## Simulation of the Interaction between Transportation Network

# and Power Grid Mediated by Electric Vehicles

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### Abstract

Although the economy and the industry are significantly developed by the wide dissemination of the automobile and public transportation systems, in recent years environmental issues are revealed concomitantly and Asian countries face structural challenges, such as how to create a low carbon society. Electric vehicles is known as one of the specific example of a policy for low carbonization and its dissemination effort has been initiated. Electric vehicles absolutely do not emit CO2 during driving and can suppress the environmental impact compared to conventional gasoline vehicles even if emissions in power generation and manufacturing process is considered. Some motor companies started to introduce their own electric vehicles into the Japan market in 2009. However, their widespread adoption is hindered by a plurality of different factors in comparison with gasoline vehicles, i.e. short cursing range, expensive purchase price, lack of charging stations and long charging time. To solve these problems, a considerable number of studies have been conducted.

In this study, we propose model in consideration of the impact on the traffic phenomenon by newly implementing electric vehicles agent and charging stations object in Mates (Multi-Agent based Traffic and Environment Simulator) [1-4], developed by the authors. Conventional traffic simulator reproduces the phenomenon on the premise of behaviors of gasoline vehicles. However, it is difficult to simulate a situation in which electric vehicles become common since it is expected that electric and gasoline vehicles exhibit different behaviors in some way. In addition, electric vehicles are expected to play an important role as an electricity storage function which is unevenly distributed in the city under a concept of the smart grid, and at the same time it is an element on the transportation network. Electric power flowing only in the power grid is able to move within the transportation network in future. However, it has not been discussed for the interaction between these two infrastructure systems having different characteristics intermediated by electric vehicles. Therefore, we also discuss the impact possibly occurring when electric vehicles become common, by interacting MATES and the simulator can be expressed the behavior of the power grid in detail.

Keywords: microscopic traffic simulator, electric vehicles, energy consumption, smart grid

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