Predicting Vertical Urban Growth Using Genetic Evolutionary Algorithms in Tokyo's Minato Ward

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Abstract

This research explores the use of artificial intelligence to simulate how cities will grow vertically. By learning how cities have evolved in the recent past, genetic algorithms can successfully simulate vertical urban growth. The research was applied to buildings 130 meters and taller in the Minato Ward of Tokyo in 2015. An evolutionary computer model was built from a standard genetic algorithm, using historical and economic data, which then simulated future growth for the 2016 to 2019 period. The results obtained matched the area of study's real vertical growth for the study period, with a 85.7% accuracy for the number of buildings, 73.7% for their average heights, and 96.3% for the likelihood of new construction projects happening within a mapped area. By learning how a city evolved in the past, the model replicated the future vertical growth of a city center.

Keywords
artificial intelligence, urban growth, genetic evolutionary algorithms