

## A haptic-based approach to virtual training for aerospace industry

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In the last years, the industrial world has been increasingly adopting computer-aided solutions for design for maintainability and maintenance training tasks with the goal to reduce development costs and to shorten time, and to improve product and service quality. Computer-based training systems created to simulate machine assembly maintenance are normally operated by means of ordinary human-computer interfaces (keyboard, mouse, etc.), but this usually results in systems that are far from the real procedures, and therefore not effective in terms of training. In this study, we show that a better solution may come from the combination of virtual reality techniques and haptic interaction. To this regard, we present the results of a research aimed at testing and evaluating the effectiveness of the haptic feedback for first-person maintenance tasks targeted to the aerospace industry. The proposed system implements an interaction environment in which each of the main maintenance activities can be simulated by the trainee exploiting a hand-based commercial haptic device, operated by means of specific haptic-rendering techniques to provide realistic feedbacks during manipulation. A usability study is included to help assessing the potential of this approach.