

Joint Parametric Modeling of Buildings and Crowds for Human-Centric Simulation and Analysis

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Abstract. Simulating groups of virtual humans (crowd simulation) affords the analysis and data-driven design of interactions between buildings and their occupants. For this to be useful in practice however, crowd simulators must be well coupled with modeling tools in a way that allows users to iteratively use simulation feedback to adjust their designs. This is a non-trivial research and engineering task as designers often use parametric exploration tools early in their design pipelines. To address this issue, we propose a platform that provides a joint parametric representation of (a) a building and the bounds of its permissible alterations, (b) a crowd that populates the environment, and (c) the activities that the crowd engages in. Based on this input, users can systematically run simulations and analyze the results in the form of data-maps, spatialized representations of human-centric analyses. The platform combines Dynamo with SteerSuite, two established tools for parametric design and crowd simulations, to create a familiar node-based workflow. We systematically evaluate the approach by tuning spatial, social, and behavioral parameters to generate human-centric analyses for the design of a generic exhibition space.

Keywords: Human-centric analytics, crowd simulation, parametric modeling, building occupancy, multi-agent systems.