Real-time Battery Swapping Station Recommendation using Ensemble Clustering

Donghwan Shin, Taesu Cheong
School of Industrial and Management Engineering
Korea University
Seoul, South Korea
Email: ppuya1212@koera.ac.kr, tcheong@korea.ac.kr

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 clustering-based recommendation system for electric two-wheeled vehicles. We first consider both temporal and spatial factors (place) to integrate the data by analyzing the demand by time of day for each day of the week in the region. After that, we perform ensemble clustering using BSS data installed for electric two-wheeled vehicles in Gangnam-gu, 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
Ensemble Clustering, Battery Swapping Station (BSS), Recommendation System, Electric two-wheeled Vehicle, GPS Location Data.

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Biographies

Donghwan Shin received a B.S. degree in Industrial and System Engineering from Dongguk University, Seoul, South Korea, in 2021. He is currently pursuing an M.S. & Ph.D. integrating a degree in Industrial and Management Engineering with Korea University, Seoul. His research interests include Image Processing, Object Detection, Image Segmentation and Reinforcement Learning.

Dr. Taesu Cheong is a Professor at the Department of Industrial and Management Engineering (IME) at the Korea University (KU). Taesu Cheong received a B.S. degree in Industrial Engineering from Korea University, Seoul, South Korea, in 1998, an M.S. degree from the Korea Advanced Institute of Science and Technology, Daejeon, South Korea, in 2001, and a Ph.D. degree in Industrial and Systems Engineering from the Georgia Institute of Technology, Atlanta, GA, USA, in 2011. His research interests include Stochastic Optimization with Applications in Transportation, Supply Chain Management, Healthcare Management, and Information System Management.