

# THE 26<sup>th</sup> INTERNATIONAL CONFERENCE OF HONG KONG SOCIETY FOR TRANSPORTATION STUDIES 12-13 December, 2022

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5201	Jianling Liu, Xiao Wen and Sisi Jian	The Role of Customized MaaS Bundles on Demand Fairness of High-Flexibility Travel Modes: A Machine Learning Approach		
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8469	Jianling Liu, Chenyang Wu, Sisi Jian and Vinayak Dixit	Modelling the Non-Linear Effect of Uncertainty on Travelers' Preferences for Mobility-as-a-Service		
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Title	Competition and Cooperation between Shared Mobility and Public Transportation
Author keywords	Cooperation Cooperative game Multimodal Public transit Shared mobility
Abstract	The liberalization of the transportation market and advancements in real-time information technologies have prospered an array of shared mobility, such as ride-sourcing, carsharing, etc. The flux of these new mobility services renders the partnerships between them and public transportation services to be ever-complex and dynamic. They are more likely to engage simultaneously in the competition and cooperation with each other. In this paper, we develop a game-theoretic approach to model the interplay of competition and cooperation between shared mobility and public transit operators. A cooperative multi-leader single-follower game is proposed. At the upper level, both operators decide their service rates as leaders. In the lower level, common travelers are assigned by a logit model, which in return affects the profitability of two operators. Additionally, public transit operator also considers providing subsidy to transit travelers, who use shared mobility service to access the first- or last-mile trips. The resulting formulation is a nonlinear nonconvex programming problem. The model is first reformulated to a standard bilevel model and further approximated by outer linear approximation, forming a mixed-integer linear program (MILP). An iterative diagonalization algorithm is derived for the problem and an adaptive bound tightening technique is developed to achieve better solution quality. We analytically and numerically investigate the process of how competition proceeds to cooperation (vice versa) and the competition between different operators. We find that small shared mobility operators (with a limited budget to maintain their service) are likely to cooperate with the public transit operator. Larger shared mobility service operators will strategically compete or cooperate with the public transit operator. We also find that subsidy plays an important role in shaping cooperative or competitive relationships and a well-tailored subsidy scheme can achieve a win-win situation for both operators and travelers.
Submitted	Apr 15, 00:55 GMT
Last update	Apr 15, 00:55 GMT

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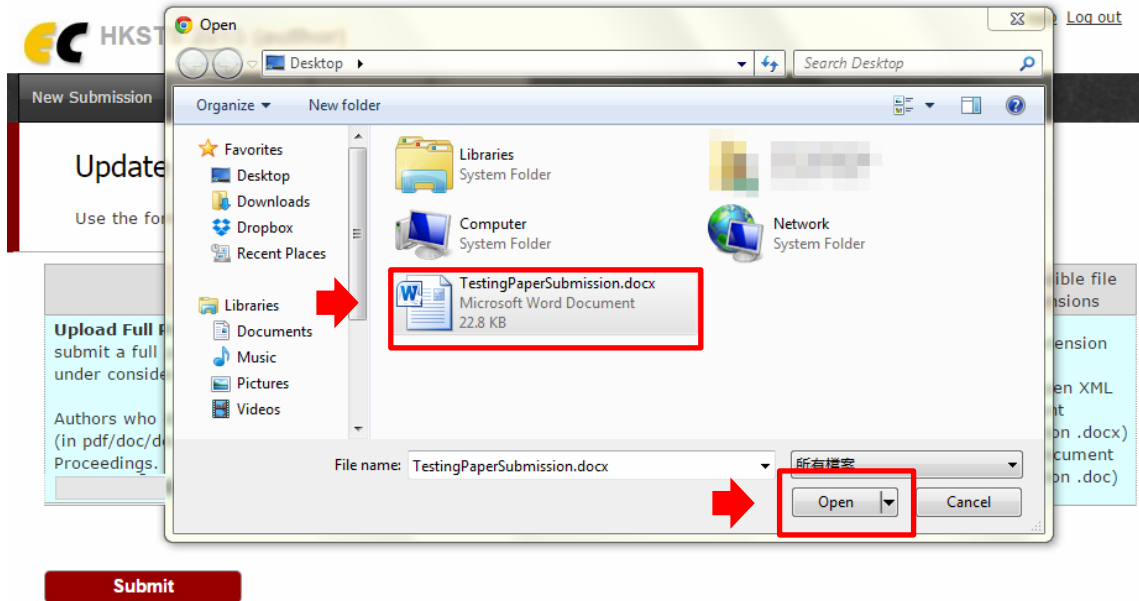
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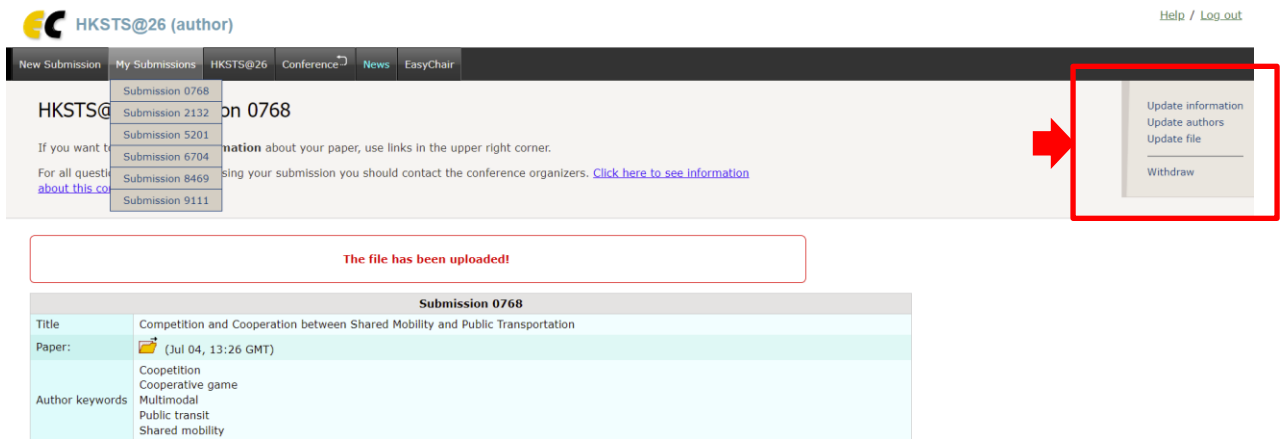
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Paper:	 (Jul 04, 13:26 GMT)
Author keywords	Coopetition Cooperative game Multimodal Public transit Shared mobility

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