Invited speech

Virtual Reality and interactive and immersive planning for the assistance to manipulation or navigation

Philippe FILLATREAU
National Engineering School of Tarbes – Production Engineering Laboratory (LGP-ENIT)
University of Toulouse
Toulouse, France
philippe.fillatreau@enit.fr

Abstract–In industry, whereas the economic competition increases, up-to-date industrial products are more and more integrated and the tasks related to their lifecycle (assembly, maintenance, disassembly…) have to be performed under sometimes very strong geometric constraints. In the context of Industry 4.0 (Factory of the Future) and PLM (Product Lifecycle Management), industrial companies therefore express the needs to validate these tasks from design stage on, in order to be able to update the design of these products (before manufacturing the physical prototypes) if needed. Such an approach allows to reduce development time and cost, to detect errors as early as possible, and to target more environment friendly development processes. When simulating such complex scenarios, it is necessary to deal with the relative positioning or to the movement of objects and of resources (machines, robots, human operators) that manipulate them. A key issue is then to find a path, a trajectory, a movement to show the feasibility of scenarios and simulate what the execution of a task will be.

Our works deal with the assistance to the simulation and validation of such complex scenarios in Virtual Reality. We present the original scientific approach on which these works are based: the joint use of motion planning and VR techniques to validate the feasibility of the movement for the simulated scenarios in an interactive and immersive way, with visuo-haptic guidance to the human operator in the loop. The initial approach was based on the use of purely geometric models. In order to improve the relevance of the assistance and the modalities of interaction and control sharing (authority sharing and intents detection) between the VR platform and the human operator, we then considered higher abstraction level (topological and semantic) data than the purely geometrical data traditionally used. Finally, for a better, task- or trade-oriented assistance, and in order to move from the "virtual experience" to the "trade-oriented experience", our work now targets the development of joint, interactive and immersive task and path planning strategies.