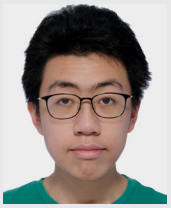

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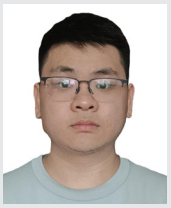
HUI King Ki



NGAN Man Leon

Dr. Boyu WANG

INSTITUTION
HKUST BIM Lab, The Hong Kong University of Science and Technology

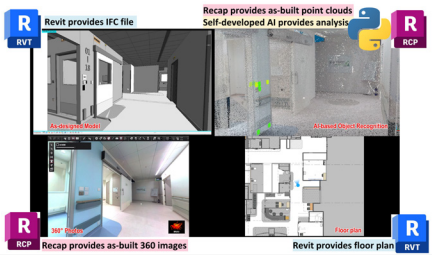
PROJECT NAME
AI-Based Scan-to-BIM for Facility Management in a Smart Sustainable Campus

PROJECT LOCATION
The Hong Kong University of Science and Technology

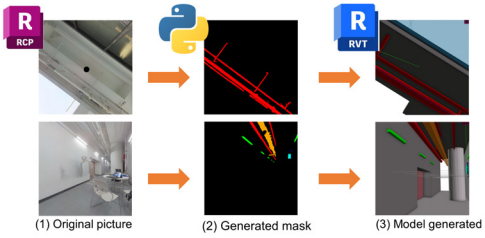
TYPE
As-Built Surveying and BIM Reconstruction

AUTODESK PRODUCTS USED
Autodesk® Dynamo
Autodesk® ReCap®
Autodesk® Revit®

AI-Based Scan-to-BIM for Facility Management in a Smart Sustainable Campus



Web-Based Integration Platform for Smart and Sustainable Campus Management
Image Courtesy of HKUST BIM Lab, The Hong Kong University of Science and Technology



Workflow Demonstration of AI-Based Scan-to-BIM
Image Courtesy of HKUST BIM Lab, The Hong Kong University of Science and Technology

Project Background

Facility management in large-scale campuses faces increasing challenges due to aging infrastructure and the lack of up-to-date building information. Traditional methods for creating Building Information Models (BIM), such as manual measurements or 2D drawings, are time-consuming, inaccurate, and unable to reflect true as-built conditions. This project aims to develop an AI-based Scan-to-BIM solution that leverages 3D scanning, computer vision, and generative modeling to automate the creation of high-precision as-built BIMs. By integrating point cloud data, 360° imagery, and AI-driven component recognition, the system enhances the efficiency, accuracy, and scalability of BIM reconstruction for smart and sustainable facility management.

Project Challenges and Solutions

Traditional BIM creation methods, reliant on manual measurements or outdated 2D drawings, are time-consuming, labor-intensive, and often inaccurate—especially for large, aging facilities. To overcome this, the project introduces an AI-based Scan-to-BIM workflow that automates as-built BIM generation using point clouds and 360° imagery.

Existing AI models also face limitations in closed-set detection, requiring large labeled datasets and struggling with unseen components. This project addresses the issue by integrating open-set, zero-shot detection using Grounding DINO and Segment Anything Model (SAM), enabling flexible object recognition via text-image prompts.

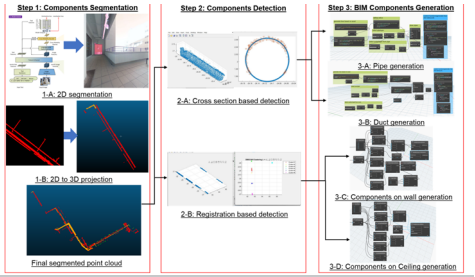
Lastly, converting AI outputs into BIM formats can be error-prone. The team resolves this by using parameter extraction and Dynamo scripting to automate BIM generation in Revit, ensuring both high accuracy and efficiency.

How does BIM help for your project?

BIM plays a central role in enabling intelligent, automated, and scalable facility management. In this project, BIM is not only the output format but also the foundation for integrating AI-driven object detection and 3D scanning data. Using Autodesk Revit and Dynamo, recognized components from point clouds are automatically converted into parametric BIM elements, ensuring consistency, accuracy, and efficiency.

BIM also serves as a single source of truth for managing and updating the as-built conditions of over 60 buildings across campus. With compatibility with Autodesk Construction Cloud, the BIM models can be easily shared among internal teams and external stakeholders, streamlining collaboration, verification, and long-term maintenance planning.

By transforming raw scan data into intelligent BIM models, this solution bridges the gap between physical environments and digital facility management systems.



NextGen AI-Based Scan-to-BIM Framework
Image Courtesy of HKUST BIM Lab, The Hong Kong University of Science and Technology

AUTODESK