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Analysis of the equilibrium trip cost accounting for the fuel cost in a single-lane traffic system without late arrival

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Abstract: In this paper, we introduce the fuel cost into each commuter's trip cost, define a new trip cost without late arrival and its corresponding equilibrium state, and use a car-following model to explore the impacts of the fuel cost on each commuter's departure time, departure interval, arrival time, arrival interval, traveling time, early arrival time and trip cost at the above equilibrium state. The numerical results show that considering the fuel cost in each commuter's trip cost has positive impacts on his trip cost and fuel cost, and the traffic situation in the system without late arrival, i.e., each commuter should explicitly consider the fuel cost in his trip cost.

Keywords: car-following model; fuel cost; trip cost; early arrival

1. Introduction

Vickrey [1] proposed the first bottleneck model, which was extended to study the commuting problem on a road with a bottleneck [2-13]. The models assumed that a vertical queue occurs at the bottleneck upstream if a road has a bottleneck and the commuter's arrival rate is greater than the bottleneck capacity, so they cannot perfectly describe the dynamics of the rush-hour congestion produced by the queue. To overcome this limitation,

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