Karlsruhe Institute of Technology

Ab sofort

Institute for Automation and Applied Informatics

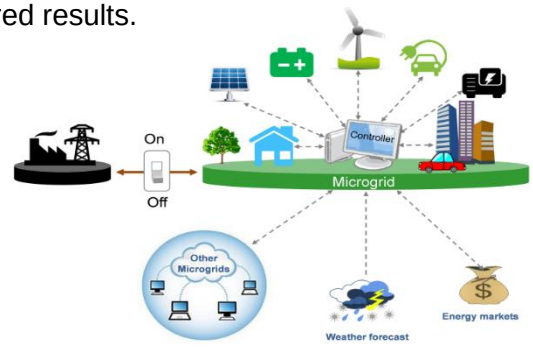
IAI

Master's Thesis

A Generic Microservice-based Framework for Scheduling of Distributed Energy Resources Using Population-based Metaheuristics

Recent years have seen an increasing integration of Renewable Energy Resources (RERs) into the existing electric power system replacing large energy providers by several small energy producers known as Distributed Energy Resources (DERs). This leads to new challenges on the level of scheduling the energy resources according to the demands of consumer and the offers of the producers. Population-based metaheuristics such as Evolutionary Algorithms (EAs) represent a powerful techniques to solve such complex optimization problems.

In this thesis, a new concept to schedule DERs based on forecasting and the results of related simulators will be developed. The framework introduced in [1] will be adapted to carry out the required tasks based on two cutting-edge technologies, namely containers and microservices. The EA GLEAM (General Learning Evolutionary Algorithm and Method) [2] will be used to obtain the desired results.



Tasks:

- Literature review on frameworks and tools used for scheduling of power resources based on metaheuristics
- Design and implementation of the new approach based on microservices and container technologies. Study on strategy parameters of the implementation and the EA.
- Evaluation of the implemented the proposed approach by creating a scheduling plan for a group of power resources

Requirements:

- Student of computer science, electrical engineering or related disciplines
- Independence and creativity at work as well as an interest in exploring new technologies are desirable.
- Experience in **Java** and **Linux**
- **Helpful**: previous knowledge in:
  - ❖ Computational intelligence especially evolutionary algorithms
  - ❖ Container and microservices technologies
  - ❖ C and python

[1] Khalloof, H., Jakob, W., Liu, J., Braun, E., Shahoud, S., Duepmeier, C., Hagenmeyer, V.: A Generic Distributed Microservices and Container based Framework for Metaheuristic Optimization. GECCO (2018).

[2] Blume, C., & Jakob, W. (2009). GLEAM-general learning evolutionary algorithm and method: ein evolutionärer Algorithmus und seine Anwendungen (Vol. 32). KIT Scientific Publishing.

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