

## Animating Believable Facial Expressions: Is it Possible to Choreograph Perceptually Valid Emotional Expressions?

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In psychology research, the nuances of facial movement have been investigated to determine the key characteristics of emotional expressions. Studies have shown that movement alone can communicate emotion [1], that particular facial regions have varying degrees of importance to expression recognition [6], and that temporal factors might affect the appearance of facial regions during expressions [5]. Furthermore, researchers have suggested that emotional expressions could have temporal configurations [7].

If facial expressions have perceptually valid (or invalid) configurations of facial actions over time, then a detailed study of how configuration manipulation affects perception could inform the practice of character animation. Studies of facial expression - most notably Ekman and Friesen's Facial Action Coding System [3] - have had an impact on animation research and application. However, most studies have focused on static expressions. A better understanding of the choreography of authentic dynamic expressions (where choreography could be described as the sequence, timing, and duration of regional facial movement within and between expressions) could be of more value to practicing animators.

In this paper, the authors discuss 'Emotional Avatars' - an interdisciplinary research project which aims to expand upon the findings of psychology-based methods in order to inform artistic practice. Drawing upon the experience of animators and psychologists, the primary aim of the project is to determine whether audiences perceive certain choreographies of facial movement to be more or less authentic.

The current research concerns the sequence and timing of regional movement within and between expressions of emotion. Using existing resources as a basis for peak expression appearance [2, 4] the authors systematically generate and manipulate animated expressions of emotion based on the generally accepted 'universal expressions' (happiness, sadness, anger, fear, disgust, and surprise). By producing a range of animations with variation in sequence, and then testing observer perception of the animations under controlled conditions, the goal of the current research is to identify potential valid and invalid emotional expression choreographies.

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