UNIVERSITY OF AGDER

KRUSE SMITH

Bachelor thesis for construction design

Title:

Digitalization of reporting and deviation control in the construction industry

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Summary

This project aims to enlighten and evaluate the potential for utilizing 3D scanning for documentation and model updating, and the possibilities the horizontal construction industry has to implement model-based reporting methods. The theory in which this thesis is based on is primarily literature studies about research techniques, BIM, enterprise form, and software.

Case

The project case for this thesis is the new European route 18 highway from Arendal to Tvedestrand, which is of the larger E18 southeast projects.

Research question

How achievable is the use of 3D-scanning for model-based documentation, and how can a project accomplish model-based reporting in the horizontal construction industry?

Method

The following methods were used to obtain results for the research question:

- Literature studies
- Interviews
- Scanning of a bridge
- Processing of a point cloud
- Use of software to identify deviations
- Comparison of model-based reporting software to traditional reporting methods
- Reporting software used on a bridge model

Results

3D scanning of a construction takes a considerable amount of time from the scan is completed to a finished point cloud exist. The tests done here showed a processing time of 2.5-3.5 hours, where most of the time was spent waiting for the software.

When the processing point cloud data is complete, the documentation process of the bridge can start. As shown in figure 1 the documentation can be done in three different ways. However, the recommended workflow is the one following the complete lines in figure 1.

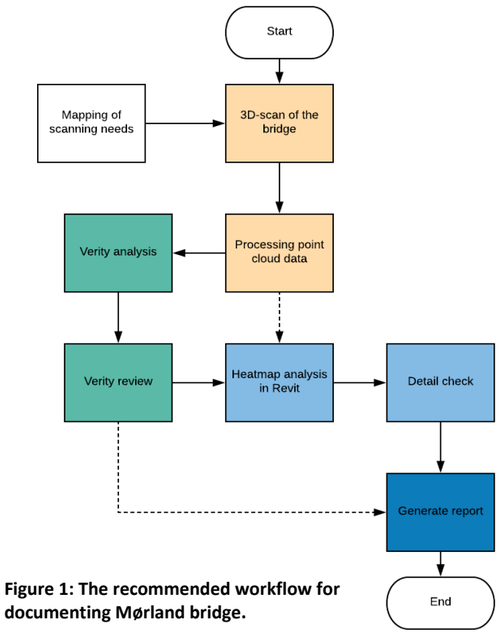

Figure 1: The recommended workflow for documenting Mørland bridge.

Figure 2 shows the layout of a report registered in a model in Dalux Field. The model can be accessed directly from the report if necessary. The use of models enables several convenient functions such as easier localization, diagnostics and visualization. The reports are generated in a model environment and can export information through BCF-format to any compatible software the recipient may be using, such as Revit. This will transfer the report information back to the BIM model. 4D sequencing data cannot be processed in Dalux Field.

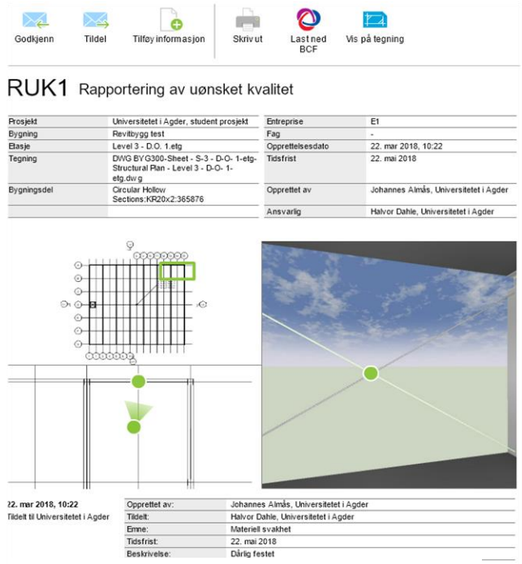

Figure 2: Display of a model-based report in Dalux Field

If model detailing and maturing is to be beneficial for the contractor, the use of models for documentation purposes needs to be decided upon during the contract agreement. It will otherwise require an inefficient amount of resources from the contractor to keep the model up to date and on a sufficient detail level, if it the proper use of models is desired.

Conclusion

The use of 3D-scanning for model-based documentation is achievable but requires expensive, specialized equipment and software, and operators that have the necessary competence to exploit the potential. Some of the main benefits of using 3D-scanning and model-based documentation are the high accuracy and the objectivity it provides, the potential for reducing human errors and the possibility to automate tasks.

Projects in the horizontal construction industry can accomplish model-based reporting by allocating more resources into creating models with sufficient detail level and their utilization. However, this requires the modern business model to accommodate for digital development.