



DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

Knowledge Matters: Integrating Additive Manufacturing into BIM-Based Design through Knowledge Formalization and Robotic Simulation

Prof. Frank Petzold and Mr. Chao Li
Technical University of Munich

Date: September 17, 2024 (Tuesday)

Time: 11:00 a.m. – 12:00 p.m.

Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

Abstract

The construction industry is increasingly grappling with challenges such as labor shortages, project delays, extended lead times, excessive material consumption, significant waste production, and negative impacts on CO2 emissions. Additive construction (AC), also known as additive manufacturing for construction (AMC) and 3D construction printing (3DCP), presents a promising solution to these issues. Building Information Modeling (BIM), a key driver of digital transformation in the architecture, engineering, and construction (AEC) sector, provides a framework for incorporating innovative additive manufacturing (AM) methods during the early stages of architectural design. Decisions made at these early stages significantly influence subsequent planning and construction phases. Prof. Frank Petzold and Mr. Chao Li will discuss the use of formal knowledge in a Design Decision Support System that assists architects in selecting feasible AM methods. Additionally, they will demonstrate the integration of formal knowledge with robotic simulations and conclude with his latest research on a mixture-of-domain knowledge graph and its application in question-answering using large language models (LLMs).

About the Speaker

The Chair of Prof. Petzold (*1968) investigates to answer the questions relating to the information technology support in architectural design processes in both research and teaching. Research at his chair involves analyzing activities of architects, formulating requirements for digital tools and – based on novel and future oriented technologies – creating concepts, developing and evaluating prototypical solutions. Findings of Professor Dr. Petzold's research have been published in more than 200 internationally recognized scientific journals and conferences' proceedings. After studying computer science, with a specialization in architecture and civil engineering, at the HAB Weimar (today Bauhaus University Weimar), he worked there as a research assistant at the Chair of Computer Sciences in Architecture. After completing his doctorate in 2001, he assumed the position of junior professor (assistant professor) of architectural informatics in Weimar before being appointed as a full professor at TUM in 2009. In 2014, Prof. Petzold was a co-founder of the LOC - Center of Digital Methods for the Built Environment. Since 2017, he is an associate member of the School of Information, Computing and Technology and core member of the Munich Data Science Institute. He is a founding member of the Association of Architectural Informatics in German-speaking regions and a member of the German Association of Computing in Civil Engineering, as well as various international bodies. Since 2015, he has been Vice President of the DARL (German Federal Association of Deans and Directors of Architecture, Regional Planning, and Landscape Architecture) and member of the task force AKIM (Task force information management) of the Federal Association of the German Construction Industry. In 2020, Prof. Petzold became spokesperson for the "Innovative construction - sustainable and digital" topic platform at Z.DB (Zentrum Digitalisierung.Bayern - Bayern Innovativ). At TUM, he is active in various committees, such as the task force "Digital Administration", TUM-IAS Advisory Council and in the scientific advisory board of the Georg Nemetschek Institute.

Mr. Chao Li is currently pursuing a PhD in Architectural Informatics under the supervision of Prof. Petzold at the School of Engineering and Design, Technical University of Munich. He acquired his bachelor's degree from the University of Duisburg-Essen and continued his studies in computer engineering at RWTH Aachen University. Since 2020, he has been working as a research associate on the DFG-funded Collaborative Research Center "Transregio 277 - Additive Manufacturing in Construction (AMC)." His research focuses on the integration of additive manufacturing (AM) into BIM-based design, with a particular emphasis on knowledge formalization, robotic simulation, and the development of a design decision support system.

- ALL ARE WELCOME -