AI-BIM Integration Transforming Architects' Daily Work

Yonsei Professor Ghang Lee's Team Reduces Architectural Detailing Workload by 80%, Enabling Architects to Focus on Creative Design

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AI-BIM Innovation Research Published in a World-Leading Journal

In architectural practice, Building Information Modeling (BIM) has emerged as a core technology that integrates and manages building information across the entire life cycle—from planning and design to construction, maintenance, demolition, and recycling—by representing buildings in three dimensions. However, BIM model development requires architects to manually input countless details such as wall thickness, insulation, and waterproofing layers, which demands significant time and effort.

Due to this complexity and heavy workload, BIM adoption remains low at just 4.4% in Korea, even though more than 80% of domestic design firms are small offices with only one to four employees.

Professor Ghang Lee and his Construction IT Research Lab in the Department of Architectural Engineering at Yonsei University have been conducting research to address this challenge by integrating artificial intelligence (AI) with BIM. Their goal is to allow AI to take over repetitive and time-consuming detailing tasks, reducing the detailing workload by more than 80% and enabling architects to focus on creative design and decision-making.

According to the research team, over the past decade more than half of AI-architecture studies have concentrated on image generation, and around 70% have been limited to the early “concept design” stage. In contrast, research on automating the “detailing design” stage—where the majority of time and resources are consumed—has been almost nonexistent.

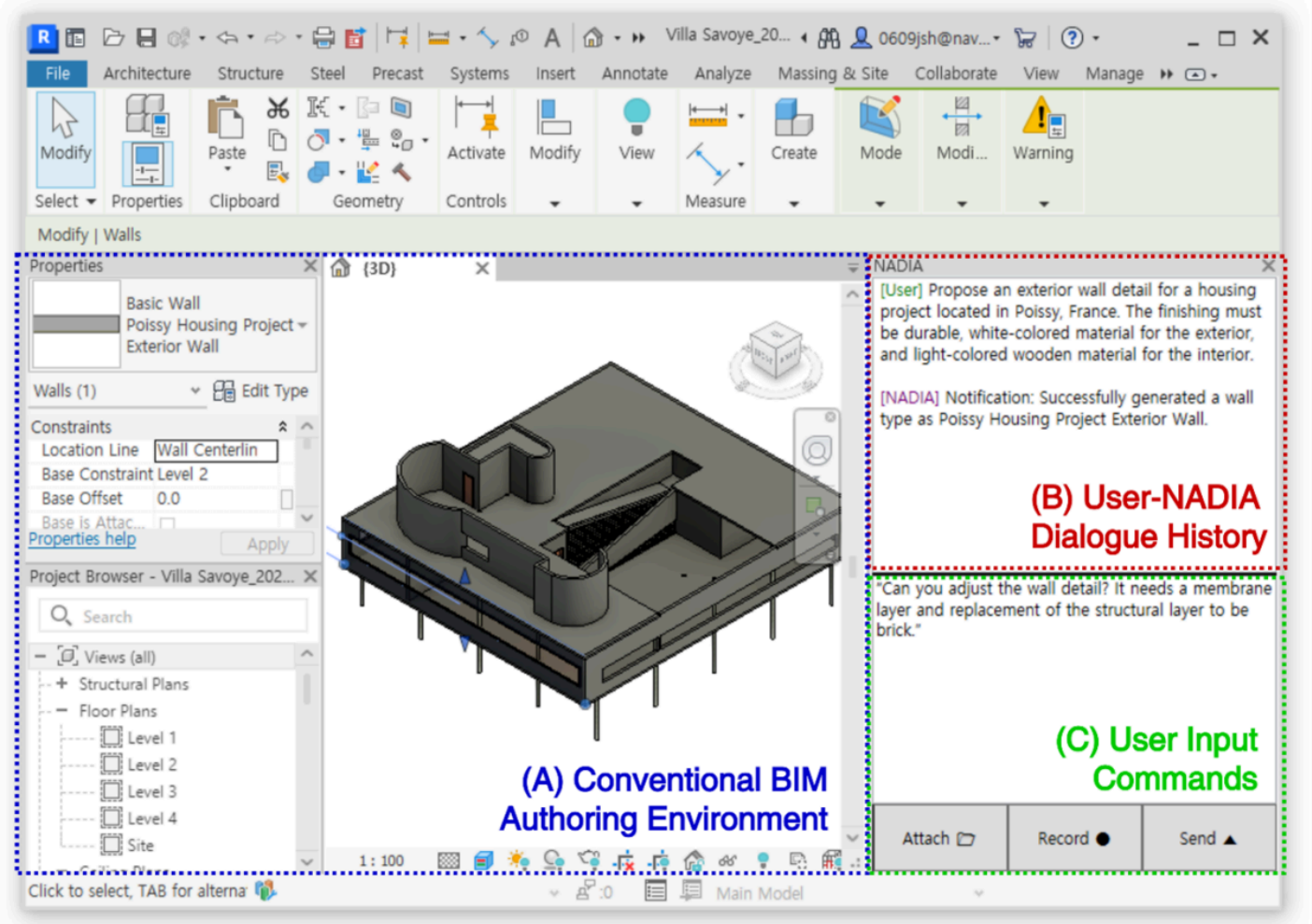
To overcome these limitations, the team has been carrying out the “AI-based Architectural Design Automation Technology Development” project since 2021, funded by the Korea Agency for Infrastructure Technology Advancement (KAIA). The lab has developed various automation technologies, including:

- **BIM Library Transplant**: a technology that automatically finds and applies detailed design elements from past projects to similar objects in new projects.

