CLASSIFYING URBAN PARKS BY THE DAILY VISITING PATTERN DURING COVID-19 USING MACHINE LEARNING

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During the pandemic of COVID-19, urban parks have proved their true value in promoting urban sustainability more than ever. Since state and local governments imposed social distancing measures, the number of park visitors has increased in almost every city globally (Geng, Innes, Wu, & Wang, 2021). The demand for outdoor leisure activities such as strolling and jogging has increased to avoid contact with others in confined indoor spaces such as shopping malls and gyms. Some parks indeed have served as a buffering place as a haven for social isolation and outdoor activity, significantly restoring physical and mental health, while others have seen a decline of visitors during the pandemic. Different daily visiting patterns classify urban parks into several types during the pandemic.

This study examines the change in the visiting pattern of urban parks during the pandemic of COVID-19 to classify them, and attempts to identify their locational factors and design features that determine the typology. For this, the number of visitors to 425 parks in Seoul, Korea was tracked with mobile phone travel data provided by SK Telecom. We used the spatiotemporal data to analyze time-series changes in the number of park visitors for 366 days in 2020. The big data was analyzed using K-shape clustering and multinomial logit model.

Following Manley, Zhong, & Batty (2018) who identified the clusters of travel patterns over space and time captured by smart card big data, this study uses K-shape clustering to classify urban parks by the time-series change in the number of daily visitors. This machine learning method identifies the similarity between different time series by measuring the distance between data with the Dynamic Time Warping method. It repeats and refines the process of designating points with similar phases as one cluster to create homogeneous and well-separated cluster groups (Paparrizos & Gravano, 2015).

Some distinctive clusters of visiting patterns will be detected: 1) not drastic but constant increase, 2) volatile fluctuation, 3) increase only when social distancing measure is strengthened. Based on the time series clustering results, we build a multinomial logit model to identify the park's design features and locational characteristics that determine the clustering, such as the ratio of the green area, leisure amenities, public transportation accessibility, parking capacity, and the composition of land use in the surrounding area. The results will show which parks with what design features have successfully performed the role of COVID shelter. This will contribute to promoting the possibility of urban parks functioning as infrastructure to improve the city's resilience during health crisis.

Citations

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