

Chapter 5

Availability Estimation of Demand Buses as Human Transportation System, Using Self-Organizing Map

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ABSTRACT

The demand bus is a new transportation means, which is timely planned and runs order by order in accordance with independent requests of individual customers. Demand buses are alternative transportation vehicles, replacing traditional routing-oriented buses. In this paper, the authors address the characteristic issues, attend to the practical operations, and estimate and evaluate the trade-off strategies between usage convenience and cost management. The main idea, which is established from the features among parameters interpretatively, is to make use of visualization techniques and apply a self-organizing map (SOM) to this visualization. The authors display the co-related classification results computed individually from several selected parameters to keep their meaningful correspondence.

1. INTRODUCTION

The demand bus is a new transportation means, which is timely planned and runs order by order in accordance with independent requests of individual customers, and may be looked upon as

alternative transportation vehicles in place of the traditional routing-oriented bus systems. So, the demand bus is a hybrid-type of transportation vehicle, combined well with taxes on demand-oriented driving and buses on scheduled-specific routing. The convenience may be particularly

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requested in provinces because the public or semi-public transportation means are desirable moving vehicles for oldsters and children though the residents are distributed here and there, and the number of potential customers is not so many. While, the cost-management is not yet sufficiently evaluated with respect to the enterprise or commerce viewpoint. Namely, the practical strategies for scheduling, planning, routing, etc. are not always sufficiently investigated from a point of trade-off view between usage-convenience and management cost though the demand bus is conveniently regarded as one of new transportation systems. This is partly because the estimation method is dependent on many co-occurred parameters, and partly because the operation situations are different case-by-case, at time or at place. At least, in order to apply the new transportation system to our real world effectively there are many problems to be heuristically or analytically resolved. In this paper, we address the characteristic issues, attended to the practical operations in this demand bus system, with a view to estimating and evaluating the trade-off strategies between usage convenience and cost management.

In our research viewpoint, we do not analyze directly the relationship among related parameters but compute various cases one by one, derived definitely from the selectively combined parameters. From various results necessary features are coordinately arranged based on the synthesis viewpoint. This is because we cannot choose truly the important parameters for our consideration in advance, but our investigation process becomes generally heuristic-dependent steps. Namely, it is very difficult to find out certainly optimal or best-fit effort from the mutually followed results, using various kinds of parameters. Thus, the main idea, which should be established from the features among parameters interpretatively in our approach, makes use of visualization techniques, and also applies self-organizing map (i.e., Kohonen, 2000) to this visualization. Our important key-point is to display the co-related classification results gener-

ated individually from the computation among several selected parameters at once so as to keep their meaningful correspondence commonly. This process is very strictly dependent on individual analysis abilities, and is too strongly superior to the traditional approaches, which illustrate business charts based on the properties between predefined parameters, in points of the understandability, multi-usability, flexibility and so on.

2. RELATED WORK

Until today, several researches about this demand bus system have been reported with respect to the convenience-specific proposal of operation methods, comparative estimation evaluation between traditionally scheduled/routed bus and this demand-type bus, and so on. Tsubouchi et al. (2007) summarized the current situation and the adaptability of demand bus. In particular, they reported the successful case in Japan that the demand bus system can provide the convenience for daily activities of residents. However, it is one question whether the demand bus system can supply cost-effective performance or not: in many cases, it is not always sure to be profitable. Concerning to the trade-off problem between profitability and convenience, many researchers have also been reported: Maeda et al. (2002) showed by computer simulation that the trade-off relationship between convenience and profitability is improved by means of making the service area of operation comparatively narrow. Also, Noda et al. (2003) pointed out that the convenience in the demand bus system is better than that in the traditional bus system when the profitability is kept so as to be constant if the service area and operation scale become large. Torii (2004) made it clear that the demand bus system is superior to the traditional bus system in case that they were planned with the number of bus vehicles (Oha, Shinoda, Noda, Kurumatsni, & Nakashima, 2002). Also, Yamato et al. (2008) investigated

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