# Visual Perception in Manual Control Tasks

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## ABSTRACT

**Visual information is the most important sensory information for manually controlling dynamic systems such as aircraft. Visual cues provide information on the current and/or the desired state of a dynamic system, but also on the controlled dynamics themselves through continuous feedback of vehicle responses to manual control inputs. This explains the importance of visual perception in the study of manual control and in the development of control-theoretic models of human control behavior.**

**Early studies on visual perception in manual control have typically been a by-product of studies on manual control, in general. Visual perception was often limited to experimental scenarios in which the operator was simply attempting to null a perceived error created by the spatial separation of a pair of display symbols with viewing conditions that were predominantly foveal in nature. However, in the last decades, many studies have investigated how different visual features or display variables, such as the quality of computer generated visual stimuli, affect human operator performance and control behavior in manual control tasks.**

**This paper presents a limited review of the literature associated with visual perception in the context of manual control. First, an overview of pilot modeling efforts and the implied requirements of visual perception on the validity of these models is given. Next, advances in modeling human visual perception in perspective scene representations are discussed. The paper ends with a discussion of the impact of several visual system features and artifacts on manual control performance and behavior.**

# BIO

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**Peter Zaal is a senior research engineer with the San Jose State University Research Foundation, performing research at the Human Systems Integration Division of NASA Ames Research Center. His current research focusses on the modeling of human visual and motion perception and cue integration in manual control tasks. In addition, he is working on objective motion cueing criteria for flight simulators.**

**Peter received his Master's degree in aerospace engineering from Delft University of Technology in 2005. In 2011, he received his PhD degree in aerospace engineering from the same university for his research on pilot control behavior discrepancies between real and simulated flight. His research interests include human factors, manual control, visual and motion perception, and flight simulation.**

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