A GENERAL SCHEMA FOR REPRESENTATION OF MONITORED DATA

Mahnameh Taheri, Ardeshir Mahdavi

E259.3 - Department of Building Physics and Building Ecology, TU Wien

INTRODUCTION

Quantitative monitored information provides the basis for the assessment of building quality with respect to, for instance, indoor environmental conditions and energy performance. In this regard, monitoring-supported verification is a key requirement for reliable building delivery and commissioning processes. Moreover, systematic monitoring, high-resolution, and high quality data can improve the state of knowledge in a wide range of domains in building science, including building integrity and building automation. As such, the relevant professional community is well aware of the importance and benefits of building monitoring. However, currently building monitoring systems appear to operate without a systematic and comprehensive ontology. There have been many efforts in the past to advance interoperability in building data communication with fairly well developed schemes for the constitutive elements of buildings pertaining, for instance, to building fabric. Nevertheless, there is a lack of explicit schemes for representation of sensory information that can be obtained from buildings. To address this issue, the present contribution describes a recently introduced ontology as a general schema for representation of multiple data streams relevant to the building operation. The contribution argues that this ontology is a robust foundation for further developments with respect to applications in building data acquisition, storage, processing, and analysis.

AN ONTOLOGY OF BUILDING-RELATED MONITORED DATA

Whether essentially a unique path to the construction of a schema for building monitoring could be defined or not is questionable. However, identification of basic data categories appears to be a fundamental step towards the construction of a well-formed schema for building monitoring. Based on previous research efforts on this topic [1], [2], [3], [4], we have demonstrated that the following six data categories could provide an effective classification framework to accommodate the empirical data obtained from building monitoring systems. These data categories include, i) inhabitants, ii) indoor environmental conditions, iii) external environmental conditions, iv) control systems and devices, v) equipment, and vi) energy. Figure 1 illustrates these categories along with applicable sub-categories of monitored data.

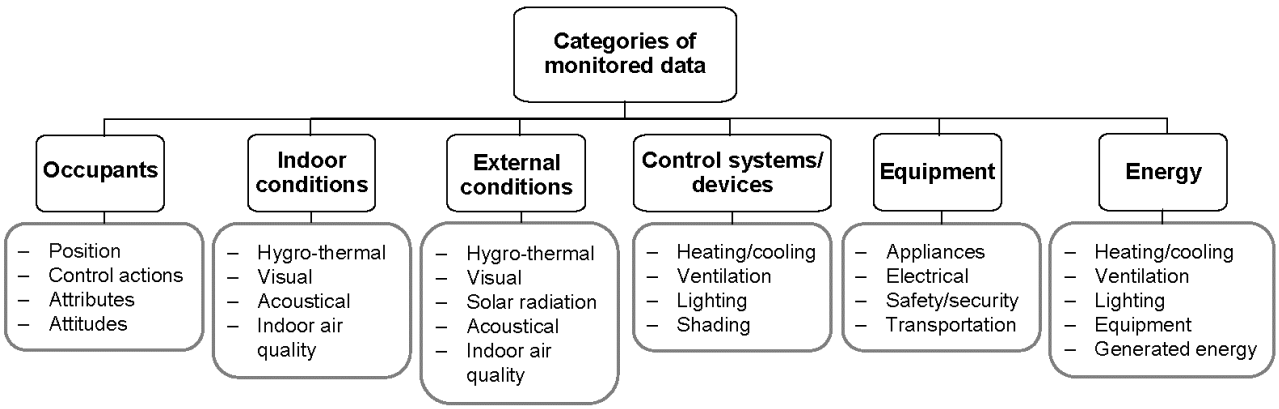

Figure 1: Data categories and sub-categories of monitored variables

Data sources, such as sensors, virtual (simulation-powered) sensors, meters, and human agents generate streams of information in the above six categories. A key requirement of a suitable ontology for the monitored data is a structured and comprehensive definition of the relevant monitored variables. For this purpose, we demonstrated that all monitored data can be captured in terms of the structure shown in the UML (Unified Modelling Language) representation of Figure 2. In each data category and in the respective sub-category, monitored variables are specified in terms of their values, related sources, and actors.

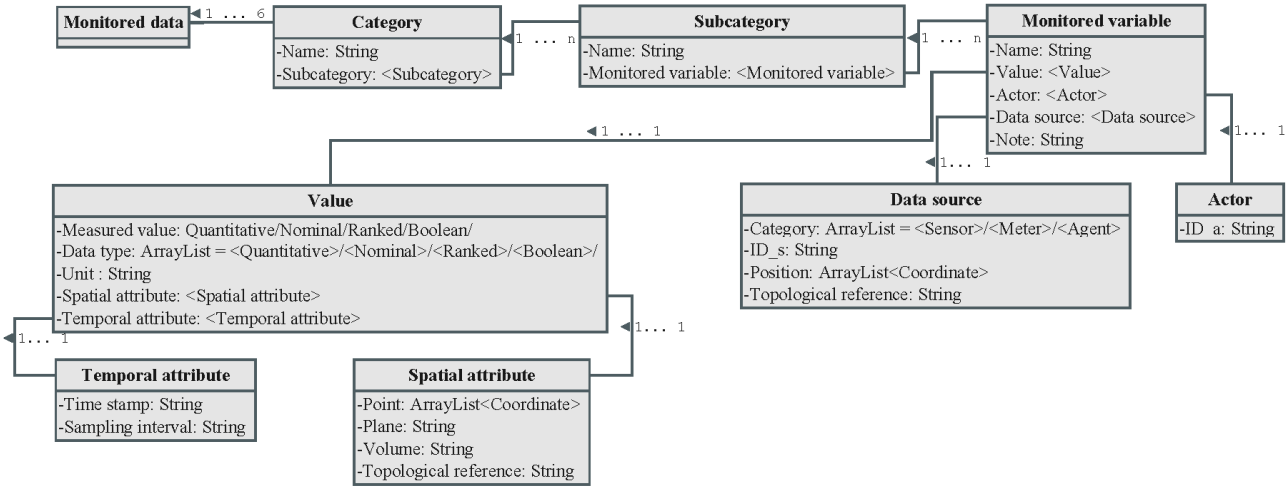

Figure 2: UML-representation of monitored data structure [4]

DISCUSSION AND CONCLUSION

This paper highlighted the lack of richly structured approaches to the collection, storage, sharing, and analyses of monitored data. To address this issue, we introduced an ontology and associated data structure for the representation and incorporation of multiple layers of data. The presented ontology has the potential to contribute to supporting and structuring building data acquisition, storage, and processing in multiple applications, such as building performance simulation, building automation, and building diagnostics.

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