

## Creating Crane-Based Functionality In Virtual Environments to Facilitate Heavy Machinery Assembly Studies

*We present the design and implementation of a fully functional overhead crane in a virtual assembly environment. This feature is essential for realistic assembly simulations of large-sized assemblies that are assembled using cranes; simulation environments that only use hands and handheld tools for assembly are inadequate. We discuss the crane geometry, the motion and degrees of freedom of the crane components, user interaction with the crane, user interaction with the part, and physically based modeling that allows gravity, reaction to forces, and collision detection. The results of an experiment comparing the virtual and real crane are also presented. Using this functionality, a module for the assembly of large press machines has been developed for Komatsu Ltd., an industry partner of the Virtual Assembly Technology Consortium (VATC). This module has been integrated with the existing virtual assembly design environment (VADE).*

*Keywords: crane simulation, physically based modeling, virtual assembly*