

Discovering Realistic Facial Dynamics for Animation

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Abstract

As the video-realism of facial models improves there is a need to study realistic facial dynamics based on the psychological analysis of real people. There is a difference between simply recognising a facial expression and truly believing its implied emotion. We have constructed models that allow us to determine the relative contribution of different facial actions to overall psychological judgements, and to measure real human facial dynamics for animation.

1 Analysing and Synthesising Facial Actions

Our models are inspired by facial appearance models [1] where a set of basis vectors - or *modes of variation* - describe a distribution of joint shape and texture features. We extend the basic model so that each separate mode represents a distinct facial action. Tracking a facial performance yields continuous curves for each action, and new animations may be created by constructing new curves or manipulating existing ones.

We are investigating how subtle temporal changes in facial expressions influence the way we form judgements and decisions. Using the smile as an example, we have studied how temporal manipulation can affect its perceived authenticity, and in combination with participant trials measuring facial dynamics, have learned characteristics for genuine and fake smiles (see Figure 1). In a study simulating a job interview, impression ratings and employment decisions were significantly influenced by temporal characteristics of smiles. Displaying a smile that was fake in its dynamic nature resulted in less positive attributions and employment decisions than a smile that was authentic in its nature [2]. In a separate study we found that the same temporal variations in smiling influenced monetary choices and behavioural intentions in a bargaining game. When paired with a partner who displayed a fake smile participants chose to trust and co-operate less often than when paired with an authentically smiling counterpart [3].

Our first facial model allowed analysis and control of only a single facial action: a smile. The output of the model was

realistic enough to convince viewers that it was a real person (see Figure 1). We have since built more complex models capable of measuring or synthesising several facial actions at once. Six example actions are demonstrated in Figure 1, along with continuous curves tracked from a real facial performance. Recorded facial action curves may be used as an input to animate other facial models. We have applied our learned smile parameters to 3D *Poser* models. Studies using these models have yielded similar results to those found with our appearance-based models. This suggests that natural facial dynamics are *model independent*, and highlights their usefulness to animators working with a range of models.

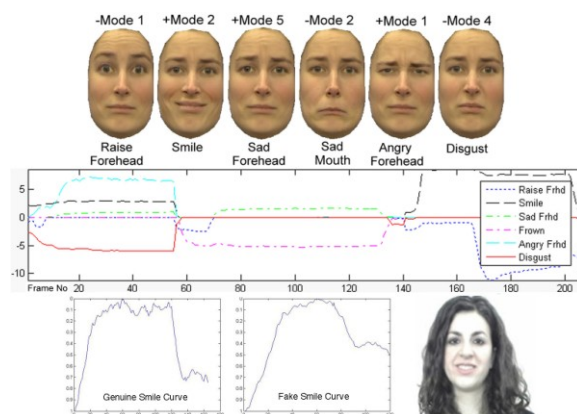


Figure 1: (Top) Distinct facial actions encoded in separate modes of variation. (Middle) Natural dynamics of a person's performance tracked using our model. (Bottom) Statistical analysis of multiple participants reveals animation curves for genuine (left) and fake (middle) smiles. (Right) Example output from stimuli used in our smile manipulation trails.

Our current projects signify the important role played by facial dynamics, and demonstrate their power in animation applications (e.g. for games and computer generated features). We will continue to explore the dynamics of other facial expressions by continued psychological experimentation.

References

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