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An As-Is Analysis and Approach for Updating Building Information Models and Laser Scans

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Abstract : Factory planning has the task of designing products, plants, processes, organization, areas, and the construction of a factory. The requirements for factory planning and the building of a factory have changed in recent years. Regular restructuring of the factory building is becoming more important in order to maintain the competitiveness of a factory. Restrictions in new areas, shorter life cycles of product and production technology as well as a VUCA world (Volatility, Uncertainty, Complexity & Ambiguity) lead to more frequent restructuring measures within a factory. A building information model (BIM) is the planning basis for rebuilding measures and becomes an indispensable data repository to be able to react quickly to changes. Use as a planning basis for restructuring measures in factories only succeeds if the BIM model has adequate data quality. Under this aspect and the industrial requirement, three data quality factors are particularly important for this paper regarding the BIM model: up-to-dateness, completeness, and correctness. The research question is: how can a BIM model be kept up to date with required data quality and which visualization techniques can be applied in a short period of time on the construction site during conversion measures? An as-is analysis is made of how BIM models and digital factory models (including laser scans) are currently being kept up to date. Industrial companies are interviewed, and expert interviews are conducted. Subsequently, the results are evaluated, and a procedure conceived how cost-effective and timesaving updating processes can be carried out. The availability of low-cost hardware and the simplicity of the process are of importance to enable service personnel from facility mnagement to keep digital factory models (BIM models and laser scans) up to date. The approach includes the detection of changes to the building, the recording of the changing area, and the insertion into the overall digital twin. Finally, an overview of the possibilities for visualizations suitable for construction sites is compiled. An augmented reality application is created based on an updated BIM model of a factory and installed on a tablet. Conversion scenarios with costs and time expenditure are displayed. A user interface is designed in such a way that all relevant conversion information is available at a glance for the respective conversion scenario. A total of three essential research results are achieved: As-is analysis of current update processes for BIM models and laser scans, development of a time-saving and cost-effective update process and the conception and implementation of an augmented reality solution for BIM models suitable for construction sites.

Keywords : building information modeling, digital factory model, factory planning, restructuring
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