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Titel des Beitrags:
An Integrated 3D Simulation Framework for Earthwork Processes

Abstract:
The paper presents a framework that helps in the planning and analysis of earthwork processes in infrastructure construction projects by applying simulation techniques. In contrast to existing solutions, the framework presented here makes it possible to retrieve all the information required to run the simulation in an automatic way from a holistic 3D model that integrates the 3D roadway model, the 3D surface model and the 3D subsoil model. The most important information needed to simulate earthwork processes are the location and the quantity of cut and fill sections. To generate this data, a computational method has been developed that applies a voxelization to the merged 3D model. The result is a large set of cubes, each of which possesses a dedicated position and material. This mass haul data is much more fine-grained than that used in traditional approaches and forms an excellent basis for performing a detailed earthwork process simulation. The employed simulation engine which is based on the discrete-events paradigm, serves to describe entities such as diggers and trucks, their behaviour (e.g. digger fills truck) and the time required for an atomic process step (to fill a truck, for instance). The result of the simulation is a set of detailed information on the utilization ratio of the employed resources and the time required for completing the entire earthwork project. This allows the user to identify bottlenecks and slack periods and adapt the resources accordingly.

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