State-of-the-Art of the Role of Perception for Computer Graphics

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Traditionally, computer graphics strived to achieve the technically best representation of the scenario or scene. For rendering, this lead to the preeminence of representations based on the physics of light interacting with different media and materials. Research in virtual reality has focused on interactivity and therefore on real-time rendering techniques that improve the immersion of users in the virtual environments. In contrast, visualization has focused on representations that that maximizes the information content. In most cases, such representations are not physically-based, requiring instead more abstract approaches. Recently, the increasing integration of the extensive knowledge and methods from perception research into computer graphics has fundamentally altered both fields, offering not only new research questions, but also new ways of solving existing issues. In rendering, for example, the integration can lead to the targeted allocation of computing resources to aspects of a scene that matter most for human observers. In visualization, the manner in which information is presented is now often driven by knowledge of low-level cues (e.g., pre-attentive features). Assumptions about how to best present information are evaluated by a psychophysical experiment. This same trend towards perceptually driven research has perhaps had the longest tradition in virtual reality, where the user's response to specific interaction and rendering techniques is examined using a variety of methods. Against this backdrop of an increasing importance of perceptual research in all areas related to computer generated imagery, we provide a state of the art report on the current state of perception in computer graphics.