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An Observation Based Muscle Model for Simulation of Facial Expressions

Tuğba Erkoç, Didem Ağdoğan, M. Taner Eskil*

Abstract

This study presents a novel facial muscle model for coding of facial expressions. We derive this model from unintrusive observation of human subjects in the progress of the surprise expression. We use a generic and single-layered face model which embeds major muscles of the human face. This model is customized onto the human subject's face on the first frame of the video. The last frame of the video is used to project a set of manually marked feature points to estimate the 3 dimensional displacements of vertices due to facial expression. Vertex displacements are used in a mass-spring model to estimate the external forces, i.e. the muscle forces on the skin. We observed that the distribution of muscle forces resemble sigmoid or hyperbolic tangent functions. We chose hyperbolic tangent function as our base model and parameterized it using least squares. We compared the proposed muscle model with frequently used models in the literature.

Keywords: Face anatomy, muscle model, facial expression, virtual human

Emotions are mainly conveyed through the gestures of the face and body rather than verbal communication. When uttered feeling is countered by a facial expression, words only emphasize the feeling conveyed by the expression through sarcasm. Mehrabian [1] reports that the feeling or attitude conveyed by a speaker is 55% facial, 38% vocal and only 7% verbal.

*Pattern Recognition and Machine Intelligence Laboratory, IŞIK University, Şile, Istanbul, Turkey
Tel.: +90 216 528 7155
Email addresses: tugba.erkoc@isikun.edu.tr (Tuğba Erkoç), didem.agdogan@isikun.edu.tr (Didem Ağdoğan), taner.eskil@isikun.edu.tr (M. Taner Eskil)

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