

Investment Cost Minimization of Autonomous-Electric Vehicles based on Queueing Model

Lae Yeop Lee *, Won Seok Choi*, Seong Gon Choi*

**Information & Communication Engineering, Chungbuk National University, Cheongju-si Chungcheongbuk-do, Korea*

omegamon@chungbuk.ac.kr, wschoi@chungbuk.ac.kr, choisg @chungbuk.ac.kr

Abstract— In this paper, we suggest investment cost minimization of Autonomous-Electric Vehicles (A-EV) for tourist transportation service in tourist spot with consideration for number of A-EVs in charging station. On providing tourist transportation service with A-EVs to tourist, a large number of A-EVs may cause more user satisfaction and require more investment cost. Contrariwise a smaller number of A-EVs may cost little investment cost and less user satisfaction. In other words, there are trade-off relation between user's satisfaction and investment cost. Also, A-EVs which is charging or waiting for charge in the tourist spot's charging station can't serve the transportation service on tourists. Therefore, we applied queueing modeling to minimization investor's investment cost for satisfying tourist's satisfaction by considering tourist's waiting time constraint and the number of A-EVs in charging station. Tour operators and investors of tourist spot can obtain suitable number of A-EVS for their environment by using this minimization.

Keyword— Optimization, Queueing theory, Transportation service, Charging Station, Tourism



Lae Yeop Lee received B.S. degree in the College of Electrical & Computer Engineering, Chungbuk National University, Korea in 2020. He is currently a M.S. candidate in School of Electrical & Computer Engineering, Chungbuk National University. His research interests include Smart Grid, Optimization, Electric Vehicle Application.



Won Seok Choi received B.S. and Ph.D. degrees in the College of Electrical and Computer Engineering, Chungbuk National University, Korea in 2008 and 2015, respectively. He is currently a researcher at the Research Institute of Computer and Information Communication (RICIC), Chungbuk National University. His research interests include Vehicle network, AI, Energy saving network, SDN, NFV, and NGN.



Seong Gon Choi received his B.S. degree in electronics engineering from the Kyeongbuk National University, in 1990, as well as his M.S. and Ph.D. degrees from the Information Communications University, South Korea, in 1999 and 2004, respectively. He is currently a Professor at the College of Electrical and Computer Engineering, Chungbuk National University. His research interests include V2X, AI, smart grid, IoT, mobile communication, high-speed network architecture, and protocol.