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Build a serious game with Gama: some insights from SimSwitch

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Abstract

Urban mobility is a key issue for the environmental and social transition: transport accounts for more than 30% of France's greenhouse gas (GHG) emissions in 2019, and urban mobility represents almost 40% of CO₂ emissions of the transport sector in Europe [3]. It is a multi-level issue that is shared by residents as users of mobility stakeholders providing transports, and local planning and transport authorities (elected representatives, urban planners, etc.). In addition to this multi-level aspect, the system involves numerous interacting components (infrastructure, means of transport, transport needs, etc.), forming a complex, constantly evolving system. There is also the question of system representations that may impair transition and good functioning of the system [2]. Indeed, biases of users and planners can induce decisions leading to undesirable situations, or can prevent the expected effects of a decision from being obtained (e.g. rebound effect, inertia, habits...).

It is therefore a significant challenge to provide stakeholders with a more comprehensive understanding of the system, encompassing not only its constituent components but also the underlying dynamics and the implications for decision-making. This can be done through more accessible version of numerical simulation models, for instance in the form of a video game. With this in mind, we designed Sim-Switch, a game aimed at the general public. Compared with other games on urban mobility, it has the original feature of bringing the question of modal choices to the fore by integrating cognitive and representational biases of transport users.



Figure 1: Screenshot of the game UI made with Unity and connected with the Switch agent-based game powered with Gama platform

Sim-Switch relies on an agent-based model implemented with the GAMA platform and inspired by the mobility choice agent-based model of [1]. The model is made up of three entities: the city, its districts, and households. The player takes on the role of the mayor, who can change the infrastructure or mobility rules within the urban area. Households draw up their mobility plans for each pair of the origin-destination matrix of districts; the selection of their mode of transport reflects the main cognitive biases associated with this type of decision-making process. The city and its districts then update the player's decisions (e.g. updating accessibility levels by mode on each section) and the households' decisions (e.g. updating actual

traffic or congestion levels), giving the player a direct feedback on her/his decisions. This enables the player to comprehend the manner in which the system responds to alterations, thereby facilitating a more comprehensive grasp of its intrinsic dynamics.

In this communication, we will describe the *gamification* process that turns a classical agent-based simulation into a fully autonomous video game. First, we will discuss the challenges relative to the use of an ABM simulation in a video game (e.g. how you deal with time, user interactions, initial setup of a game session). Second, we will talk about the specificity of developing a Gama-Unity coupled software to bring a web-browser game.

Additional material

Sim-Switch github repository

References

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