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In the main urban centers across the world, there is a growing and serious problem arising in its day-to-day transportation activities, both public, private (cars) and commercial: increasingly traffic congestion. This is not only leads to more delays for both public and private users of the urban transportation network, it also causes more accidents and pollution in the short run, and most importantly, deteriorates the quality of life and productivity from practically all citizens in the long term. In short, increasing traffic congestion is a major issue for the sustainability of mega cities, the more acute the larger the city, so its knowledge and resolution is crucial in order to design and develop efficient public policies.

In the case of private cars, when the objective is to study strategic transport plans, the most utilized tool by planners is to carry out the traffic flow equilibrium, based on the equivalent optimization problem that allow finding the static equilibrium of the private traffic assignment problem on large-scale urban networks (macroscopic approach). In such a problem, the decision variables are the aggregated flows of vehicles on each link within the modeled network.

A fundamental limitation of such a static approach, is that this modeling scheme does not recognize that urban networks are utilized by different type of users (drivers), with different driving habits and skills, as well as many other features, that clearly affect the motorists' behavior when sharing the urban infrastructure with other motorists (social, economical, cognitive, and so on). Although such limitations are somehow overcome by micro-simulation approaches, in this research the objective is to include these features in the context of a city-scale equilibrium formulation.

In this thesis we recognize the existence and interaction of different motorists described by specific driving behavior and then we disaggregate the total flow on each link by user type, at a mesoscopic level (aggregate behavior of individuals in the link but differentiating by type of users' driving behavior). This differentiation will allow us treat more realistically the interrelations that occur on the network while travelers are moving from origins to destinations.

The major goal of this research is to develop a multi-user dynamic formulation of the network traffic assignment problem for a generic urban network, considering processes at multiple spatial scales. In this formulation, at the meso spatial level we will recognize different behavioral patterns of individuals sharing the network infrastructure upon time, which will result in link performance functions also differentiated by user type. At a more aggregate level (macro-scale), we will define the equilibrium conditions in the network at any point in time. Among the major contributions of this approach with respect to micro simulation models is that ours attain equilibrium in the network. With respect to more classical macroscopic equilibrium models, we highlight the followings:

• Driving congestion: Considering different users opens the possibility to model another source of congestion affecting each user, generated by the externalities caused by different driving habits onto each user sharing the infrastructure in a given time.

- Travel times on links: If different user classes are considered, also different travel times can be considered in the modeling framework, in line with a more realistic situation.

- Differentiate behavior at a node level: It is possible to model the detail of the operation at each intersection, in order to capture different behaviors and interactions.