TOWARDS CREATIVE VISUAL EXPRESSION IN VIRTUAL HUMANS

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Virtual humans are embodied characters which inhabit virtual worlds. They introduce a new paradigm of human-machine interaction using natural multimodal communication and, thus, need to be expressive. Furthermore, expression should be effective and aesthetic. Effective means the receiver should understand the message. Aesthetic means that besides function, expression should strive for beauty. In humans, we see the former in everyday communication and, the latter, particularly in the arts.

Key to effective and aesthetic expression is a model for creativity, a model for emotions and a sophisticated medium. Given a communicative intent, the creativity model is responsible for expressing it in the medium. The emotion model affects the generation and selection of alternatives and is also central to the expression of emotions. Finally, the medium structures creative expression and, thus, should be versatile.

This work aims at creating a model for effective and aesthetic visual expression in virtual humans, Fig.1. Essentially, the communicative intent is generated in a *communicative intent planner*. The *creativity model*, then, expresses it, effectively and aesthetically, in the *bodily*, *environment* and *screen expression modules*. The *emotion model* may define communicative intent in the case of expression of emotions and may influence the creative process itself. The creativity model may also define communicative intent, a task usually referred to as problem identification, and may elicit further emotions.

Having clarified the goal, this work's contribution can now be explained. This work proposes a model for bodily, environment and screen expression as well as emotion synthesis based on the OCC emotion theory, Fig.2. These are two of the components required for effective and aesthetic expression. Furthermore, the model is fully integrated and supports sophisticated multimodal expression.

Bodily expression explores the virtual human body and face and supports: (a) keyframe animation; (b) robotics-based procedural animation; (c) psycholinguistics-based gesticulation animation; (d) pseudo-muscular facial animation. Environment expression explores the virtual human surrounding environment and supports: (a) a pixel-based lighting model which supports three types of light, multiple light sources and shadows; (b) a camera model which supports three types

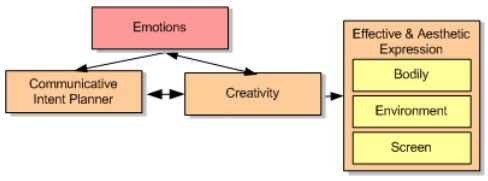

Figure 1: Overview of our approach.

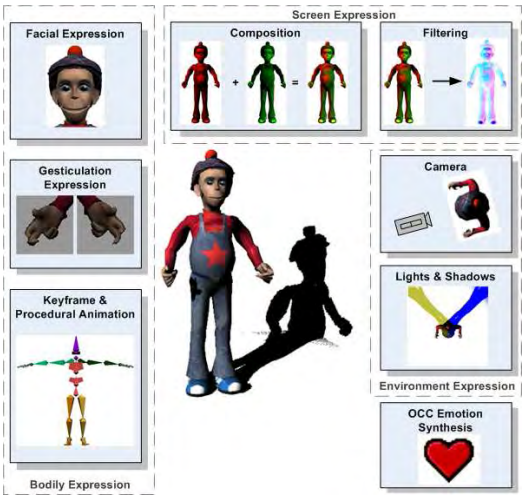

Figure 2: Overview of the model.

of cameras and a library of shots. Screen expression interprets the virtual human medium as a pixel canvas and explores: (a) filters that manipulate the scene pixels before rendering them to the backbuffer; (b) composition, where aspects of the scene are separated into layers which are filtered before combining to form the final image. Finally, emotion synthesis relies on an implementation of the OCC emotion theory with extensions to handle emotion decay, reinforcement, mood and arousal.

The proposed model is presented as a step towards effective and aesthetic virtual human visual expression. What is missing is the creativity model which converts communicative intent into bodily, environment and screen expression. To accomplish this several issues must be addressed: How does this translation occur? What aesthetic values guide this translation? How can we formalize and evaluate the aesthetics of expression? How does emotion influence the generation and selection of alternatives?