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# Moov'Hanoi: A Data-Driven Agent-Based Model for Simulating Multimodal Urban Mobility in Hanoi

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## Keywords

Urban Mobility, Agent-Based Modeling, Public Transportation, Multimodal Transport, Traffic Simulation

## Abstract

Hanoi, like many rapidly urbanizing cities in Asia, faces significant mobility challenges due to its high population growth, reliance on private vehicles, and underdeveloped public transport systems. This paper presents an agent-based model developed to simulate multimodal urban traffic within the complex environment of Hanoi, Vietnam. As part of the Moov'Hanoi project, our model integrates geographic data, public transport schedules, and population mobility surveys to create a virtual environment for testing various urban mobility scenarios. The model simulates individual travelers, multiple transportation modes (including motorbikes, cars, buses, and metro), and their interactions within Hanoi's urban landscape. Key features include:

- A synthesized population based on survey data, capturing the heterogeneity of Hanoi's residents
- Integration of OpenStreetMap data for accurate representation of road networks
- Simulation of public transport systems, including buses and the newly operational metro line
- Implementation of congestion effects on road speeds
- Modeling of individual decision-making processes for mode choice and route selection

The goal of this research is to model and analyze multimodal urban traffic, with a specific focus on optimizing public transport routes, reducing traffic congestion, and promoting sustainable transportation alternatives. The agent-based modeling approach allows for the representation of individual behaviors, traffic patterns, and the impacts of policy interventions. Preliminary results provide insights into journey times, congestion patterns, and modal split under different scenarios. The model demonstrates potential for evaluating the impact of new infrastructure developments, such as metro line expansions, and for testing policy interventions aimed at encouraging shifts from private vehicles to public transport. This research contributes to the growing field of agent-based modeling for urban systems, offering a tool for city planners to test hypotheses, explore "what-if" scenarios, and predict outcomes of potential policy changes in complex urban environments.

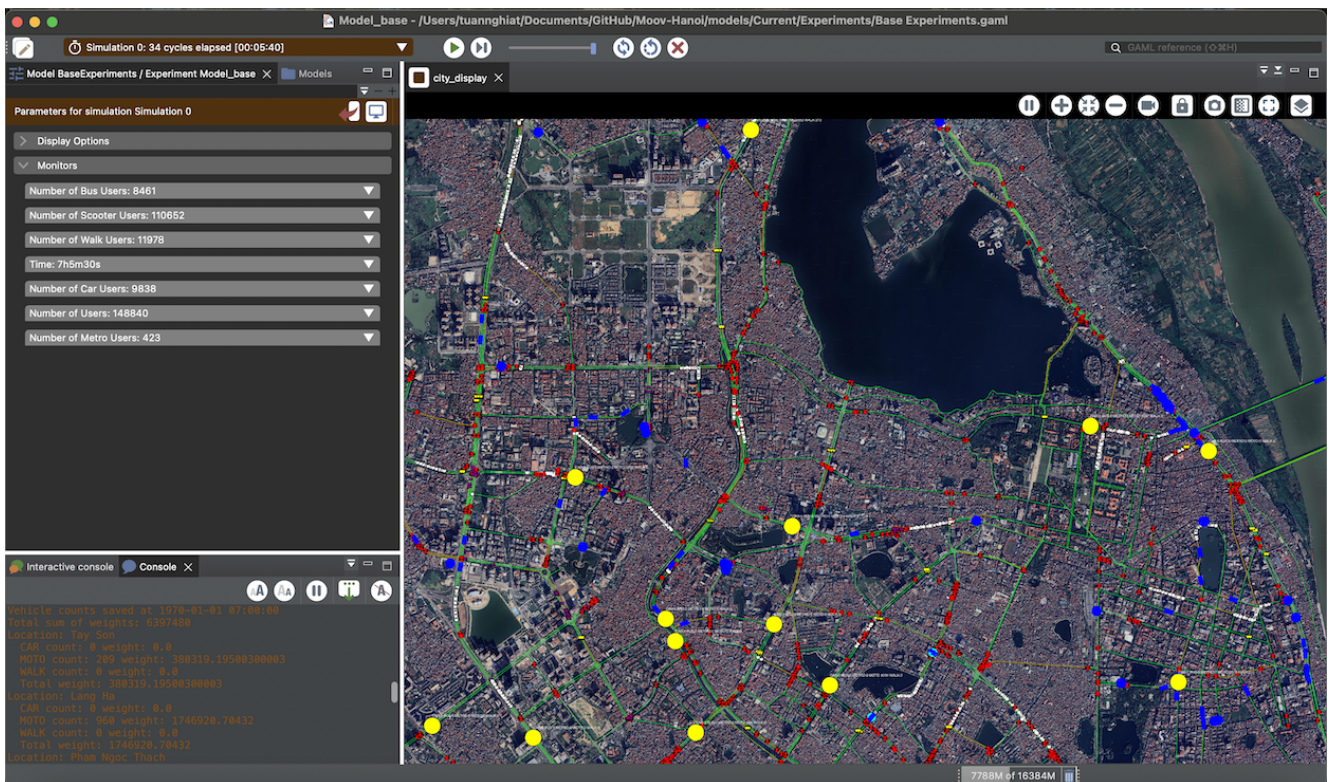


Figure 1: Moov'Hanoi Simulation Interface: Visualizing Urban Mobility Patterns in Hanoi Center on the GAMA Platform