Towards Large-Pose Face Frontalization in the Wild
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Highlights

Problem Statement:
Given a face image with arbitrary pose, generate a frontal face of the same identity.

Need:
Face recognition engines favor frontal poses due to dataset biases.
Augmented reality requires photorealism from arbitrary viewpoints.

Insights and Contributions:
- Faces are constrained shapes: 3DMM priors.
- Low frequency bias in reconstruction: Adversarial framework.
- Special properties of faces: Smoothness and symmetry.
- Identity preservation: Face recognition engine.

Preliminaries

(1) 3D Morphable Model (3DMM)
3DMM defines face shape and texture in the PCA space.
Weak perspective projection: pitch, yaw, roll, scale, x-y-translations.
3DMM coefficients: shape and texture basis + projection matrix.

(2) Generative Adversarial Network (GAN)
GAN maps from a source distribution to a target distribution using a minimax optimization between a generator and a discriminator.

(3) Face Frontalization
Prior work [1]: use a single 3D surface as an approximation of any face shape.
Prior work [2]: 3DMM-based pose and expression normalization.
Drawbacks: small pose, artifacts.

Experimental Results

(1) 3D Face Recognition
Input / Generated
- Estimated 3DMM
- Ground truth 3DMM

Face recognition results on LFW-A.

(1) Face Frontalization
Multi-PFE:
Input
LEN3D
LEN3D

Ablation Study

Quantitative results of ablation study on Multi-PFE.

References: