Revealing Unexplored Data: Architectural Design Insights through Crowd Behavior Simulations. A case study from professionals' perspectives.

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Agent-based simulation (ABS) accurately models individual actions and interactions in diverse environments, including crowd behavior in digital spaces. In architecture, ABS research focuses on areas like wayfinding and design outcomes, but there's a gap in understanding how ABS can inform architectural decision-making. This includes integrating ABS into design workflows and extracting design insights from ABS data.

This research aims to explore the potential of Crowd Behavior Simulations within the architectural practice by examining these aspects from the viewpoint of current design professionals, specifically those from RSP Architects, the architectural firm responsible for designing the building under study, the 'Campbell Hall Institute of Childhood Learning'. This research aims to uncover previously overlooked data from the building design process, which can be revealed through simulation. By extracting insights from these simulations, the goal is to inform architectural decision-making and improve the effectiveness of design considerations in the early stages of future projects, with ABS software serving as a valuable support tool.

As a first step, a literature review and software analysis were conducted. Subsequently, the Building Case Study was studied to configure the scene and agents using ABS Software. Finally, simulations were run, and task-oriented interviews were conducted. Architects analyzed their design alongside simulations illustrating crowd behaviors, and evaluated overlooked data by comparing the actual building outcome with insights gained from observing different simulation scenarios.

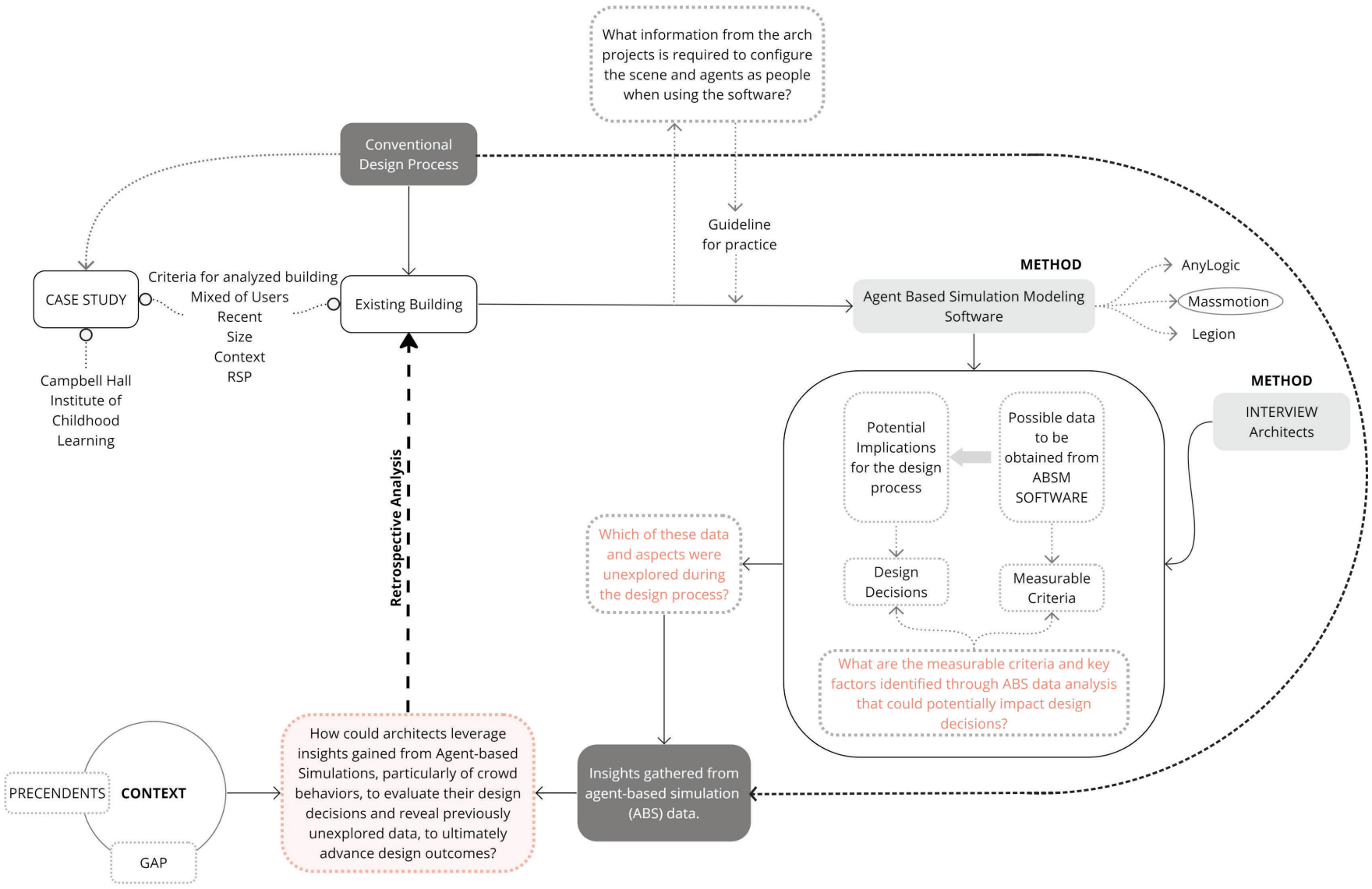

Figure 1. Research Design, Context Overview.

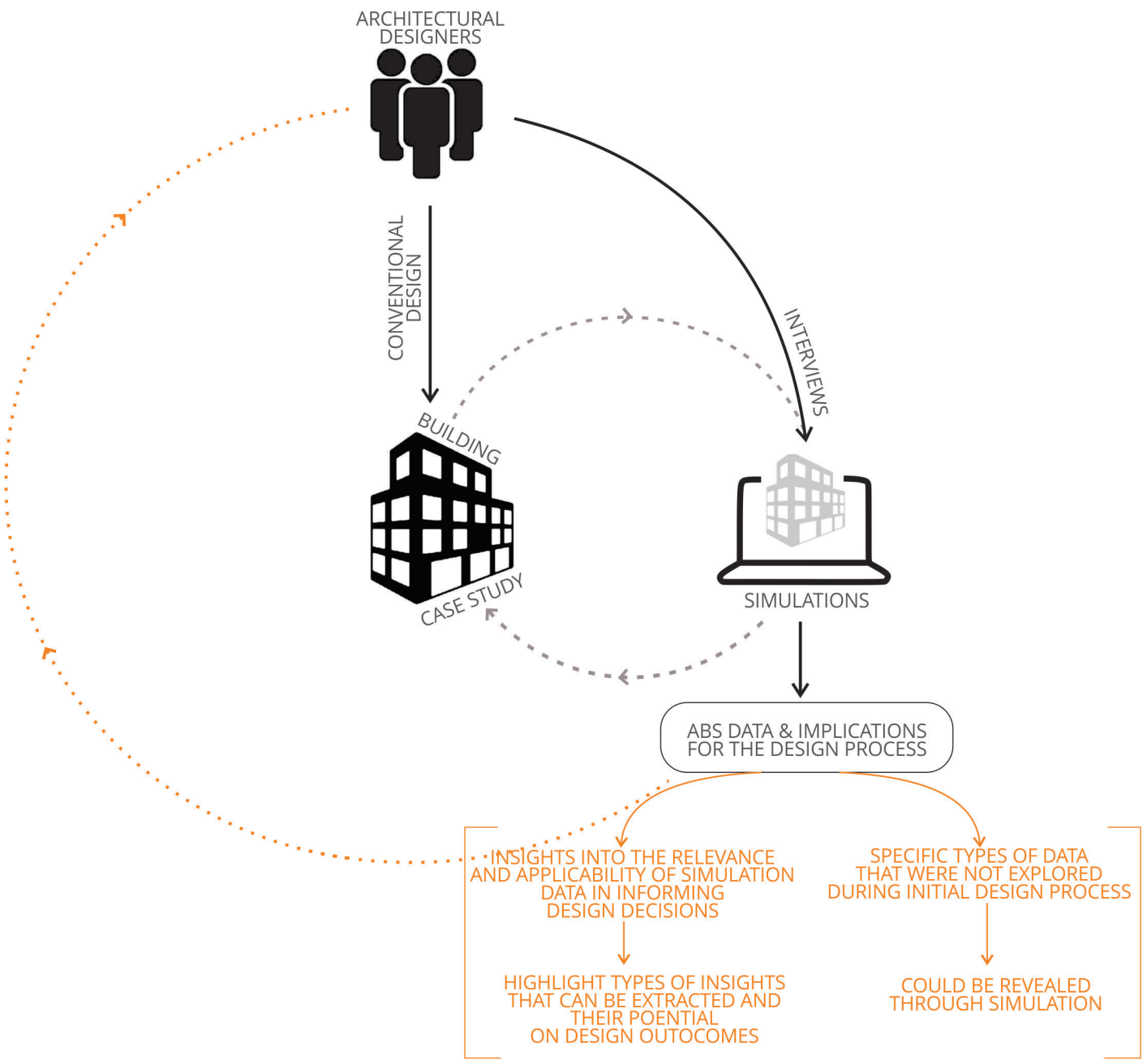

Figure 2. Research Design Diagram.

