ABSTRACT

FACIAL ANIMATION USING MESH SIMPLIFICATION AND SUBDIVISION SURFACES

by

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In this thesis, we summarize facial mask animation with a targeted survey of three interrelated topics: vector based muscle models, subdivision surfaces, and surface simplification. Each of these methods is employed in facial models that emphasize realistic expression and conformance to original models.

We first describe Keith Water's seminal vector field simulation of facial models, which is used to embed facial muscle controls in a polygonal mesh. We then discuss some of the mathematics for subdivision surfaces and the reasons these surfaces have gained in popularity when detailed facial animation is needed. Next we review the mathematics of the quadric error surface simplification, which is used to simplify dense polygonal models so that they can be used as a base domain for a subdivision surface. Finally we describe a round trip process that begins with facial mask data acquisition and we describe how this data can be simplified to generate a subdivision surface facial mask.