Jing Zhou
Research Assistant

Email: jingzhou@arch.ethz.ch

Chair of Information Architecture

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Accessibility in the vertical urban space

Against worldwide urbanization and the continuously increasing population in **high-density regions**, such as some metropolitans in Asia, architects and city planners are facing more and more projects which are in an environment of **verticalized urban space**. Accessibility as an essential indicator of the quality of urban space is seemingly more important because for pedestrians, it is harder to orient and navigate themselves in such a tri-dimensional complex space system. For architects, it is also harder to predict the consequences of their modification in such a verticalized environment. Therefore, this research primarily tends to measure and appraise the accessibility in a more correct and complete manner under the precondition of considering the vertical urban space as an overall system.

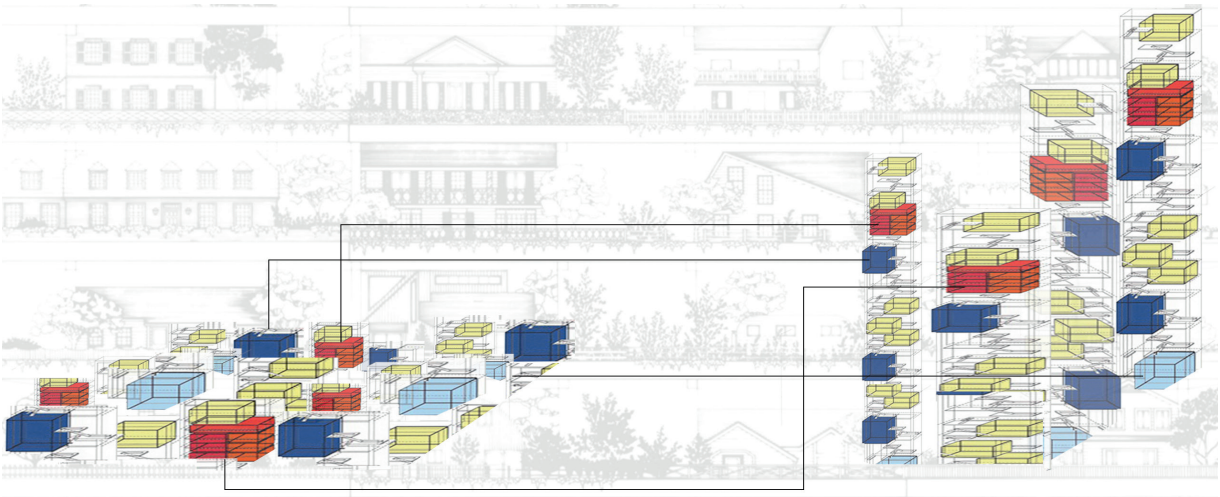
In some places, the concept of a **"vertical city"** has been so far viewed with great suspicion. However, in some places like Hong Kong, the vertical city **is already a reality.** The mixed property rights, functions and various means of transportation all come together to generate a different kind of urban morphology. But at present the design supported analysis methods we have in terms of the vertical urban space are still rare and limited.

The basic methodology of this research is to first develop an appropriate **graph-based accessibility evaluation model** by adopting the method from spatial network analysis. Then to validate and improve the model by **pedestrian data collection** and observations through the case study.

There has already been some methods that can measure the accessibility of urban street networks, but in verticalized urban environments, those methods need to be extended and improved. Specifically, in the graph-based model which are used to represent the spatial configuration into calculable graphs, the vertical elements, like stairs and elevators, will be considered and weighted in a proper way. Furthermore, in verticalized urban environments, pedestrians are passing both through outdoor and indoor spaces from time to time. The opening time for each of the doors will be included as major obstacles of the edges in the graph model. Various public transportation stations will also be taken into consideration as a key component.

The accessibility evaluation results from the network analysis above theoretically demonstrate a spatial hierarchy of tri-dimensional public urban space systems. But the evaluation results are not meaningful unless they can be validate d by the collected data. Wi-Fi detecting devices will be used to gather pedestrian movement data in corresponding case studies. The expected results of this research will be an **accessibility evaluation and simulation method**, which can support verticalized urban space design, and in turn inform future design strategies.

Currently the graph-based three-dimensional spatial representation model have been built and tested in a prototype building. The pedestrian movement data for a high-rise mixed-use building in Beijing has been collected and is curently being analysed. A larger and more complex case study is next planned for Hong Kong. Evaluation methods will be developed and refined before being applied.



The mixed property rights, functions and means of transportation all come together generate a vertical urban morphology, as it is in a normal urban district