Proceedings of the International Conference on Industrial Engineering and Operations Management
Bangkok, Thailand, March 5-7, 2019

Location model minimizing distances between EV charging stations

Yohei Kakimoto
Graduate School of Science and Engineering
Hosei University
Tokyo, Japan
yohei.kakimoto.9t@stu.hosei.ac.jp

Hiroyuki Goto
Department of Industrial and Systems Engineering
Hosei University
Tokyo, Japan
goto-h@hosei.ac.jp

Yoichi Shimakawa
Department of Computer Science & Technology
Salesian Polytechnic
Tokyo, Japan
simakawa@salesio-sp.ac.jp

Prommas Panote
Graduate School of Science and Engineering
Hosei University
Tokyo, Japan
prommas.panote@gmail.com

Abstract

In cooperation with the recent prevalence of electric vehicles (EVs), researches focus on location planning for EV charging stations are being conducted actively. Fundamental in most relevant studies is that demand is associated with population. However, alongside a viewpoint that users of a facility are vehicles, traffic flow would be a primary instance which arises demand. Given a region, we consider a road network with links and nodes associated with roads and intersections. Given an origin-destination pair, each traffic shall flow on the shortest path. In this context, there is a concept called cannibalization, reflecting multiple facilities deprive the others of demand flowing on the same single path. A model explaining this phenomenon is called the flow-capturing location-allocation model (FCLM). Meanwhile, EVs have a significant constraint which should be taken into account in formulation; their driving distance is shorter than gasoline-powered vehicles. Thus, it is not adequate to apply the FCLM as it is to EVs. In light of this, we propose a new location-allocation model designed for EV charging stations. The model is an outgrowth of the standard FCLM, for which an out-of-battery situation does not occur. The distance between multiple facilities allocated on same path is minimized.

Keywords
Transportation; Location; Combinatorial Optimization; Flow-capturing;

Biography / Biographies

Yohei Kakimoto is a currently graduate student in the Graduate School of Science and Engineering, Hosei University, Japan. His research interests include operations research and geographic information science. He is a student member of the Operations Research Society of Japan.

Hiroyuki Goto is a professor in the department of Industrial & System Engineering, Hosei University, Japan. He received his B.S. and M.S. degrees from The University of Tokyo in 1995 and 1997. He received his D.E. degree from Tokyo Metropolitan Institute of Technology in 2004. His research interests include operations research, geographic information science, and high-performance computing.

Yoichi Shimakawa is a Professor and Director of the Department of Computer Science and Technology, Salesian Polytechnic Japan. He received his B.S. and M.Sc. degrees from Chuo University in 1990 and 1996. In 1998, he joined the staff as a research assistant on the research project "Integrated Geographic Information Systems" at Chuo University. He received his D.E. degree from Chuo University. He received paper awards from the Operations Research Society of Japan(ORSJ) in 2002. He is a member of ORSJ and the Geographic Information Systems Association of Japan.

Panote Prommas received his B.Eng in mechanical engineering from Thammasat University in 2009. He received his M.B.A from Mahidol University in 2014. He is currently a research student of Hosei University, Japan. His research interests include transportation planning and resource planning.