

A reinforcement learning approach to autonomous decision-making in smart electricity markets

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Abstract The vision of a Smart Electric Grid relies critically on substantial advances in intelligent decentralized control mechanisms. We propose a novel class of autonomous broker agents for retail electricity trading that can operate in a wide range of Smart Electricity Markets, and that are capable of deriving long-term, profit-maximizing policies. Our brokers use Reinforcement Learning with function approximation, they can accommodate arbitrary economic signals from their environments, and they learn efficiently over the large state spaces resulting from these signals. We show how feature selection and regularization can be leveraged to automatically optimize brokers for particular market conditions, and demonstrate the performance of our design in extensive experiments using real-world energy market data.

Keywords Energy brokers · Feature selection · Reinforcement learning · Smart electricity grid · Trading agents

1 Introduction

Liberalization efforts in electricity markets and the advent of decentralized power generation technologies are challenging the traditional ways of producing, distributing, and consuming

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