

## 論 文 要 旨

## Thesis Abstract

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| 主論文題名 (Title)<br>A human behavioral pedestrian simulation model with reinforcement learning approach   |     |               |                   |
| 内容の要旨 (Abstract)<br><p>Pedestrian simulation has a significant role thanks to its contributions in many research fields, including robotics, human safety, and urban planning. However, perfectly simulating pedestrian behavior is difficult because of the complexity of the human cognition system. This complexity causes many problems, such as cognitive bias or human mistakes, which could not be achieved by using an optimization method. Many pedestrian simulation models approach the problem by using an empirical model, often with force-based or rule-based methods. While these approaches could provide believable results in common situations, it does not always resemble natural pedestrian navigation behavior in certain settings. To improve the replicated behavior of the pedestrian, the simulation model needs to consider the ideas in human factors and human cognition.</p> <p>We proposed a model to simulate pedestrian navigation by adopting several concepts of the human cognitive system in behavioral science combined with reinforcement learning. The proposed model was correspondingly designed consisting of two tasks: a pedestrian path-planning task to simulate the navigation planning process in the pedestrian's mind, and a pedestrian interacting task to replicate the interaction between the pedestrian and another obstacle while following the planned navigation. For a more realistic human behavior, we also suggested a prediction method based on the predictive process in human cognition.</p> <p>In addition, risk assessment of the obstacle's danger is another focus in this dissertation. While this process could substantially affect how a pedestrian navigates, this problem is often overlooked in other studies. In our research, we have addressed the risk determination mechanism by humans and its effect on the pedestrian's navigation. Based on that, risk assessment methods were modeled and incorporated extensively in many aspects of our behavioral pedestrian simulation model.</p> <p>The empirical result demonstrates a highly realistic human behavior of pedestrian interactions, which resembles actual situations in real life. The simulated pedestrian actions share many similarities with a human pedestrian in several aspects such as following common walking conventions and human behaviors.</p> |     |               |                   |