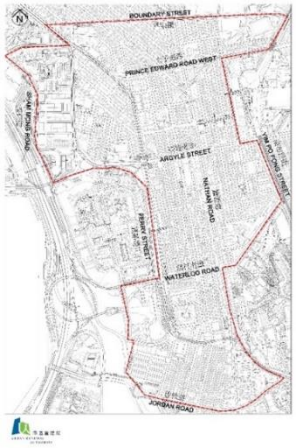
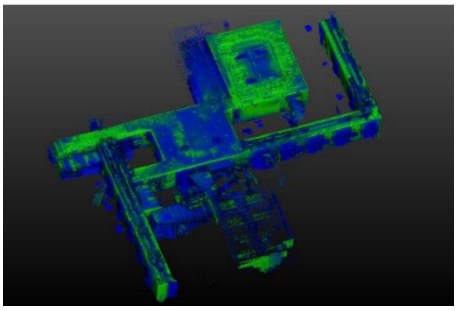
News Article for RISUD Strategic Focus Area (SFA) Scheme

		Name	Department
1.	**Principal Investigator**:	Prof. Anthony CHEN	CEE
2.	**Name of SFA:**	Urban Simulation	
3.	**Project Title:**	3D GIS, Land-Use Planning Scenarios, and Transport Models for Urban Simulation	

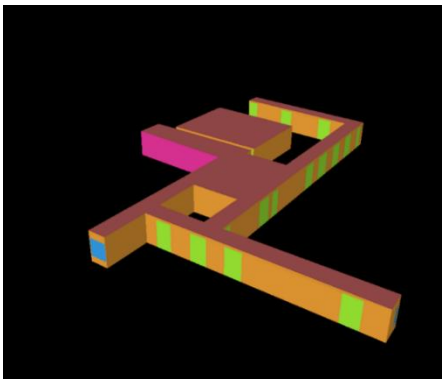
4. **First Year Progress/Achievement**



The Urban Renewal Authority (URA) has commenced a comprehensive renewal project for the Yau Ma Tei and Mong Kok Districts (or short the Yau Mong District), where it is a densely built and populated district. Urban renewal in high-density cities is challenging in balancing the social-environmental performance and economic benefit since the promotion of built environment (e.g., the distribution of public spaces) involves high costs due to the scarcity of land resources. Meanwhile, the current transport network is already congested. Given the scarcity of land resources and fiscal constraints, how to promote public open space in the urban renewal areas within the budget is to be answered. Several objectives are being carried out, and the progress of each objective is briefly summarized below:



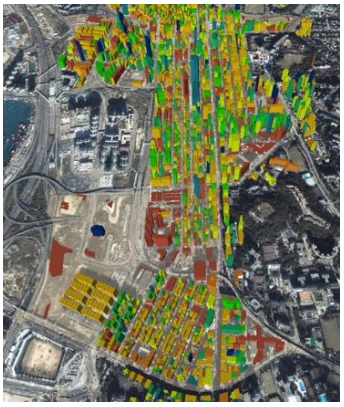
Spatial data acquisition and 3D GIS data management technologies. Currently, most mobile mapping methods for producing high-precision 3D spatial models rely on the integration of Simultaneous Localization And Mapping (SLAM) and costly Inertial Measurement Units (IMUs). The point-based alignments between such point clouds are affected by the highly dynamic moving patterns of the platform, while the plane-based methods are limited by the poor quality of the planes extracted, which reduce the methods' robustness, reliability, and applicability. Thus, one patent, namely the *Plane Extraction from Low-Resolution Inhomogeneous Point Clouds*, has been proposed to alleviate these issues. The proposed method not only reduces the over-segmentation fractions caused by measurement noise and scanline curvature, but also assists in the production of high precision 3D models.

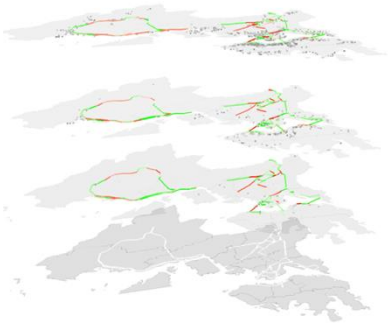


The land-use model via NetLogo is used to spatially quantify the social-environmental performance of land use in the urban renewal areas and their relationship with economic cost by integrating four parts of analysis, including (1) the land use probability-based on spatial regression and principles of policy, (2) the building-level prediction of redevelopment, (3) the social-environ

mental considerations of living quality and built environment, and (4) the cost-benefit trade-off of design schemes. Further, the 3D analysis with parameters regarding building height stereoscopically reflects urban morphology, density, and land value. Results show a sustainable evaluation of different scenarios and the advantage of the proposed model in facilitating urban planning and land-use decision making.

Identification and collection of data are being continuously gathered to construct the multi-modal transport model in Hong Kong. For instance, initial activity plans can be generated from the 2011 Travel Characteristics Survey (TCS); population data can be obtained from the open Hong Kong Population Census data; road and public transport networks can be obtained from data.gov.hk; public transport schedules are also obtained from the General Transit Feed Specification (GTFS) from the Transport Department. These data will be used to develop the urban simulation model for testing land use and transportation scenarios.





Acquisition of dynamic traffic flow data is to collect traffic data from cameras at major roads in Hong Kong. The traffic webcast data is obtained from one of the Hong Kong Transport Department's Intelligent Transportation Systems (ITS) applications - Real-time Road Traffic Information Dashboard. The data is provided in the format of snapshot images from closed-circuit television (CCTV) updated in every two minutes, while the traffic speed data are estimated through probe vehicle trajectories updated in every five minutes. By applying state-of-the-art deep learning and computer vision techniques, the following traffic information could be extracted from the dataset: (1) traffic density by vehicle types and classes; (2) queue length at intersections by-lanes; and (3) car crashes and traffic-related anomalies. By applying traffic flow theories, further traffic information could be derived: (a) travel time, (b) congestion level and delays, and (c) time-dependent traffic flow/volume. These traffic flow data will be very useful in developing the transport models for both planning and management applications.