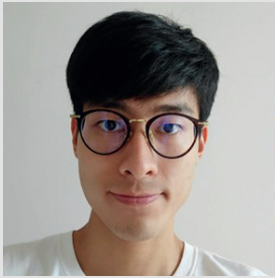
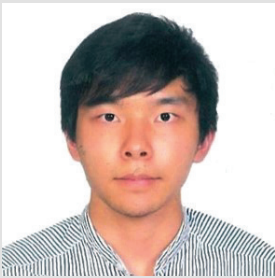




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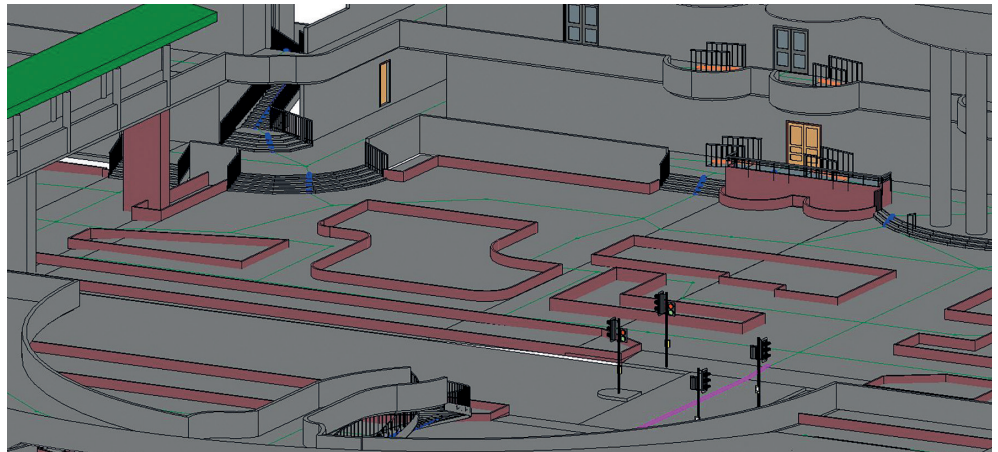
PROJECT NAME
**Integrating BIM-GIS with IoT-AI for
Urban Walkability Analysis**

PROJECT LOCATION
Kwun Tong, Kowloon, Hong Kong

TYPE
**Analysis of pedestrian flow and urban
walkability**

AUTODESK PRODUCTS USED

AutoCAD
BIM360
Dynamo
Revit



Constructed BIM Model in Revit
Image Courtesy of The Hong Kong University of Science and Technology

Integrating BIM-GIS with IoT-AI for Urban Walkability Analysis: Smart Walkability Analytics for Smart Urban Design

Project Background

Walking is a basic transportation mode of citizens which facilitates the sustainable development of a city. There has been worldwide promotion for incorporating walkability analysis into urban planning, for creating a pleasant walking environment. Yet, walkability broadly covers many region-specific factors regarding infrastructure and pedestrians. Conventional methods for regional walkability assessment include on-site audit of walking facilities and pedestrian survey. However, these are labor-intensive in data collection, and may require non-trivial analysis to devise improvement measures. Therefore, a more effective methodology is developed, by integrating BIM-GIS for infrastructural modeling and IoT-AI for pedestrian flow analytics based on CCTV videos.

Project Challenges and Solutions

Walkability analysis faces two challenges. Firstly, conventional methods of walkability analysis such as on-site surveying are labor-intensive, since pedestrian walking behaviors largely differ among different pedestrian groups and different regions. Secondly, current practices of walking facility audit quantify walking scores of different facilities separately, which could not fully capture infrastructure conditions such as regional connectivity. To address the first challenge, IoT technologies are utilized to facilitate pedestrian flow analytics, based on automated CCTV video processing powered by our developed AI engine. Pedestrian flow statistics are efficiently obtained, which could help understand different pedestrian behaviors in a specific study area. As for the second challenge, BIM-GIS modeling is incorporated into our 3D pedestrian network construction, which integrates rich geometric and semantic attributes of a study area. An integrated 3D walkability

network is constructed, which captures the regional connectivity and rich infrastructure conditions, for conducting fine-grained pedestrian flow simulation and walkability analysis.



Automatic Pedestrian Detection from CCTV in HKUST
Image Courtesy of The Hong Kong University of Science and Technology

How does BIM help for your project?

In our BIM platform based mainly on Revit, GIS information are firstly imported to construct coarse dimensional details, e.g. AutoCAD 1:1000 digital maps from Lands Department to form the geometric boundaries of roads and buildings. Subsequently, a BIM-based data model is developed to specify the fine-grained geometric and semantic attributes of facilities to be modeled. Furthermore, 3D pedestrian walking network is efficiently generated with our developed Dynamo plugin. To construct the network, BIM family object templates are defined to categorize the attributes of different facility types, enabling an object-oriented management of the network elements. The constructed BIM model could then be imported to an agent-based 3D pedestrian simulation engine called Pathfinder. The well-categorized BIM objects enable an efficient process of geometry extraction and definition of pedestrian agents' behaviors for simulation. Moreover, BIM360 greatly facilitates collaboration, where relevant drawings, site visits' photos and BIM sub-models are shared within our team.