Abstract:

In a current research project we are developing a software tool for the predictive life-cycle management of reinforced concrete buildings. A key feature of our system is a three-dimensional building information model which forms the basis of all data acquisition and functional evaluation. This model serves to store all non-geometric information on building elements in relation to their geometry. The model provides multiple levels of detail and means to associate semantic classes with geometric objects. As the life-cycle management system is designed for different kinds of building types an explicitly available meta-model has been integrated which is used to generate a specific building information model. In contrast to other existing building management systems in our tool the building is structured into five levels of detail. The structures are divided into modules and further into building elements. There are also sub-element levels of the element parts and so called "hot spots". The advantage of this approach is that information like for example inspection results or photos can be located exactly inside the geometry. The subdivision is necessary to make use of fully probabilistic deterioration models. These fully probabilistic deterioration models are used to compute the future condition states of the whole building or its individual parts. Therefore they are combined with non-destructive inspection methods that offer new boundary conditions for the prognosis computation making it more precise. The condition prognosis is done for the surfaces on the lowest level and can be aggregated to compute the condition
state of whole modules or the entire building. In this way deteriorations can be detected at an early stage and repair measures can be planned to eliminate the damage. This consequently means a reduction of the financial outlay for the structure's maintenance. The predictive life-cycle management system is implemented by coupling a Java application with a relational MySQL database. Using the Java3D library the geometry model can be visualized in the user interface. Thus non-geometric information can be easily allocated to the building by the user. Also the condition states of the building and its individual elements can be visualized with the three-dimensional model.

Stichworte: life-cycle management, three-dimensional geometry, non-destructive inspection, reinforced concrete, deterioration mechanisms, Java, Java3D

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