Computer Science
Seminar

An Integrated Human Decision Making Model under Extended Belief-Desire-Intention Framework: Emergency Evacuation Applications

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Abstract: In this talk, we discuss an integrated Belief-Desire-Intention (BDI) modeling framework for human decision making, whose sub-modules are based on Bayesian belief network, Decision-Field-Theory, and probabilistic depth first search technique. A key novelty of the proposed model is its ability to represent both the human decision-making and decision-planning functions in a unified framework. In this talk, the proposed modeling framework is demonstrated for humans evacuation behaviors under a terrorist bomb attack situation. To mimic realistic human behaviors, attributes of the BDI framework are reverse-engineered from the human-in-the-loop experiments conducted in the Cave Automatic Virtual Environment (CAVE) available at The University of Arizona. A crowd simulation is then constructed, where individual human behaviors are based on what was learned from the CAVE experiments. In this work, the simulated environment and humans conforming to the proposed BDI framework are implemented in AnyLogic agent-based simulation software, where each human entity calls external Netica BBN software to perform its perceptual processing function and Soar software to perform its real-time planning and decision-execution functions. The constructed crowd simulation is then used to test impact of several factors (e.g. demographics of people, number of policemen, information sharing via speakers) on evacuation performance (e.g. average evacuation time, percentage of casualties). Finally, we discuss other emergency evacuation applications (e.g. evacuation behaviors under fire in a factory) and research extensions for the proposed BDI framework.

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