives reflecting the large model within defined deviation boundary.

In this thesis, model reduction of transmission power systems is to be researched and evaluated using adequate cluster and reduction techniques. The accuracy of the reduced model can be tested using statistical criteria, such as the **Akaike information criterion**, which examines its quality.

Advantage of the supposed approach would be i.a. the reduction of the needed measurement station in real operation, the efficiency enhancement of the model simulation and the capability for real time applications.

Following procedure is proposed:

- Literature research to transmission power system aggregation and reduction (4W)
- Familiarization with different cluster algorithms using Matlab (3W)
- Identification of adequate approaches for power system aggregation and model reduction techniques to be applied (7W)
- Getting familiar with the Analysis software DIgSILENT PowerFactory/MATPOWER with Focus on integrated transmission power system models (3W)
- Simulations und Evaluation (6W)
- Writing (6W)

This thesis is addressed to Master students of Electrical Engineering and Information Technologies (or similar).

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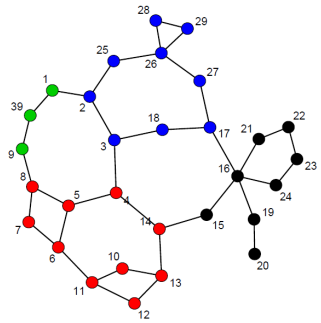

ABBILDUNG 1: CLUSTERING EXAMPLE OF IEEE 39 NEW ENGLAND TEST SYSTEM

[1] SVD: Singular Value Decomposition; BT: Balanced Truncation; MT: Modal Truncation