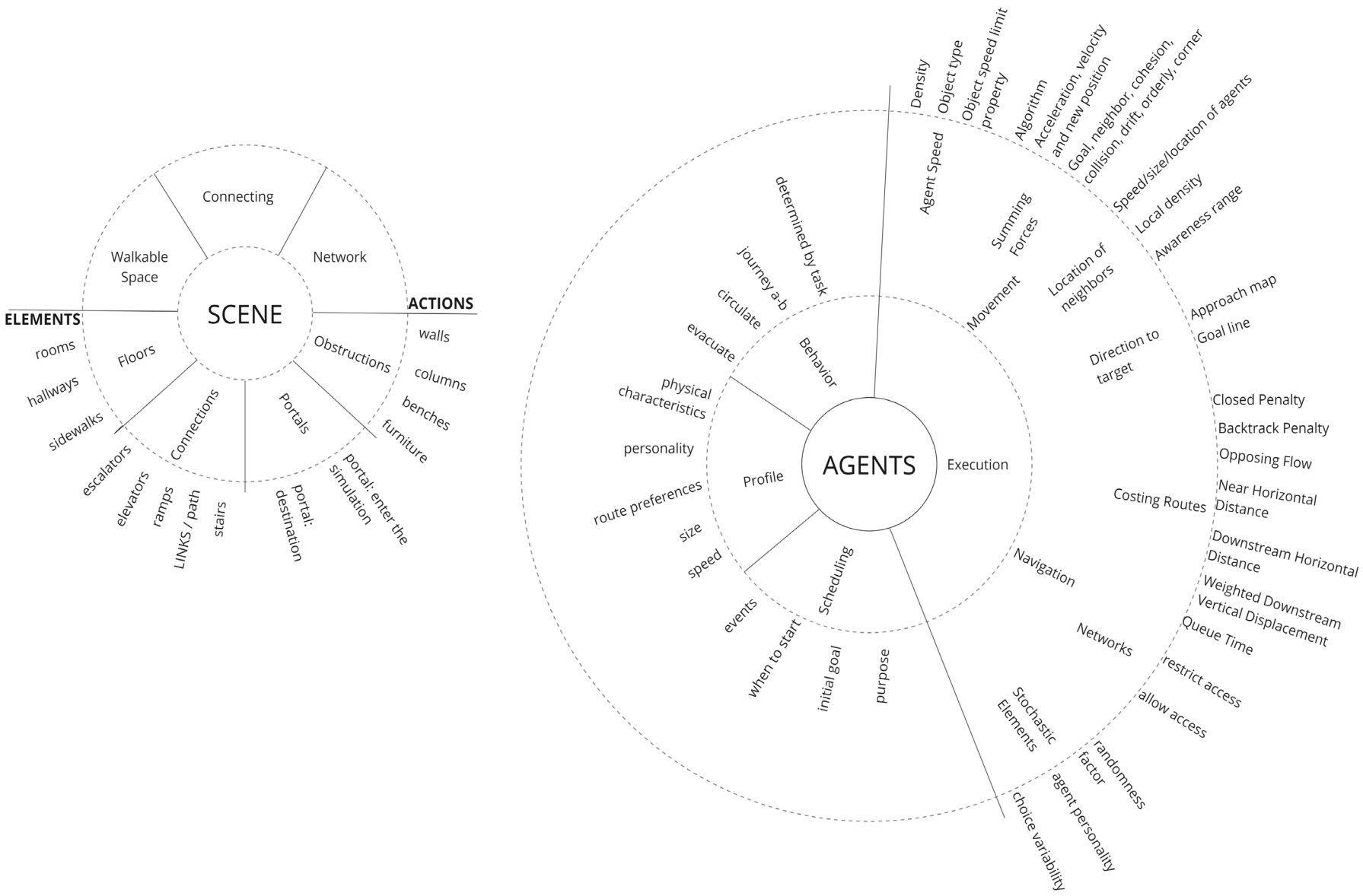

Figure 3. Agent Based Simulation, specific configurations of the software

