ETH zürich

Future Cities Laboratory

Paper on demand-driven cooling wins best paper

(FCL) FUTURE CITIES LABORATORY 未来城市实验室

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Paper on demand-driven cooling, as part of the 3for2 Beyond Efficiency project, was awarded the 2017 Best Paper from the *Building and Environment* journal.

The paper **Occupancy learning-based demand-driven cooling control for office spaces** was awarded the **2017 Best Paper** from the *Building and Environment* journal. Authors Peng Yuzhen, Dr Adam Rysanek, Prof Zoltán Nagy, and Prof Arno Schlueter received the award for their paper for its originality, contributions to the field, quality of presentation, and soundness of the science.

This study, as part of the **3for2 Beyond Efficiency** project, is based on the premise that while occupancy in buildings is one of the key factors influencing air-conditioning energy use, in practice, air-conditioning systems do not adapt to actual energy demand for offices that are not fully occupied during their operating time.

This study analyses occupancy data for a period of seven months, based on motion signals collected from six offices with 10 occupants in a commercial building, covering both private and multi-person offices.

Based on an occupancy analysis, the authors propose a learning-based demand-driven control strategy for sensible cooling. It predicts occupants' next presence and the presence duration of the remainder of a day by learning their behaviour in the past and current days, and then the predicted occupancy information is employed indirectly to infer setback temperature set points according to rules we specified in this study.

The strategy is applied for the controls of a cooling system using passive chilled beams for sensible cooling of office spaces. Over the period of two months both a baseline control and the proposed demand-driven control were operated on 42 weekdays of real-world occupancy. Using the demand-driven control, an energy saving of 20.3% was achieved as compared to the benchmark. The authors found that energy savings potential in an individual office was inversely correlated to its occupancy rate.

Authors

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Further reading

Access paper

The award was established in 2007 as a measure to encourage publishing high-quality papers in Building and Environment. The paper, out of more than 2,000 submissions, was one of three selected by by the reviewers, the Editorial Advisory Board of the journal, and the Paper Award Committee of the journal that consists of Prof. Arsen Melikov of Denmark, Prof. Richard Corsi of USA, and Prof. Christopher Chao of Hong Kong, China.

Yuzhen Peng, Adam Rysanek, Zoltán Nagy, Arno Schlüter, Occupancy learning-based demand-driven cooling control for office spaces, In Building and Environment, Volume 122, 2017, Pages 145-160, Volume 122, 2017, Pages 145-160.

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