Subpixel Registration for Facial Expression Analysis

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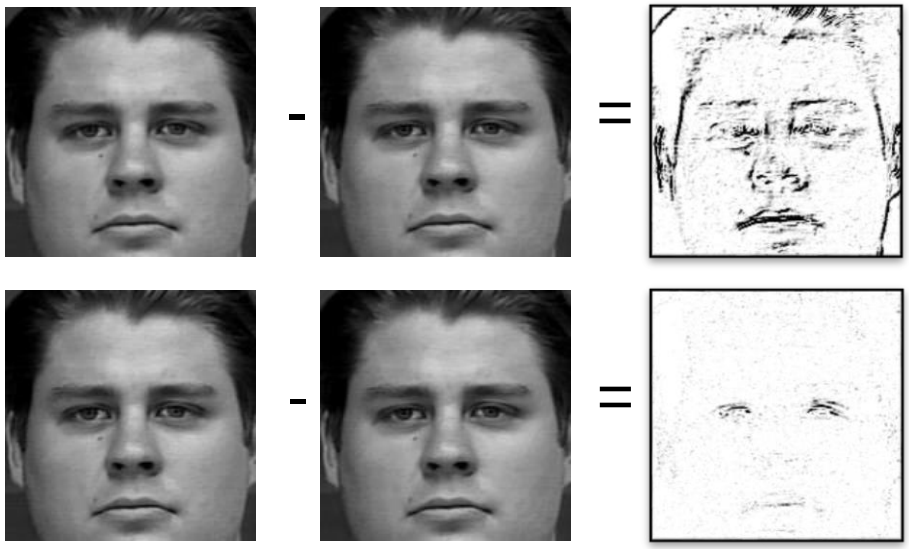
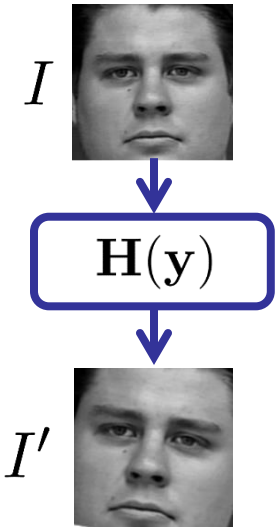
- In daily life we manifest emotions with *subtle* expressions
- Subtle expressions are difficult to analyse:
  They cause very small deformations in facial appearance
- Accurate analysis requires accurate registration (see below)



Subpixel Registration for Facial Expression Analysis

- Statistical Estimator:
  Learns how to align from a large pool of samples (i.e. dataset)
- Robust to challenging (non-uniform) illumination variations
- Identifies registration failure via probabilistic inference



Probabilistic statistical estimator

$$\hat{\mathbf{y}} = f_{SL}(\Phi(I, I'); W)$$

Input transformation:
Robustness
Illumination variations

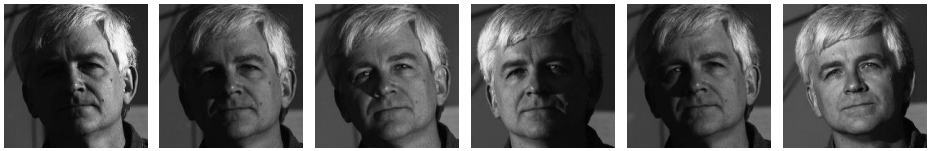
Parameters
learnt from dataset

Results and conclusion

- Subpixel registration even in challenging lighting conditions
- Reliable failure identification

Average registration errors on **PIE** Dataset

	τ_x (pix.)	τ_y (pix.)	s (ratio)	θ (deg.)	# failures
Proposed	0.13	0.11	0.07	0.05	11 (auto)
Robust FFT [2]	0.29	0.26	0.55	0.16	10
RANSAC - SURF	0.75	0.80	0.52	0.29	44



- Registration via statistical estimation is robust to multiple challenges and achieves reliable failure identification.

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E. Sariyanidi, H. Gunes, A. Cavallaro
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