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An Effect Evaluation of the Predictive Open Communities based on Simulation Techniques — Taking the Traffic Congestion in Wuhan as An Example

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Abstract

Considering the situation of traffic congestion and degeneration of living environment of communities brought about by sprawl of urban diseases, this context extracts statistics from a residential land (3.26km²) in Wuhan using spatial data analysis software (Arc GIS), combined with on-site-collected resident trips and the matrix (OD) of traffic capacity with the assistance of traffic simulation software (Trans CAD), to predict and analyze the equilibrium between traffic generation and attraction, so as to build up the matrix of trip volume of the objective year (2020) and acquire traffic assigning parameter. Development intensity and degree of units in communities and other factors are also included to conduct the visual assessment. The conclusion can be drawn as the followings: 1) hour spent in open communities is less and waiting line is shorter than that in gated communities, so that the cost will be reduced. 2) In open communities the V/C (degree of saturation of road) ≤ 1.2 while in gated communities the result is ≤ 1.8 , which indicate the rise of road capacity and level of service, as well as the relief of traffic congestion. 3) There is a connection between the planning area and spatial units in communities. Adjacent units are positive correlated: communities near the junction in the southeast are highly aggregated and trip volume of residents is large while communities near the junction in the northwest relatively loosely gathered and trip volume of residents is smaller, which means choosing roads in the northwest during peaks in the morning and evening is a feasible way to avoid traffic congestion. Aggregation is not that obvious communities in the middle than the others'. The results demonstrate the practicability and significance of assessment methods of this essay.

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1. Introduction

Since the beginning of the NPC and CPPCC (the National People's Congress and the Chinese Political Consultative Conference) in 2016, Chinese government has started to promote the block system policy, which will be implemented on newly-constructed communities in principle. On the other side, completed communities could also be open to the public gradually. This policy aims to turn private roads in communities into public ones in urban areas and solving the problem of traffic congestion in order to improve living environment of communities. Closed network of city roads will be activated by open communities, thus accessibility is upgraded (Zhu Miaomiao, 2011), and time and distance of delay is shortened. Stress on urban roads is released as a result (Guo Ji-fu, 2011). Meanwhile, road capacity is decreased and connection between adjacent neighborhoods is enhanced, which is in significance meaning in tackling down the ecological issues in urban villages (Wu Fulong, 2015; Tobollik et al., 2016).

The emergence of open communities can be traced back to the Settlement Movement launched in British, American and France in the early twenty century. The target of the movement was to cultivate spirits of self-government and mutual aid (Shao Da-wei, 2010). In the 1915, American sociologist K. Farringtons firstly came up with the concept of Community Development (Xin, 2001). After the Second World War, it went into a period when urban sprawl began to swell, which led to traffic congestion, air pollution, land wastage and ecological damage because of low-density residence area and vehicle boost (Shan Hao, 2003). Governments in different countries began to establish develop plans of communities in the hope of guiding the development of communities to proper paths through cooperation between relative institutions and non-government organizations (Rahman, 2015). In the 1990s, American planner Peter Calthorpe proposed a plan to build up Harmonious Society, where spatial shaping of neighborhood, street and urban design, high-quality parks, land reservation and connection within communities are all attached with great importance, with the assistance of topology of streets and architectures. His plan reflects spirits of open and harmonizing in American community planning. In the early twenty-first century, government in Barcelona extended bicycle routes from 68 miles to 186 miles and re-plan bus stations to offer more convenient public transportation for the residents. Every resident could reach to a bus station within 250m. The new network of road contributed to a faster spot-to-spot public transportation and citizens could travel to every corner in the city with only one transfer. Barcelona is going to become a walking city and intersections suffering from traffic congestion will be turned into walking space in 2017 as expected (Jordi. Carrabelle, 1988). In the far East, during the Northern Song Dynasty in China, prosperous business and safe society accelerated transformation of urban morphology. The closed neighborhood system was gradually replaced by the open lane system (Horthy and Wilensky, 2014) to fit into social development. Artist Zhang Zeduan in Northern Song painted the world famous "Along the

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