

# A modular framework for multi-behavior and multi-scale simulation of pedestrians

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## Abstract

Crowd simulation has been the subject of intensive research over the past two decades, and this work has produced successful findings in a wide range of applications, including computer graphics, urban planning, and many more. The modeling of crowds in high-density situations, however, remains a challenge for researchers. The majority of cutting-edge methods concentrate their attention on the operational level, which is where pedestrians adapt their behavior to prevent local collisions with their neighbors while maintaining their primary path to their objective. In densely populated environments, it is necessary to carry out in-depth research into higher levels of behavior: strategic and tactical levels [1], at which pedestrians decide where they want to go and how to choose a route to the predefined destination. Here, we introduce a modular framework that allows modelers to dynamically incorporate a variety of modeling techniques to simulate the multi-level behaviors of pedestrians. In addition to that, this framework is able to perform multi-scale simulations, which means that in the same environment, individuals, groups, and flows may all be taken into consideration. Finally, we present a set of applications in order to demonstrate the capability of the framework.

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## References

- [1] Serge P Hoogendoorn and Piet HL Bovy. Pedestrian route-choice and activity scheduling theory and models. *Transportation Research Part B: Methodological*, 38(2):169–190, 2004.