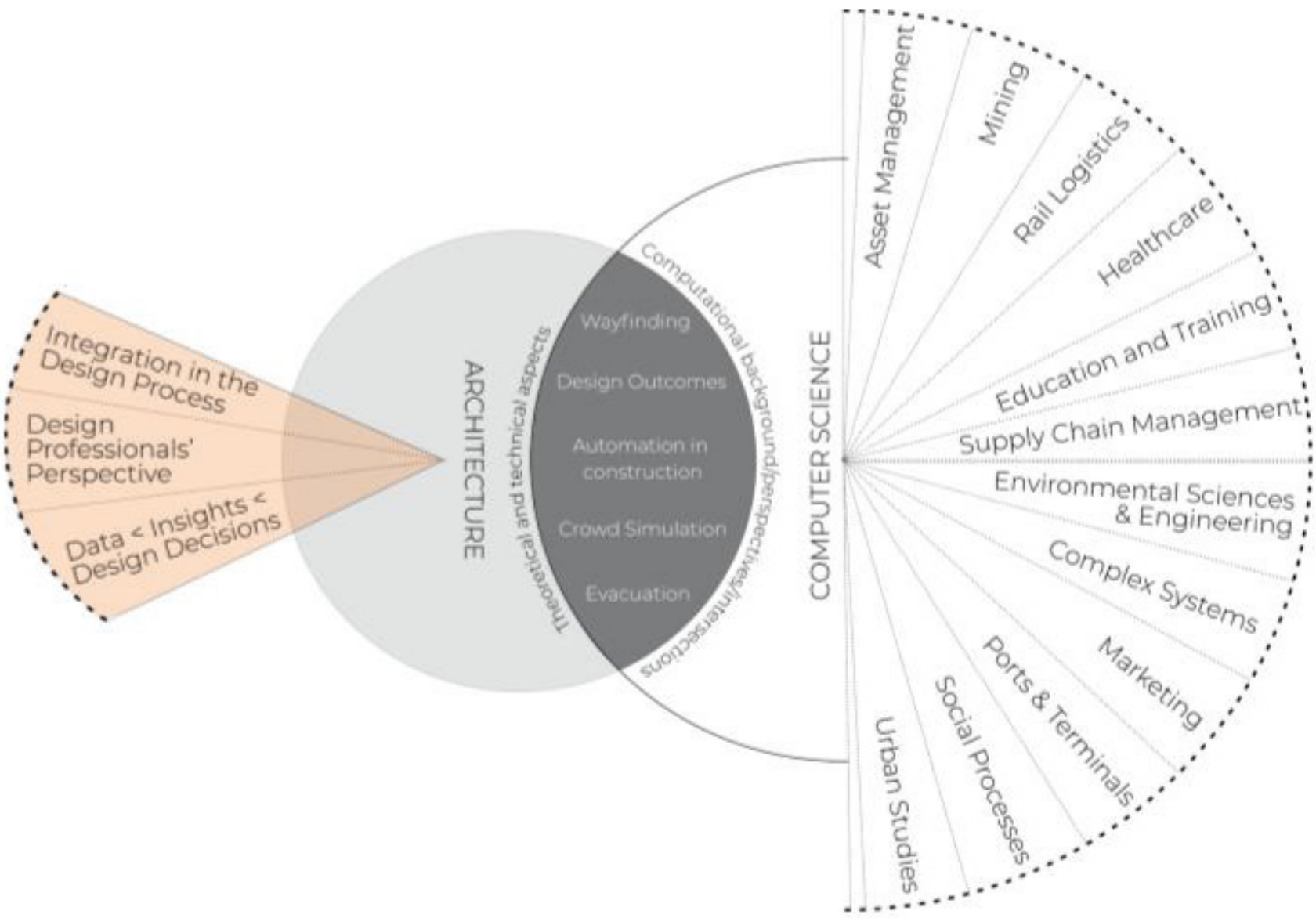

Figure 4. ABS and Architecture. Gap and Intersections.

