News Article for RISUD Strategic Focus Area (SFA) Scheme

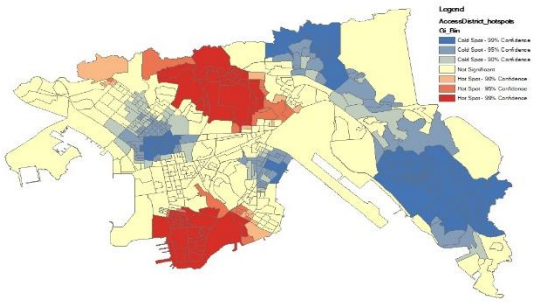
		Name	Department
1.	**Principal Investigator**:	Prof. Anthony CHEN	CEE
2.	**Name of SFA:**	Urban Simulation	
3.	**Project Title:**	3D GIS, Land-Use Planning Scenarios, and Transport Models for Urban Simulation	

4. **First/Second/Third Year Progress/Achievement (***in layman's language, no more than two A4 pages, pls attach a few figures***)**

3D GIS Platform. A common 3D geospatial platform has been developed for collaborative urban simulation that includes urban land-use and transportation planning. This platform consists of three main components: (i) Multimodal transportation network with 2D transportation network data and 3D pedestrian network data; (ii) Geo-spatial data including building footprint data, 3D oblique photography data, and community data with point of interests (POIs) of public facilities; (iii) Large-scale 3D data visualization for collaboratively displaying and analyzing the 3D model of the entire Tsim Sha Tsui area with both road network and POI data.

Urban Form and Livability. Transit-oriented development (TOD) has been one of the strategies for developing dense urban form. This study aims to investigate the areas around metro stations by focusing on the neighborhood livability and public facilities accessibility. We employ the Urban Network Analysis (UNA) in GIS at the building level with five metrics – Reachability, Betweenness, Gravity, Closeness, and Straightness – to delineate the spatial configurations of TOD areas, to display locations of public facilities using points of interest (POIs) data, and to synthesize urban form attributes that can be used to examine urban form and livability in Hong Kong.

3D Walking Accessibility of Public Open Spaces. 3D analysis is more accurate in measuring the actual walking accessibility, particularly in dense urban city. We explore the 3D walking accessibility of multi-type public open spaces (POS) in Kowloon. The term of "*accessible service area*" is used to assess the accessibility of POS by large street block group (LSBG) by measuring the area of POS within walking distance for each person. The results show that improving North Yau Tsim Mong, South Sham Shui Po, South Kowloon City, and Kwun Tong can improve the district POS.



Traffic Simulation with Multi-Agent Reinforcement Learning Testbeds. Smart traffic control and management are becoming an emerging application for Deep Reinforcement Learning (DRL) to solve traffic congestion problems in urban networks. Different traffic control and management policies can be tested on the traffic simulation. By adopting near real-time data from cameras at major roads of Hong Kong and applying state-of-the-art deep learning and computer vision techniques, a prototype is developed to simulate and geo-visualize traffic flow for the road network in Hong Kong. The proposed simulator integrates mesoscopic and macroscopic traffic simulation model to improve efficiency and eliminate gridlocks. The mesoscopic link model simulates flow dynamics on roads, and the macroscopic bathtub model depicts vehicle movement in regions. Moreover, both types of models can be hybridized to accommodate various DRL tasks.

Public Transit Service and Equity. This research provides empirical evidence to answer two questions: (1) How do choice sets differ spatially and socially? (2) How could adjustment of fare/travel time of current services improve the quality of choice and thus reduce inequity? Using multiple data sources collected by the urban simulation project, we explore the spatial differences in transport choice availability in a multimodal public transportation system for Hong Kong. We investigate both spatial and social inequity of transport choice for transit riders under two desired preferences: trading time for money and vice versa. We conclude that policies to increase transport choice can also enhance transport equity if they are properly designed.