Opponent’s review of the Doctoral Thesis

Candidate Ing. Miroslav Vyčítal

Title of the doctoral thesis On BIM based automatized nD modelling for construction management

Branch of study Building engineering

Tutor Prof. Ing. Čeněk Jaršký, DrSc., FEng.

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Topicality of the doctoral thesis theme

Commentary:
Over the past decade, BIM has been a highly developed topic in the construction industry. At this time, it is gradually used as an effective tool for sharing knowledge and information of the created and operated construction project. Therefore, the dissertation on BIM is very topical.

☐ excellent ☑ above average ☐ average ☐ below average ☐ poor

Fulfilment of the doctoral thesis objectives

Commentary:
Chapter 3. of the doctoral thesis presents the following objectives:
evaluation of the current state of BIM models,
definition of the basic data set of BIM model,
classification systems evaluation in respect to technological modeling,
selection of a classification system,
application of selected coding system into the model and
automated creation of technological model (discrete nD model), based on data extracted from a BIM model.
I can say that the set goals of the dissertation were fulfilled according to the dissertant's plan.

☐ excellent ☑ above average ☐ average ☐ below average ☐ poor

Research methods and procedures

Commentary:
The following research methods and procedures were used to achieve the objectives of the dissertation:
analytical-synthetic method of scientific work, basics of network diagram construction technology, time analysis of network diagram construction technology, integrated modeling approach and discrete modeling approach.
So I can say, that presented work uses scientific methods and procedures.
Results of the doctoral thesis – dissertant's concrete achievements

Commentary:
The following results and concrete benefits were achieved by the doctoral student:

- enable automated nD modeling based on BIM data nD models by linking the BIM model to CONTEC and automating the creation of discrete nD models from the original BIM model,
- evaluation of existing classification systems for automated data transmission and design and selection of classification system for testing purposes,
- methods have been developed and tested to link existing BIM data and CONTEC to produce the required data,
- BIM model assumptions have been defined to allow data transfer from the model for linking methods. These assumptions would be applicable to any data transformation, not just for CONTEC, but for general BIM data processing,
- The feasibility of the proposed procedure is shown in case studies, which also define the conditions of precision of the method.

Importance for practice and for development within a branch of science

Commentary:
An important practical contribution of the doctoral thesis is especially:

- definition of transformation means between BIM and Contec and automated nD modeling. It is used in two stages of the construction process. First phase of construction preparation - quick time analysis and information on the financial costs of the construction,
- the second phase - the execution - creates a complete set of documentation for the technological solution of the construction.

The contribution to the development of science is the study and definition of classification systems for use in BIM so that they meet the requirements of the Czech and foreign markets of the European Union.

Another benefit for science is the creation of an automated nD system through CONTEC, which provides a possible alternative to the methods that are currently being developed.

Formal layout of the doctoral thesis and the level of language used

Commentary:
The dissertation contains all the parts that are necessary for the dissertation. The formal arrangement of the dissertation is at a nice level. I would not like to evaluate the language level, but the reading of the work was nice and I have no further comments.
Remarks

The basic requirement for wider use of BIM is the mutual consistency of data not only in the content of the data, but also in formal similarity. This is currently the main limiting parameter for the wider use of BIM in the Czech Republic and also in the European Union. Also, the unification of the classification system used in building structures is an important condition for the effective use of BIM.
I note that no BIM data structure is currently defined in the Czech Republic through legislation or technical standards.

I am interested in the opinion of the doctoral student, how can this problem be solved in the Czech Republic?
What is the situation in developed countries and how the doctoral student sees the solution of this problem in the future for the European Union countries?

Final assessment of the doctoral thesis

As already mentioned, I see the main contribution of the dissertation in solving the problem of unification and transformation of the database and classification systems for mutual communication in BIM.
An important contribution of this thesis is also the contribution to the solution of automated nD modeling in Contec. I believe that the possibility of using Contec for BIM will contribute to more efficient work on the preparation and execution of constructions. Therefore, I evaluate this work very positively.

Following a successful defence of the doctoral thesis I recommend the granting of the Ph.D. degree

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Date: 24. 10. 2019

Opponent's signature: [Signature]