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TravelAgent: Generative-Agents Simulator for Human Behavior Analysis in Design Environments

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Keywords

Urban Planning, Architectural Design, Human Behavior, Generative Agents, Simulation, Agent-Based Modeling

Abstract

Understanding human interaction with built environments is essential for designing functional and engaging urban spaces[3, 1]. Traditional methods, such as manual observations, surveys, and simplified simulations, often fall short of capturing the complexity of real-world behaviors[2]. To address this, we introduce **TravelAgent**, a platform designed to simulate human behavior in spatial environments through Generative Agents.

TravelAgent enables agents to roam, navigate, observe, and perform tasks in virtual spaces, using human-like navigation cues—such as vision, spatial memory, and prior knowledge—without relying on predefined routes or maps. Decisions made by these agents, including navigation, interaction, and exploration, are processed using language models, allowing for inference and analysis of behaviors. This approach closely mimics how humans perceive and engage with their surroundings, whether familiar or novel.

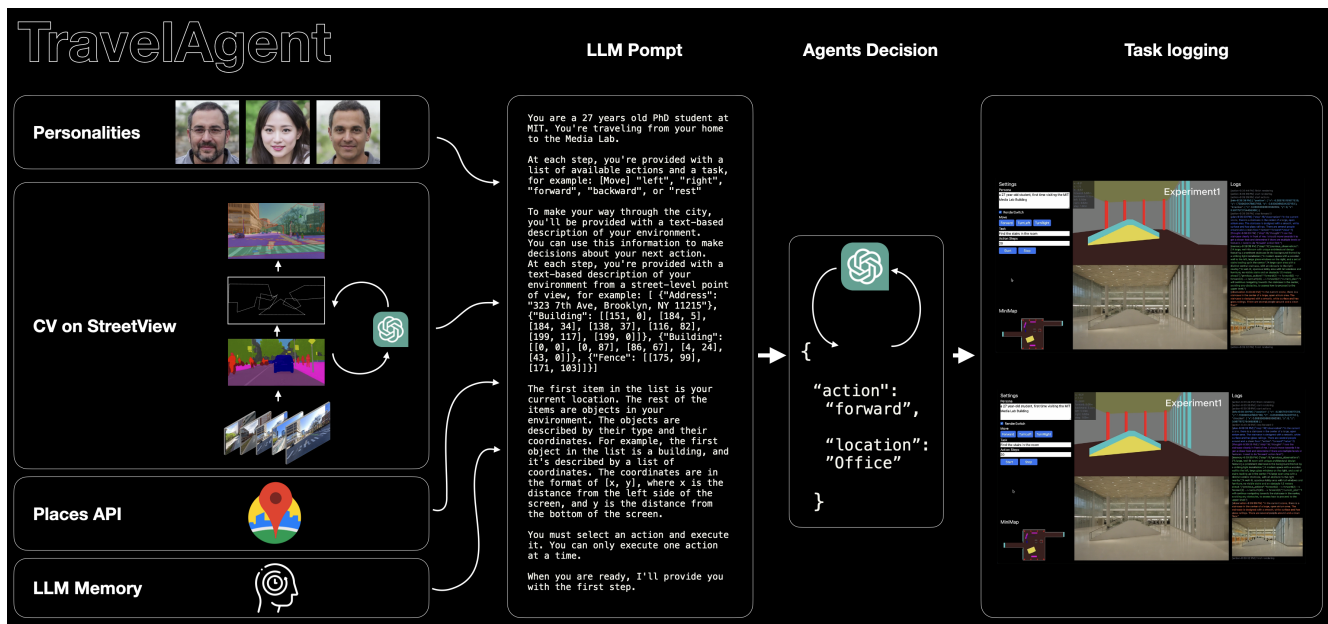


Figure 1: TravelAgent: Overview of the system architecture. The platform integrates generative agents[4], street-level computer vision, and Chain-of-Thought (CoT) language models to simulate human behavior in urban and design environments.

System Overview: TravelAgent combines Chain-of-Thought (CoT) in Large Language Models (LLMs), computer vision models, and image generation diffusion models to simulate human perception and behavior. Experiments involve: (1) creating 3D scenes of interior or exterior environments; (2) generating sensory inputs such as realistic point-of-view images, segmentation maps, discovery maps, and memory cues; (3) using a CoT framework to process sensory inputs, guiding planning, decision-making, and memory management; Finally, (4) each experiment is recorded, facilitating post-experiment analysis and enabling interactive dialogues with the agent.



Figure 2: TravelAgent simulation interface showing a street scene with agent navigation logs and decision-making process. This platform visualizes the agent’s perception and behavioral decisions in different urban scenarios.

Objectives: TravelAgent aims to evaluate how individuals might respond to different design scenarios, such as varied urban design elements of a street section, the spatial arrangement of a public plaza affecting wayfinding, or visitor navigation through a museum exhibition. By analyzing the behavior of generative agents in these simulations, designers can gain insights into the potential challenges, risks, and opportunities of various design choices prior to real-world implementation. This tool enhances our understanding of human-environment interaction and assists urban planners and designers in creating more intuitive, user-friendly spaces.

References

- [1] Michal Gath-Morad et al. “The role of strategic visibility in shaping wayfinding behavior in multilevel buildings”. In: *Scientific Reports* 14.1 (2024), p. 3735.
- [2] Ariel Noyman. “CityScope: An Urban Modeling and Simulation Platform”. PhD thesis. Massachusetts Institute of Technology, 2022.
- [3] Ariel Noyman and Kent Larson. “Deepscope: HCI platform for generative cityscape visualization”. In: *Extended abstracts of the 2020 CHI conference on human factors in computing systems*. 2020, pp. 1–9.
- [4] Joon Sung Park et al. “Generative agents: Interactive simulacra of human behavior”. In: *Proceedings of the 36th annual acm symposium on user interface software and technology*. 2023, pp. 1–22.