ASSIGNMENT IN MULTIMODAL NETWORKS

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ABSTRACT

The object of the paper is to study static assignment problems in the context of multimodal networks. In such networks, the properties of arc cost functions are very different from those encountered in simple road networks, notably because the efficiency of public transportation normally increases with demand. Therefore, the usual properties of the solutions of static assignment problems, as they are known for vehicular traffic networks (convexity, unicity of solutions, Beckmann transformation, etc), do not apply in multimodal networks. The paper presents an approach to this problem by investigating how the solutions of the multimodal assignment problem are modified by variations of arc costs (i.e. variations of tolls, fares or capacity), and which modal shifts and traffic paradoxes are induced by such variations.

The object of the paper is to study the competition between the road system and two bimodal systems, car+train and bus+train, in congested traffic situations. The two bimodal systems are considered as separate modes. Typically, work is the purpose of the trips considered in the paper; these trips are home-based, the origins and destinations of the trips are located in the outskirts and the city center respectively. As the trips are regular, the classical hypotheses of static assignment apply. An essential feature of the car+train system is constituted by parkings. The competition between the three modes will be discussed taking into account the size of parkings, the parking toll, and also the possibility of tolling the road (as it gives access to the city center) and modifying the fare of public transportation. Effects such as the Downs-Thomson paradox will be analyzed, as well as the effects of various tolling strategies on the global efficiency of the transportation system and on controlling congestion.