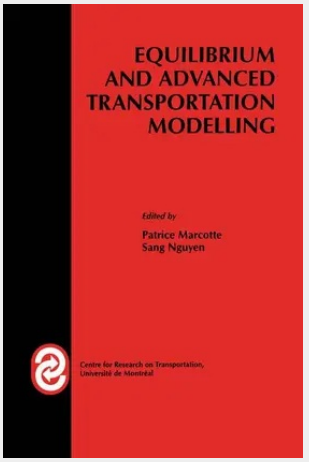
Marcotte

# Equilibrium and Advanced Transportation Modelling




Each chapter in develops a topic from basic concepts to the state-of-the-art, and beyond. All chapters relate to aspects of network equilibrium. Chapter One advocates the use of simulation models for the representation of traffic flow movements at the microscopic level. Chapter Two presents travel demand systems for generating trip matrices from activity-based models, taking into account the entire daily schedule of network users. Chapter Three examines equilibrium strategic choices adopted by the passengers of a congested transit system, carefully addressing line selection at boarding and transfer nodes. Chapter Four provides a critical appraisal of the traditional process that consists in sequentially performing the tasks of trip generation, trip distribution, mode split and assignment, and its impact on the practice of transportation planning. Chapter Five gives an insightful overview of stochastic assignment models, both in the static and dynamic cases. Chapters Six and Seven investigate the setting of tolls to improve traffic flow conditions in a congested transportation network. Chapter Eight provides a unifying framework for the analysis of multicriteria assignment models. In this chapter, available algorithms are summarized and an econometric perspective on the estimation of heterogeneous preferences is given. Chapter Nine surveys the use of hyperpaths in operations research and proposes a new paradigm of equilibrium in a capacitated network, with an application to transit assignment. Chapter Ten analyzes the transient states of a system moving towards equilibrium, using the mathematical framework of projected dynamical systems. Chapter Eleven discusses an in-depth survey of algorithms for solving shortest path problems, which are pervasive to any equilibrium algorithm. The chapter devotes special attention to the computation of dynamic shortest paths and to shortest hyperpaths. The final chapter considers operations research tools for reducing traffic congestion, in particular introducing an algorithm for solving a signal-setting problem formulated as a bilevel program.

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