BIM-integrated software platform for robotic construction through Contour Crafting

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March 23, 3:00pm-3:30pm, RRI 101

Abstract:

Robotic construction through concrete 3D printing is an in-progress revolution in construction industry. While significant progress is made on hardware related challenges, software and information related issues of such innovative system are less discussed. In this study, a software platform is proposed for data retrieval and analysis from BIM models and utilizing it efficiently during various stages of the process. To this aim, a framework is proposed to integrate BIM into an automated construction system. A Planning and Operations Control Software for Automated Construction (POCSAC) is developed as a major enabler for a seamless integration of BIM and Contour Crafting. The interoperation between different components of the construction system and BIM platform are designed to maximize the realized benefits through synergy of the two technologies.

High-resolution integration of water, energy, and climate models to assess electricity grid vulnerabilities to climate change

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Abstract:

The U.S. power sector is dependent on water resources for generating hydroelectricity and cooling thermoelectric power plants. Insufficient access to water or increases in cooling water temperatures can have negative consequences on the efficiency and reliability of the electricity grid. Although previous studies have assessed the water usage of power plants, most do not incorporate physical water constraints or the dynamic nature of power plant dispatching. A modeling framework was developed, coupling a power model, a reservoir operations model, a surface hydrology model, and a climate model. The San Juan River basin, located in the Southwestern U.S., was chosen as a case study. Simulations reflect downscaled data from global climate models and predicted changes in regional water demand changes. An electricity production cost model developed in PLEXOS simulated the impacts of climate variability on electric grid operations and cooling water usage. This model was integrated with a Variable Infiltration Capacity (VIC) hydrologic model, which was used to project inflows, ambient air temperature, and humidity, while a RiverWare model was used to simulate river operations, hydroelectricity generation, water deliveries, and new water demands. Results indicate that during intense drought scenarios, reductions in water availability could require thermoelectric generators to decrease power production as much as 50% in some years. This novel framework can be applied in other regions to model the impacts of climate and hydrologic variability on the dispatch, operational behaviors, and reliability of the power sector, at both the generating unit level and systems level, in high spatio-temporal resolution.