Master thesis

Circuit diagram visualisation: Generation of circuit diagram images from logical data models

Initial situation and motivation

The first logical data models are already available from various applications (e.g. SCADA, GIS or asset management systems).

To make this data optimally usable for operating personnel and for documentation purposes, it must be visualised in a clear, standard-compliant circuit diagram layout. Output in common formats (PDF, PNG) is required in order to integrate the visualisation into different systems.

Problem definition

The creation of circuit diagrams from raw data requires a rule-based or algorithmic arrangement of the elements so that a legible, technically correct representation is created. In practice, this involves a great deal of manual effort when creating new schematics and adapting existing ones until they meet the technical and aesthetic requirements of the electrical engineering experts.

The scalability of the method is crucial, as both small, clear network sections and extensive transmission networks are to be visualised.

Research question(s)

1. What common (ideally standard-compliant) methods are there for modelling or saving logical circuit diagrams from electrical engineering? How do they differ?

2. How can these logical data models be automatically converted into an appealing layout for primary technology or single-line circuit diagrams in a process chain?

3. Which algorithms (e.g. graph drawing, automatic layouting, spring models, etc.) are best suited to placing switching elements and connecting cables in a visually appealing and rule-compliant manner? Where are there shortcomings and which methods can be used to improve the results?

4. What export options (e.g. PDF, PNG) are available to easily integrate the generated circuit diagrams into existing documentation and SCADA systems, and how can this be prototypically implemented in Python?

Desired methodology

- Literature research
- Programming
- Benchmarking and comparison of relevant methods
- Prototype with basic functionality and
- Preparation of results in structured form for the APG data catalogue