



Data driven BIM models in bridges

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Abstract

Design automation tools are rarely used in a context of existing structures. The methods of modelling can also be harnessed to create digital twins of structures with the help of data from the structural health management systems. With 10 pilot bridges, the workflow was studied and key parameters for the modelling specified. Semi-automated modelling process made it possible to create models from bridges that were designed and built before the BIM era.

Keywords: bridges, BIM, structural health management, SHM, data driven design

1 Introduction

The knowledge and tools in the field of design automation have developed rapidly during the last years. With the developing technologies, digital twins can be produced even from the structures that have been designed and built before the digital era.

In the project case, the national structural health management system (SHMS) was utilized to create digital twin of bridges. Several bridges were randomly selected as pilot cases from the SHMS of Finnish Transport Infrastructure Agency. Goal was to determine required parameters for automated digital twin creation.

Bridge models studied in this case contained only limited amount of data and can't therefore be considered as building information models (BIM). These models are considered as geometry models which are to be enriched with the data from the SHMS database.

Goal for the research was to discover the workflow and required minimum parameters to create bridge model from the database without any manual work.

2 Initial data

2.1 Data from the structural management system

The data for the models was exported from the national registry of bridges and infrastructure in Finland. Instead of browser interface, data was exported in JSON (JavaScript Object Notion) format, which is useful open file standard for information exchange.

This format will gather the bridge information into easily understandable attribute pairs and groups. With the help of data hierarchy, a certain part of the bridge and its attributes can easily be found.

2.2 Open data interfaces

In this research, several different open data services and interfaces were utilized. The goal was to supplement the data from SHMS with open data and to connect the structures more accurately to roads and surroundings.

Most of the open data services used can be categorized into, WMS (Web Map Service) or direct