



## Modeling Dynamic Interaction in Virtual Environments and the Evaluation of Dynamic Virtual Fixtures

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### Résumé en anglais

Virtual reality (VR) is a technology covering a large field of applications among which are sports and video games. In both gaming and sporting VR applications, interaction techniques involve specific gestures such as catching or striking. However, such dynamic gestures are not currently being recognized as elementary task primitives, and have therefore not been investigated as such. In this paper, we propose a framework for the analysis of interaction in dynamic virtual environments (DVEs). This framework is based on three dynamic interaction primitives (DIPs) that are common to many sporting activities: catching, throwing, and striking. For each of these primitives, an original modeling approach is proposed. Furthermore, we introduce and formalize the concept of dynamic virtual fixtures (DVF). These fixtures aim to assist the user in tasks involving interaction with moving objects or with objects to be set in movement. Two experiments have been carried out to investigate the influence of different DVFs on human performance in the context of ball catching and archery. The results reveal a significant positive effect of the DVFs, and that DVFs could be either classified as “performance-assisted” or “learning-assisted.”

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