Prasant Rekapalli May 16th 2:00pm to 4:00pm
G212 CIVL

TITLE
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Discrete-Event Simulation based Virtual Reality Environments for Construction Operations

ABSTRACT
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Discrete-event simulation (DES) is a quantitative technique that can significantly improve the analysis and design of construction operations. As the complexity of an operation increases, so does the utility of modeling it using DES and the need for enhanced capabilities in the information technology that is required.

At the onset of this research, the state-of-the-art allowed engineers to (a) model very complex construction operations using DES, and (b) photo-realistically animate previously simulated operations with temporal and spatial accuracy in 3D. It was not possible for an engineer who was experiencing an animation to interact with it in ways that could affect the course of the remaining events in the simulation. As a consequence, the engineer could not test the response of a DES model to the spontaneous curiosity that often comes about while viewing an animation. This state of technological advance limited the ability of engineers to validate complex construction operations, and contributed to limit the credibility of DES studies.

The research presented in this dissertation advanced the state-of-the-art so that now engineers can: (a) run animations and their simulations concurrently, and (b) interact with animations to change the course of events in their simulations. These advances make it possible to create essentially what is a Virtual Reality environment with the underlying logic defined by a sophisticated DES model where engineers can study/visualize the model’s reaction to events introduced by them while experiencing the concurrently run animation. This can provide construction engineers with an increased understanding of the underlying DES model, simulation experiments that can/should be conducted, and possibly insights about the underlying operation itself. In short, these advances allow experts and decision-makers to get a clear understanding of what is and what is not modeled – a necessary condition for achieving credibility.

The tangible product from this research, in combination with DES and 3D animation, is similar to a 3D gaming toolkit with the important difference being the serious nature of the underlying logic supported. This makes it possible to develop high-impact ‘serious games’ of construction that can be used for teaching and training at all levels.