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Improved Solution Approach for Bus Model with Stops Generalization

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Abstract

We study the analytical traffic model to provide a better approximated solution for headway. Our work is an extension of two published papers for fixed-route bus with not all stops being made and random arrival waiting time. The purpose of this paper is threefold. First, we provide a new formulated approximation for headway. Second, numerical examples are used to point out that our new formulated approximation is more accurate than two published papers. Third, we show that the optimum headway is not a decreasing function of the average extra time required to decelerate and accelerate for a patron stop. Hence, a previous theorem needs a modification, and then we derive an improvement. The same numerical examples from two published papers are examined to support our findings.

Keywords: Analytical approach, bus headway, stop-spacing, public transportation.

1. Introduction

Analytical traffic models are used as an approximation to real traffic situations, which can be used to help researchers develop and plan a city's transit infrastructure. Hendrickson [3] considered riding time and waiting time with random patron arrivals and vehicle capacity limitations to construct transit performance functions. Then he established a bus service model to locate the best solution for headway, the frequency of service. Chuang and Chu [1] examined a design to provide a generalization for Hendrickson [3] to incorporate of the number of potential stops and average random patron arrivals such that they presented a formulated approximation for the optimal solution of the headway. In this paper, we will provide a new formulated approximation that is closer to the optimal solution. Moreover, we will point out that the relation between (a) headway and (b) average extra time required to decelerate and accelerate for a patron stop, proposed by Chuang and Chu [1] needs a revision, which will be improved in this study.