

Agent-based modelling of habits in urban mobility

Alice Jacquier¹, Carole Adam¹,

¹ Université Grenoble Alpes, LIG

prenom.nom@univ-grenoble-alpes.fr

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Abstract

Means of mobility have changed a lot recently and will continue to evolve, in order to meet new environmental challenges. For instance, self service electric scooter or VTC are new ways of moving within the city. The SwITCh project aims to create a tool to help urban planners designing smart and sustainable cities that integrate these new mobility modes. This tool will let them explore scenarios to find out tendencies in human behaviour. It is therefore important that this tool can explain the reasons of the population's mobility choices, so as to help deciders change their decisions if needed, to mitigate unwanted behaviours.

Our approach is therefore to provide an agent-based model of the population. This model must recreate and explain the cognitive process of decision. Thus we will not use machine learning models that recreate only the final decision without explaining the reasons leading to it. Many cognitive models of decision making already exist, but most are purely rational. Nevertheless, it has been shown that habits highly impact everyday mobility choices [1]. Therefore we aim at designing a more realistic model of human decision that integrates habits.

Our first model takes into account six rational criteria (time, price, safety, comfort, simplicity and ecology) to calculate a score for each mode of transport. The score is then weighed by a habit coefficient that favors the usual mode of transport. Each agent then makes a decision to choose its favorite mode of transportation depending on its characteristics and the environment.

Our simulator is a GAMA implementation of this agent-based model of how the population of a town chooses their mode of transportation from home to work. With this first version, our results show that better cycling infrastructures result in an increase in the number of cyclists; but that a simple petrol price rise is not enough to discourage car users, who still stick to their habit.

In later work, we propose to enhance the BDI architecture in order to directly integrate habits in the reasoning. Concretely, habits are created when an action is performed multiple times in a stable context. Using this information, we will create a database of habits for each agent, from which the agent can use an habit anchor coefficient to prioritize one plan over another. This will allow to investigate other urban planning strategies, such as making interventions at specific rupture points in an agent's routine: changing job, moving home, etc. Such rupture points have been shown to be particularly favorable to introduce new, better habits. The simulator will also be turned into a serious game where players take on the role of urban planners to better understand the impact of their mobility choices on various indicators (well-being, pollution, traffic jams, etc).

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References

- [1] Olivier Brette, Thomas Buhler, Nathalie Lazaric, and Kevin Marechal. Reconsidering the nature and effects of habits in urban transportation behavior. *Journal of Institutional Economics*, 10(3):399–426, 2014.