IFC-BASED MONITORING INFORMATION MODELING FOR DATA MANAGEMENT IN STRUCTURAL HEALTH MONITORING

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Abstract. This conceptual paper discusses opportunities and challenges towards the digital representation of structural health monitoring systems using the Industry Foundation Classes (IFC) standard. State-of-the-art sensor nodes, collecting structural and environmental data from civil infrastructure systems, are capable of processing and analyzing the data sets directly on-board the nodes. Structural health monitoring (SHM) based on sensor nodes that possess so-called “on-chip intelligence” is, in this study, referred to as “intelligent SHM”, and the infrastructure system being equipped with an intelligent SHM system is referred to as “intelligent infrastructure”. Although intelligent SHM will continue to grow, it is not possible, on a well-defined formalism, to digitally represent information about sensors, about the overall SHM system, and about the monitoring strategies being implemented (“monitoring-related information”). Based on a review of available SHM regulations and guidelines as well as existing sensor models and sensor modeling languages, this conceptual paper investigates how to digitally represent monitoring-related information in a semantic model. With the Industry Foundation Classes, there exists an open standard for the digital representation of building information; however, it is not possible to represent monitoring-related information using the IFC object model. This paper proposes a conceptual approach for extending the current IFC object model in order to include monitoring-related information. Taking civil infrastructure systems as an illustrative example, it becomes possible to adequately represent, process, and exchange monitoring-related information throughout the whole life cycle of civil infrastructure systems, which is referred to as monitoring information modeling (MIM). However, since this paper is conceptual, additional research efforts are required to further investigate, implement, and validate the proposed concepts and methods.