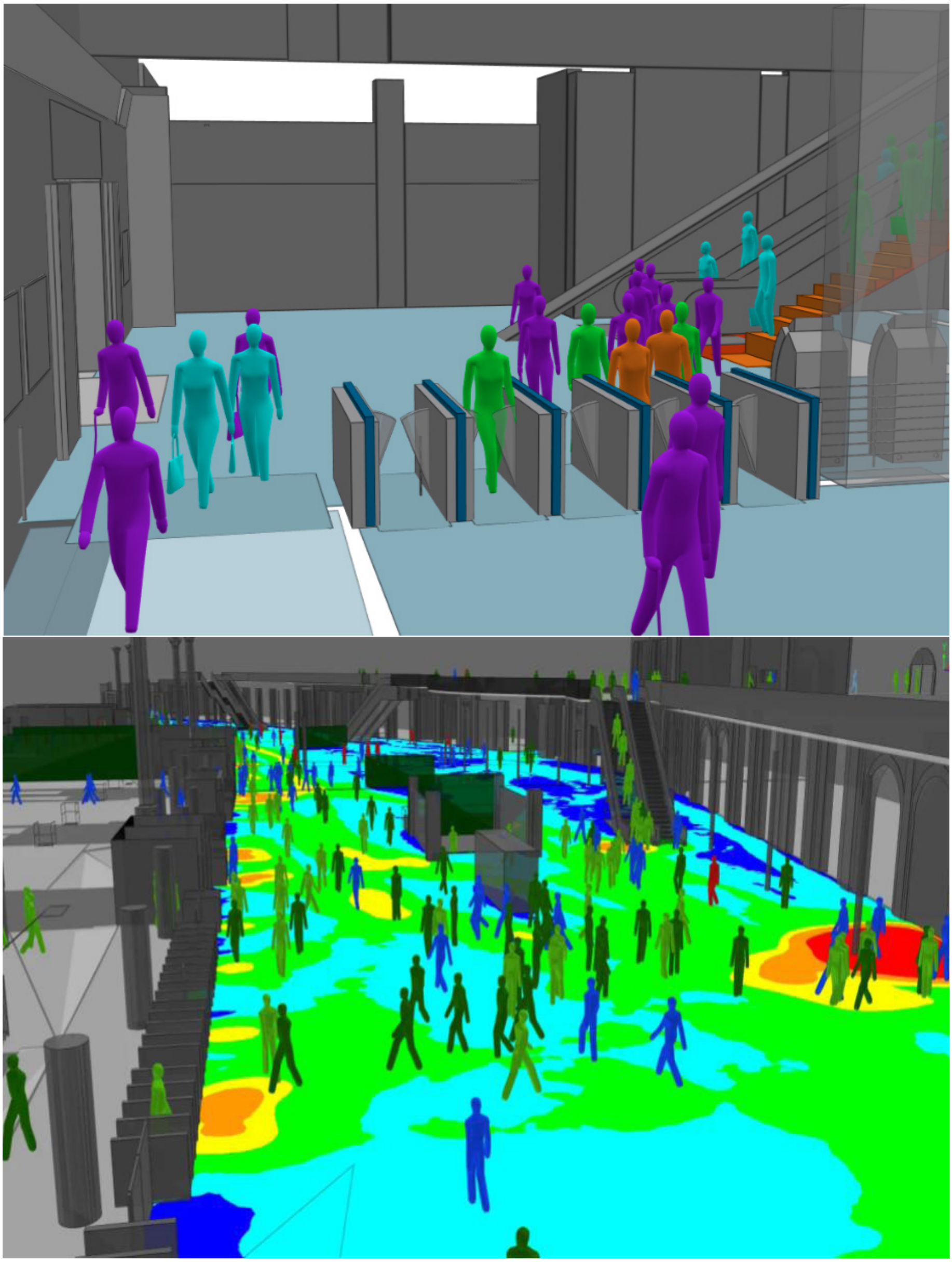

Figure 5. Massmotion software, example of movement patterns and crowd behaviour simulations.
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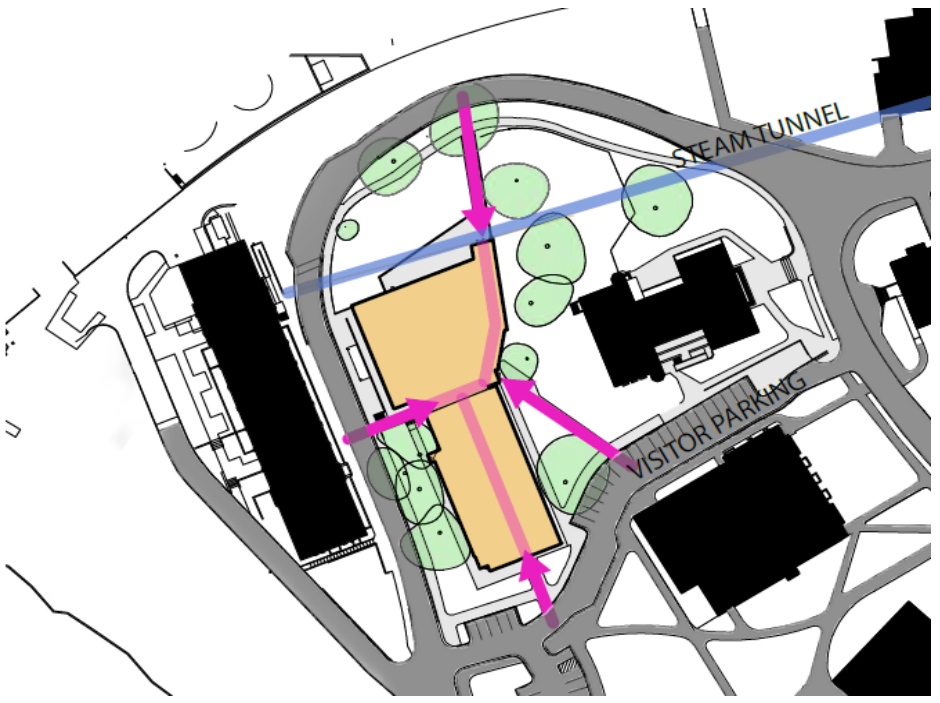

