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The contribution of the agent-based model to the simulation of urban mobility actors behaviour

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Abstract

The objective of the paper is to explore potentialities and any limits of agent-based models for analyzing the behaviours of the urban mobility actors and for simulating behavioural changes as a consequence of the implementation of given public and private policy measures.

The first part of the work provides a review of research on agent-based models focusing on urban mobility, dealing either with passengers mobility or with freight transport. The features of the reviewed papers included in this survey have been classified according to a taxonomy that includes the following dimensions: model intention, time horizon, dynamical or static structure, agents attitudes, maturity level, usage of the model, data calibration and variables used.

The review have highlighted that agent-based modelling presents important advantages for analyzing city logistics, but more efforts are needed in order to test and improve their use. In fact, the literature on this issue is still lacking. More specifically, on the one hand, attempts of using ABMs for investigating urban mobility are more numerous in the domain of passengers transport than in the one of freight transport, but they are still limited in the number. On the other hand there is a relative high number of ABMs dealing with freight mobility in broader geographical areas, but few that are focused on urban areas. To the best of our knowledge, none uses ABM for analysing and predicting the effects of specific policies on both people and goods mobility in urban areas.

On the basis of the results of this review, in the paper also the design of an ABM framework developed by the authors for modelling passenger urban mobility is presented. The model includes a high number of agents representing individuals with heterogeneous preferences regarding the choice of different transport modes: private car, bicycle and local public transport.

They decide on the basis of their individual preference, of the monetary costs of each option and of the influence of the social network they are embedded in. The impact of policies that aim to foster the use of less polluting options, through incentives at a monetary level and at a motivational level will be observed. The impact of the different types of policies will be estimated also in terms of greenhouse gas emissions deriving from the transport choices of the totality of the agents. The model will be calibrated with data deriving from the urban area of Varese (Italy).

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