- **Semantic Elaboration**: a technique that uses graph neural networks to automatically infer structural, insulation, and waterproofing properties based on connections among walls, floors, and other components.

The team has also developed:

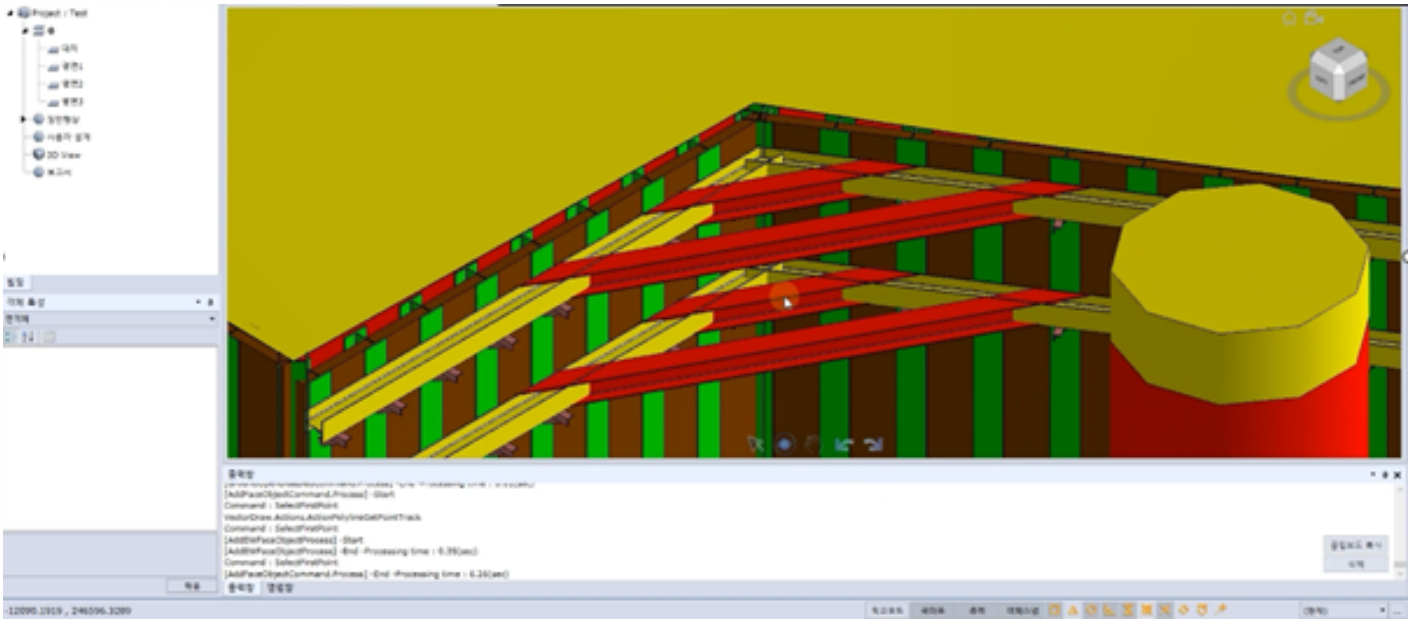
- **NADIA (Natural-language-based Architectural Detailing through Interaction with AI)**, an AI system that replaces traditional mouse-based interfaces with natural language commands to detail BIM models.
- **HADES (Hybrid Automated Design of Excavation Support Systems in Building Projects)**, an AI system that automatically generates excavation support models tailored to the site's subsurface conditions using basic project information such as the site address.



[Photo 1. The NADIA system integrates a conversational interface into existing BIM software to enable AI-assisted architectural detailing through natural language interaction.]

These achievements have been published in leading journals, including Automation in Construction (top 1%) and Advanced Engineering Informatics (top 2%).

As a result, Professor Ghang Lee was named a Hans Fischer Senior Fellow at the Institute for Advanced Study, Technical University of Munich, in 2024. Dr. Soohyoung Jang, who led the NADIA project, was selected in the same year as one of the inaugural recipients of the Presidential Science Scholarship for Graduate Students while still pursuing his Ph.D. Meanwhile, Hyunseong Noh, who spearheaded the HADES project, received the GNI Best Paper Award at the 2025 European Council on Computing in Construction (EC3), earning international recognition for the team's research.



[Photo 2. The HADES system automatically generates BIM excavation support models by recommending retaining walls, cut-off walls, support

methods, and design parameters based on public data and project information.]

Professor Ghang Lee stated, “With the rapid advancement of large language models like ChatGPT, we are already performing many tasks through natural language. In the near future, the user interface of complex 3D design systems will shift from being mouse-based to language-driven, allowing designers to use digital tools far more intuitively and freely. Instead of being limited to functions provided by software companies, architects will soon be able to create customized functions through approaches such as ‘vibe coding.’ When that era arrives, fundamental architectural knowledge and expertise will become even more critical.”

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Generative AI in architectural design: Application, data, and evaluation methods

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Semantic elaboration of low-LOD BIMs: Inferring functional requirements using graph neural networks

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Automated detailing of exterior walls using NADIA: Natural-language-based architectural detailing through interaction with AI