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INSTITUTION

The Hong Kong University of Science and Technology

PROJECT NAME

Digital Twin-based ESG Platform for Property and Facility Management Industries

PROJECT LOCATION

Yau Tong, Hong Kong

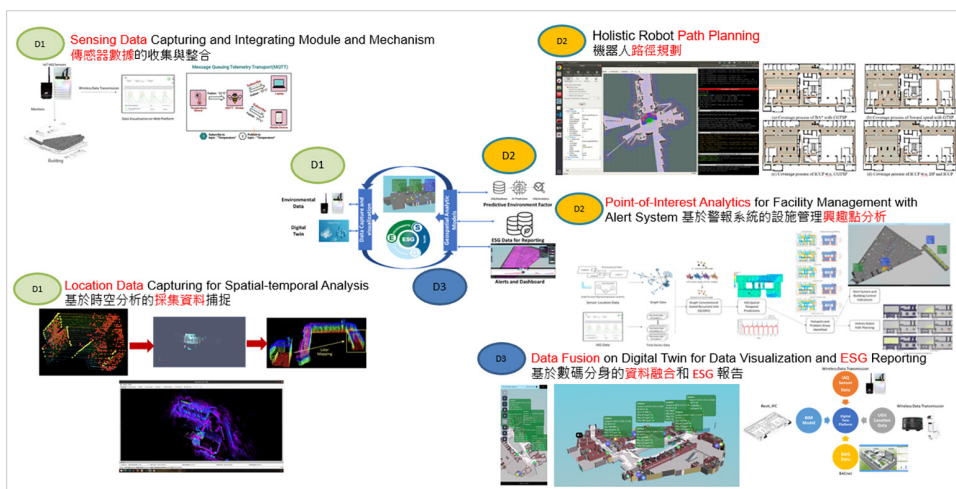
TYPE

Digital twin platform for ESG management

AUTODESK PRODUCTS USED

- Autodesk® AutoCAD®
- Autodesk Construction Cloud®
- Autodesk® Forma
- Autodesk® Revit®
- Autodesk Viewer

Digital twin-based ESG Management in Built Environment using BIM, Robotics and AI



BIM-based Digital Twin IAQ Robotic Platform for ESG
Image Courtesy of The Hong Kong University of Science and Technology

Project Background

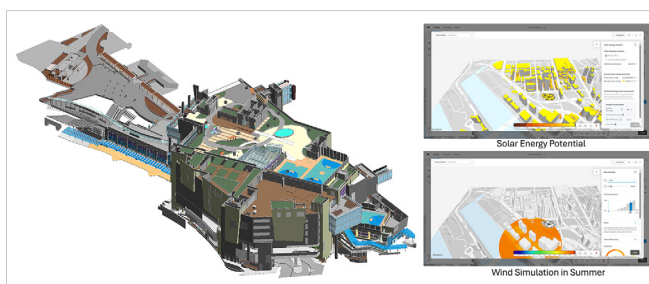
Environmental, social, and governance (ESG) initiatives push upgrades in the property and facility management industry. There are increasing concerns about indoor air quality (IAQ) from occupants. However, there is a lack of manpower and expertise to conduct regular on-site inspections and monitor IAQ. This project aims to develop a digital twin-based ESG platform, based on BIM, robotics and AI technologies to support ESG reporting and environmental monitoring. International IAQ standards and workflows specific to building operations are considered when integrating building system data, sensor data and location data from the robots with the digital twin platform.

Project Challenges and Solutions

The first challenge is that path planning capability of robots in the market cannot meet high and constant demands in conducting on-site inspections and IAQ monitoring. The holistic path planning framework for UGV is proposed to improve IAQ monitoring coverage, as well as to predict and avoid collisions in an indoor environment. Robot localization methodology and a protocol to establish stable communication for continuous location extraction of UGVs are developed. Secondly, the existing digital twin systems focused on data visualization, which is insufficient for decision-making in building control. An environmental monitoring framework using digital twin and robotics technology is developed. Spatial-temporal analytic models for Point-of-Interest (PoI) analytics and IAQ monitoring are developed to identify hotspots and problem areas and to set up an alert system for regions with poor IAQ. A data integration framework to support dynamic IAQ data display and evident-based ESG analytics on openBIM-based digital twin platform.

How does BIM help for your project?

BIM technologies are used for visualization, analysis, simulations, monitoring and collaboration. Firstly, as-built models are not up-to-date from facility management perspective. Scanning may not be reliable as MEP equipment is hidden above false ceiling. We first to inspect the MEP system using AutoCAD and conduct site inspection for checking. Then, we update the as-built BIM model based on the inspection results using Autodesk Revit. Secondly, we need to conduct multiple analysis and simulations. Utilizing Autodesk Construction Cloud, BIM model is served as single source of truth for accuracy and consistency for multiple simulations, which includes conducting site analysis Using Autodesk Forma and crowd simulation using Anylogic. Lastly, as



BIM Model of Domain Shopping Mall and BIM-based site analysis using Autodesk Forma
Image Courtesy of The Hong Kong University of Science and Technology

this project involves multiple parties, reliable collaboration mechanism is required for both internal and external parties. We use Autodesk Construction Cloud for internal BIM model sharing and Autodesk Viewer for sharing to external parties for review.