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A Hybrid Data Mining Approach on BIM-based Building Operation and Maintenance

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Abstract

Huge amounts of data are generated daily during the operation and maintenance (O&M) phase of buildings. These accumulated data have the potential to provide deep information that can help improve facility management. Building Information Model/Modeling (BIM) technology has proven potential in O&M management in some studies, making it possible to store massive data. However, the complex and non-intuitive data records, as well as inaccurate manual inputs, raise difficulties in making full use of information in current O&M activities. This paper aims to address these problems by proposing a BIM-based Data Mining (DM) approach for extracting meaningful laws and patterns, as well as detecting improper records. In this approach, the BIM database is first transformed into a data warehouse. After that, three DM methods are combined to find useful information from the BIM. Specifically, the cluster analysis can find relationships of similarity among records, the outlier detection detects manually input improper data and keeps the database fresh, and the improved pattern mining algorithm finds deeper logic links among records. Particular emphasis is put on introducing the algorithms and how they should be used by building managers. Hence, the value of BIM is increased based on rules, extracted from data of O&M phase that appear irregular and disordered. Validated by an integrated on-site practice in an airport terminal, the proposed DM methods are helpful in prediction, early warning, and decision making, leading to the improvements of resource usage and maintenance efficiency during the O&M phase.

Keywords: data mining, building information modeling, Operation and maintenance, cluster analysis, pattern analysis, outlier detection

1. Introduction

The operation and maintenance (O&M) phase of buildings is the longest phase within the lifecycle. It always involves sophisticated interactions among various stakeholders, facilities, pro-
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