

# Multi-Period Multi-Depot Location-Routing Problem for Mobile Center-based Last Mile Delivery

**Minseo Choi and Taesu Cheong**  
School of Industrial Management Engineering  
Korea University  
Seoul, 02841, South Korea  
[iemschoi@korea.ac.kr](mailto:iemschoi@korea.ac.kr), [tcheong@korea.ac.kr](mailto:tcheong@korea.ac.kr)

## Abstract

The last mile delivery volume has been gradually increasing worldwide, and in particular, the volume trend is expected to accelerate dramatically due to COVID-19. Furthermore, the expansion of the last mile delivery market negatively impacts social and environmental issues (urban traffic congestion, greenhouse gas emissions, etc.) owing to the delivery system employing internal combustion engine delivery trucks in metropolitan areas. Therefore, mobile centers for the last mile delivery have been studied to solve the previously stated issues. That is because mobile centers can enable the active use of eco-friendly transportation, be easily relocated, and be installed in empty spaces in the city. In this study, we consider this problem as the multi-period multi-depot location-routing problem to operate a mobile center efficiently. We present a 2-phase method for the addressed problem and develop a heuristic algorithm. The first phase of the proposed method is formulated as a stochastic dynamic programming model for the multi-period locating problem, and the second phase is constructed as a mixed-integer programming model for the multi-depot routing problem.

## Keywords

Mobile center, Location-routing problem, Last mile delivery, Dynamic programming

## Acknowledgements

This work was supported by Jungseok Logistics Foundation. It was also supported by the Korea Institute for Advancement of Technology (KIAT) grant funded by the Korea Government (MOTIE) (The Competency Development Program for Industry Specialist) under Grant P0008691.

## Biographies

**Minseo Choi** received the B.S. degree in industrial engineering from Pusan National University, South Korea. He is currently a Ph.D. student in the Department of Industrial and Management Engineering, Korea University, South Korea. His research interests include logistics, supply chain management, and 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 a Professor with the School of Industrial Management Engineering, Korea University. His research interests include stochastic optimization with applications in transportation, supply chain management, healthcare management, and information system management.