

# A Simulation of Human Mobility that Reproduces the Behavioral Characteristics

Yuri MIZUNO<sup>1</sup>, Daishi SAGAWA, Yuya KIMURA, and Kenji TANAKA  
*School of Engineering, The University of Tokyo, Japan*

**Abstract.** As interest in smart cities grows, foot traffic data is expected to solve diverse problems cities have. However, it has a fragmented nature in time and space, and this incompleteness obstructs its utilization. Therefore, simulation of human mobility is necessary not only for measuring policy effectiveness but also for identifying urban realities that are not observed directly from foot traffic data. Although previous research has proposed various simulations of human mobility, they are inadequate in that they do not take behavioral characteristics into account. This paper presents a behavioral characteristics classification method using foot traffic data and a method for designing a human mobility forecasting simulator that implements a decision-making model to complement the incompleteness of the foot traffic data through a transdisciplinary approach. The proposed method is divided into two phases: classification of behavioral characteristics and designing a human mobility forecasting simulator. We conducted a case study using data from an actual urban city. As a result of the classification, differences were observed in the trends of facilities used and time spent in each cluster. The constructed simulator used Bayesian optimization to adjust parameters, and the results showed a significant correlation between simulation results and real-world data. Two simulations were conducted to measure the effectiveness of adding new stores and operating digital signage. Both simulations identified changes in human mobility for each scenario. Counterintuitive results were also observed, such as a decreased total number of visitors to each building.

**Keywords.** Foot traffic data, smart cities, simulation of human mobility, classification of behavioral characteristics

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<sup>1</sup> Corresponding Author, Mail: [kmaru-eeen@g.ecc.u-tokyo.ac.jp](mailto:kmaru-eeen@g.ecc.u-tokyo.ac.jp).