

Locating battery swapping stations for smart e-bus system

Joon Moon and Taesu Cheong

School of Industrial Management Engineering
Korea University
Seoul, 02841, South Korea
nrbam123@korea.ac.kr, tcheong@korea.ac.kr

Sang Hwa Song

Graduate School of Logistics
Incheon National University
Incheon, South Korea
songsh@incheon.ac.kr

Abstract

Environment-friendly electric vehicles have gained popularity and increased attention in recent years. Electric vehicles must be accompanied by a charging station that can charge electricity. In other word, the deployment of a network of recharging stations is essential due to their limited travel range. This paper considers the problem of locating battery swapping stations among bus stops for electric vehicles on a traffic network with flow-based demand, based on the location routing problem. From these three different mathematical models and compare their performance with real-world data of Seoul metropolitan area in South Korea. The contribution of our study is to suggest several mathematical programming models on locating charging machine problem, which is kind of location routing problem. Through solving a problem in several ways, we can compare the advantages and disadvantages of each model in this problem. In practical aspects, we have studied and proposed solutions about one of the worries, that can arise in preparation for the introduction of electric buses in the near future.

Keywords

e-Bus, Location routing problem, battery swapping, mathematical programming

Acknowledgements

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (No. NRF-2018S1A5A2A03038146 and NRF-2018R1D1A1B07047651).

Biographies

Joon Moon is a candidate of Master's degree in Korea university. He is majored in industrial management engineering since 2012. The research area is supply chain and vehicle routing problems.

Taesu Cheong received the B.S. degree in industrial engineering from Korea University, Seoul, Korea, in 1998; the M.S. degree from the Korea Advanced Institute of Science and Technology, Daejeon, Korea, in 2001; and the Ph.D. degree in industrial and systems engineering from the Georgia Institute of Technology, Atlanta, GA, USA, in 2011. He is currently an Associate Professor with the School of Industrial Management Engineering, Korea University. He is research interests include stochastic optimization with applications in transportation, supply chain management, healthcare management, and information system management.

Sang Hwa Song. has been studying supply chain management and corporate logistics innovation at the Graduate School of Northeast Asia Logistics at Incheon University. He has developed supply chain optimization engine and has been in charge of process consulting at IBM Technology Labs and Business Consulting Services.