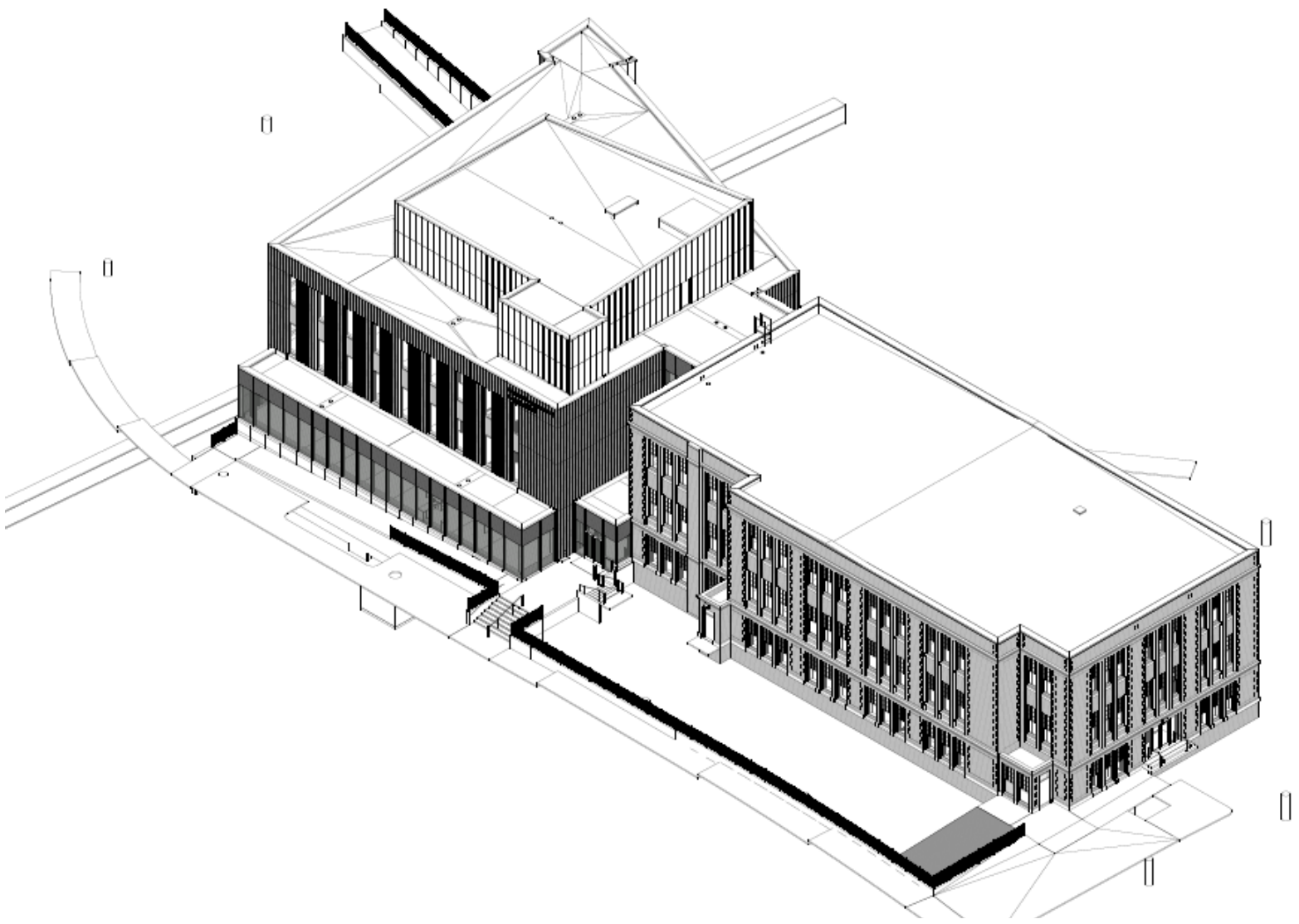

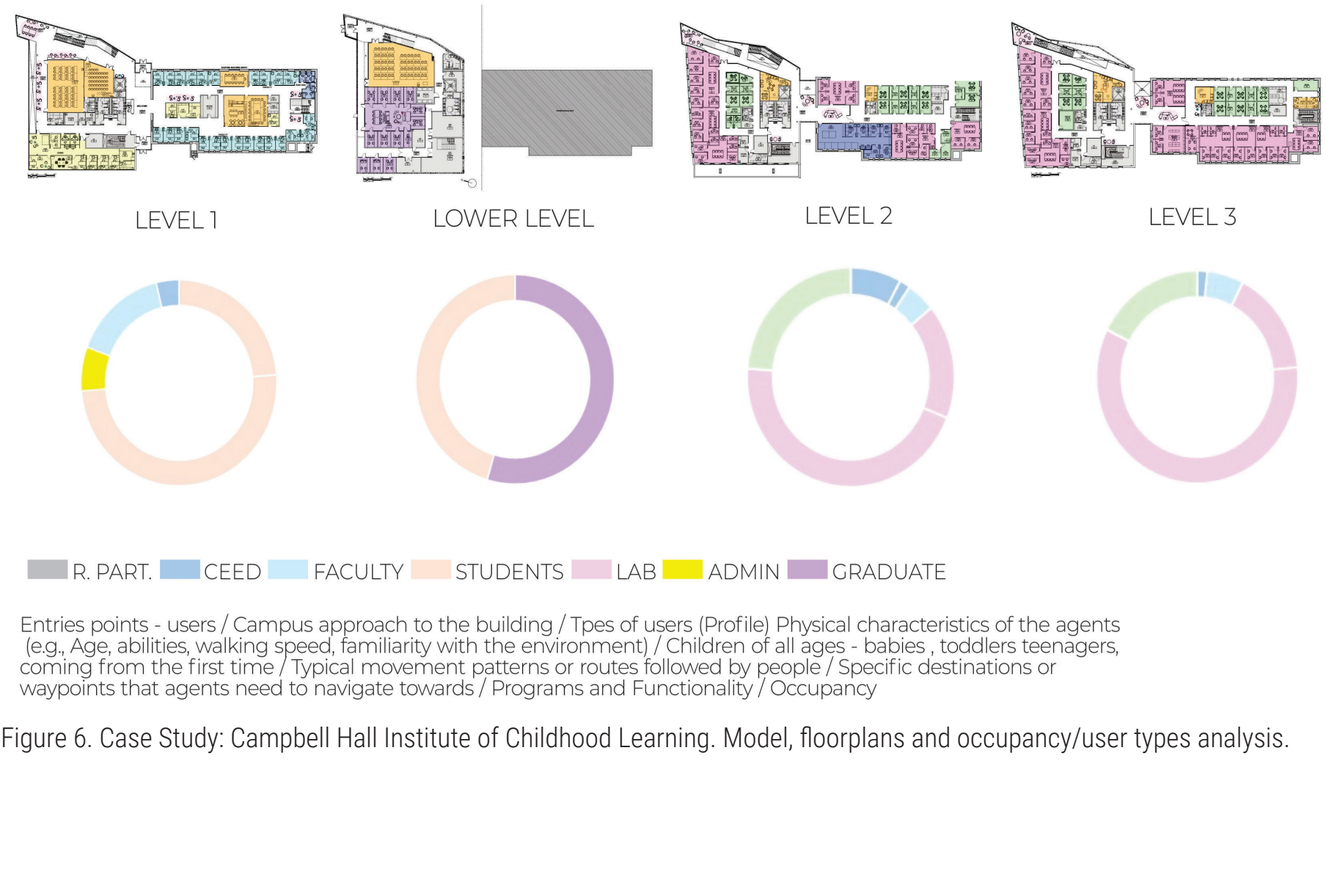

Entries points - users / Campus approach to the building / Tpes of users (Profile) Physical characteristics of the agents (e.g., Age, abilities, walking speed, familiarity with the environment) / Children of all ages - babies , toddlers teenagers, coming from the first time / Typical movement patterns or routes followed by people / Specific destinations or waypoints that agents need to navigate towards / Programs and Functionality / Occupancy

Figure 6. Case Study: Campbell Hall Institute of Childhood Learning. Model, floorplans and occupancy/user types analysis.