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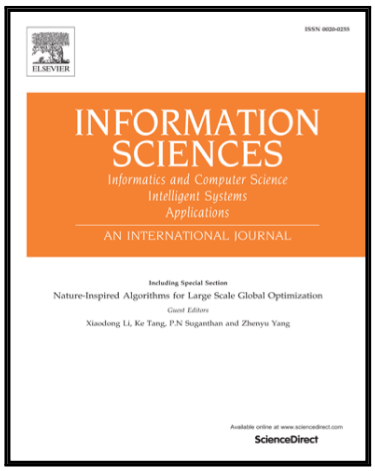

An Integrated Optimization + Learning Approach to Optimal Dynamic Pricing for the Retailer with Multi-type Customers in Smart Grids

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An Integrated *Optimization + Learning* Approach to Optimal Dynamic Pricing for the Retailer with Multi-type Customers in Smart Grids

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Abstract

In this paper, we consider a realistic and meaningful scenario in the context of smart grids where an electricity retailer serves three different types of customers, i.e., customers with an optimal home energy management system embedded in their smart meters (C-HEMS), customers with only smart meters (C-SM), and customers without smart meters (C-NONE). The main objective of this paper is to support the retailer to make optimal day-ahead dynamic pricing decisions in such a mixed customer pool. To this end, we propose a two-level decision-making framework where the retailer acting as upper-level agent firstly announces its electricity prices of next 24 hours and customers acting as lower-level agents subsequently schedule their energy usages accordingly. For the lower level problem, we model the price responsiveness of different customers according to their unique characteristics. For the upper level problem, we optimize the dynamic prices for the retailer to maximize its profit subject to realistic market constraints. The above two-level model is tackled by genetic algorithms (GA) based distributed optimization methods while its feasibility and effectiveness are confirmed via simulation results.

Keywords:

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