

# How Emma Learned to Smile and Frown

## The Implementation of the Facial Action Coding System in an Avatar

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Human facial expressions are crucial for communication in modulating the meaning of other signals, like speech. The internal and motivational state corresponds to a certain extent with facial expressions, however much is left to the interpretation of the observer. This study focuses on the perception of expressions, not on the production. Our componential approach assumes that there is informational value not only in basic expressions as described by categorical approaches, but even single action units have signal quality, whether or not combined with others. Virtual agents allow creating expressions of varying intensity and combinations of action units. This poses an excellent testbed for the exploration of the meaning of such displays. We modeled 44 muscle contractions based on the Facial Action Coding System on the avatar “Emma”. The repertoire contained facial expressions, gaze directions and head turns. All behavior elements were combined randomly into 3517 complex displays, which were judged by 353 participants on the dimensions pleasure, arousal and dominance (18 items, 7-point Likert Scale). This study involves the largest repertoire of the Facial Action Coding System applied so far. Action units adopt typical values on the rating scales, which they maintain irrespective the combined other action units. Regression of the ratings onto the intensities of the action units generates the basis for an expression control architecture. The values of the pleasure-arousal-dominance-space drive the expressions, i.e. there is a display for each state in these dimensions. This allows controlling the facial expressions of “Emma” through an intrinsic mood-emotion-system.

### References

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