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Research Article

Face to Face: Anthropometry-Based Interactive Face Shape Modeling Using Model Priors

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Abstract

This paper presents a new anthropometrics-based method for generating realistic, controllable face models. Our method establishes an intuitive and efficient interface to facilitate procedures for interactive 3D face modeling and editing. It takes 3D face scans as examples in order to exploit the variations presented in the real faces of individuals. The system automatically learns a model prior from the data-sets of example meshes of facial features using principal component analysis (PCA) and uses it to regulate the naturalness of synthesized faces. For each facial feature, we compute a set of anthropometric measurements to parameterize the example meshes into a measurement space. Using PCA coefficients as a compact shape representation, we formulate the face modeling problem in a scattered data interpolation framework which takes the user-specified anthropometric parameters as input. Solving the interpolation problem in a reduced subspace allows us to generate a natural face shape that satisfies the user-specified constraints. At runtime, the new face shape can be generated at an interactive rate. We demonstrate the utility of our method by presenting several applications, including analysis of facial features of subjects in different race groups, facial feature transfer, and adapting face models to a particular population group.