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Design of an energy consumption scheduler based on genetic algorithms in the smart grid.

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Summary: This paper designs an energy consumption scheduler capable of reducing peak power load in smart places based on genetic algorithms and measures its performance. The proposed scheme follows the task model consisting of actuation time, operation length, deadline, and a consumption profile, while each task can be either nonpreemptive or preemptive. Each schedule is encoded to a gene, each element of which element represents the start time for nonpreemptive tasks and the precalculated combination index for preemptive tasks. The evolution process includes random initialization, Roulette Wheel selection, uniform crossover, and replacement for duplicated genes. The performance measurement result, obtained from a prototype implementation of both the proposed genetic scheduler and the backtracking-based optimal scheduler, shows that the proposed scheme can always meet the time constraint of each task and keeps the accuracy loss below 4.7 %, even for quite a large search space. It also achieves uncomparable execution time of just a few seconds, which makes it appropriate in the real-world deployment.

Keywords: smart grid; power consumption scheduler; genetic algorithm; combinatory index; peak load reduction
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