

A Review of Eye Gaze in Virtual Agents, Social Robotics and HCI: Behaviour Generation, User Interaction and Perception

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Abstract:

A person's emotions and state of mind are apparent in their face and eyes. As a Latin proverb states: 'The face is the portrait of the mind; the eyes, its informers'. This presents a significant challenge for Computer Graphics researchers who generate artificial entities that aim to replicate the movement and appearance of the human eye, which is so important in human–human interactions. This review article provides an overview of the efforts made on tackling this demanding task. As with many topics in computer graphics, a cross-disciplinary approach is required to fully understand the workings of the eye in the transmission of information to the user. We begin with a discussion of the movement of the eyeballs, eyelids and the head from a physiological perspective and how these movements can be modelled, rendered and animated in computer graphics applications. Furthermore, we present recent research from psychology and sociology that seeks to understand higher level behaviours, such as attention and eye gaze, during the expression of emotion or during conversation. We discuss how these findings are synthesized in computer graphics and can be utilized in the domains of Human–Robot Interaction and Human–Computer Interaction for allowing humans to interact with virtual agents and other artificial entities. We conclude with a summary of guidelines for animating the eye and head from the perspective of a character animator.

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