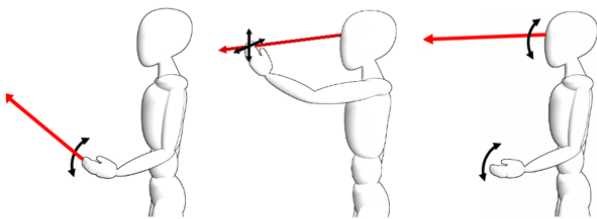


# A survey of 3D object selection techniques for virtual environments

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Computer graphics applications controlled through natural gestures are gaining increasing popularity these days due to recent developments in low-cost tracking systems and gesture recognition technologies. Although interaction techniques through natural gestures have already demonstrated their benefits in manipulation, navigation and avatar-control tasks, effective selection with pointing gestures remains an open problem. In this paper we survey the state-of-the-art in 3D object selection techniques. We review important findings in human control models, analyze major factors influencing selection performance,

and classify existing techniques according to a number of criteria. Unlike other components of the applications user interface, pointing techniques need a close coupling with the rendering pipeline, introducing new elements to be drawn, and potentially modifying the object layout and the way the scene is rendered. Conversely, selection performance is affected by rendering issues such as visual feedback, depth perception, and occlusion management. We thus review existing literature paying special attention to those aspects in the boundary between computer graphics and human-computer interaction.