

Building energy efficiency retrofit: informatics and AI approaches

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Abstract

With the development of artificial intelligence and Internet of Things (IoT) technologies, modern architecture is increasingly becoming intelligent, green, and human-centered. The intelligent retrofitting of existing buildings is an important means of achieving green buildings, effectively reducing energy consumption and carbon emissions. The challenge of building energy efficiency retrofitting lies in the design of retrofitting and maintenance plans based on contemporary information methods, aiming to minimize economic costs and maximize energy savings. Unlike traditional energy system control and scheduling, energy efficiency retrofitting lies on researching artificial intelligence and data mining technologies to make optimal decisions throughout the entire life cycle of a building. This report primarily introduces the latest applications of information theory methods in building retrofitting from four aspects: modeling, optimization, control, and game theory. It analyzes requirements across different dimensions of problem, such as single-objective vs. multi-objective, static vs. dynamic, and single-party vs. multi-party participation, and proposes improvements and innovations in intelligent algorithms.

Biography

Prof. Wu is a full professor in Chongqing University. He got his Ph.D. from City University of Hong Kong, 2013. Prof. Wu has been an IEEE Senior Member since 2020. He is also a member of Association of Computer Machinery and Chinese Association of Automation. His research interests focus on intelligent optimization, smart grid, smart buildings & construction. He won the best paper award of IEEE ISPCE-CN 2020, ISPCE-AS 2024, and the best Associated Editor award of IEEE Transactions on Consumer Electronics. He held a couple of national patents and software copyrights, and co-authored more than 80 papers on top journals, e.g., Science Advances, IEEE TNNLS, TII, TCE, and Applied Energy. He served as the associate editor or editorial member for IEEE Transactions on Consumer Electronics, Complex & Intelligent Systems, International Journal of Fuzzy & Intelligent Systems.

Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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