Spacetime-aware Network for Battery Swapping Station Recommendation using Ensemble Clustering

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Abstract

Sustainable and energy-saving transportation options such as electric vehicles (EVs) are becoming increasingly common in our society. This has extended not only to EVs but also to real-life transportation such as two-wheelers, bicycles, and scooters. However, in many large cities, the limited capacity of batteries and the number of battery swapping stations (BSS) have led to an imbalance between demand and supply. Indeed, when drivers go to a BSS, there are many cases where the number of fully charged batteries is not available, or the BSS is relatively far away. Therefore, in this study, we propose a session-based recommendation system for electric two-wheeled vehicles. We first consider both temporal and spatial factors to integrate the data by analyzing the demand by time of day for each day of the week in the region. Then, we perform ensemble clustering using BSS data installed for electric two-wheeled vehicles in Seoul, Korea. Finally, it recommends the BSS with the shortest distance without waiting time by considering the current time and location of the driver.

Keywords
Spacetime-aware Network, Ensemble Clustering, Battery Swapping Station (BSS), Session-based Recommendation, Electric two-wheeled Vehicle

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