

Temporal knowledge discovery in big BAS data for building energy management - DTU Orbit (08/11/2017)

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With the advances of information technologies, today's building automation systems (BASs) are capable of managing building operational performance in an efficient and convenient way. Meanwhile, the amount of real-time monitoring and control data in BASs grows continually in the building lifecycle, which stimulates an intense demand for powerful big data analysis tools in BASs. Existing big data analytics adopted in the building automation industry focus on mining cross-sectional relationships, whereas the temporal relationships, i.e., the relationships over time, are usually overlooked. However, building operations are typically dynamic and BAS data are essentially multivariate time series data. This paper presents a time series data mining methodology for temporal knowledge discovery in big BAS data. A number of time series data mining techniques are explored and carefully assembled, including the Symbolic Aggregate approxXimation (SAX), motif discovery, and temporal association rule mining. This study also develops two methods for the efficient post-processing of knowledge discovered. The methodology has been applied to analyze the BAS data retrieved from a real building. The temporal knowledge discovered is valuable to identify dynamics, patterns and anomalies in building operations, derive temporal association rules within and between subsystems, assess building system performance and spot opportunities in energy conservation.

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