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Microsimulation framework for urban price-taker markets

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Abstract

In the context of integrated transportation and other urban engineering infrastructure systems, there are many examples of markets, where consumers exhibit price-taking behavior. While this behavior is ubiquitous, the underlying mechanism can be captured in a single framework. Here, we present a microsimulation framework of a price-taker market that recognizes this generality and develop efficient algorithms for the associated market-clearing problem. By abstracting the problem as a specific graph theoretic problem (i.e., maximum weighted bipartite graph), we are first able to exploit algorithms that are developed in graph theory. We then explore their appropriateness in terms of large-scale integrated urban microsimulations. Based on this, we further develop a generic and efficient clearing algorithm that takes advantage of the features specific to urban price-taker markets. This clearing solution is then used to operationalize two price-taker markets, from two different contexts, within a microsimulation of urban systems. The initial validation of results against the observed data generally shows a close match.

Keywords

Large-scale microsimulation; Behavioural modelling; Urban markets; Assignment problems

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