Effective Face Frontalization in Unconstrained Images

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Our Goal

Synthesize front-facing ("*frontalized*") views of faces in single unconstrained photos

Why?

Better face alignment

→ **Accurate comparison of the same facial features**

→ **Better face recognition performance**

The problem

Frontalization requires estimation of 3D facial shape [1,2,3,4] *does it, really?*

References

[1] Blanz & Vetter '99
[2] Kemelmacher & Basri '06
[3] Hassner '13
[4] Taigman et al. '14
[5] Huang et al. '07
[6] Wolf, Hassner & Taigman '09
[7] Huang et al. '12
[8] Cao, Ying & Li '13
[9] Eidinger, Enbar & Hassner '14

The strange history of 3D face reconstruction

Detail / accuracy   Robustness

1999	2006	2013	2014
Morphable models [1]	Molding face shapes [2]	Viewing faces 3D [3]	Deep Faces [4]
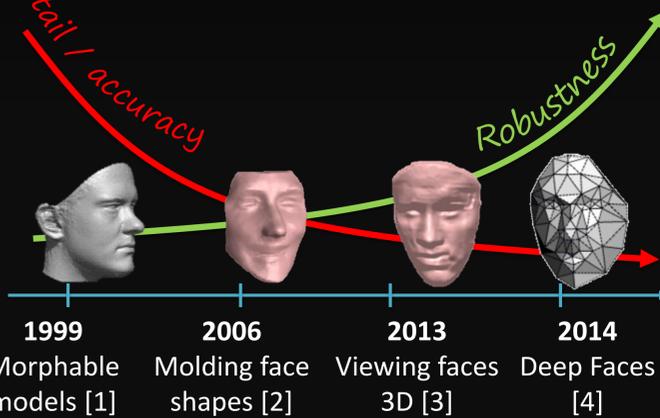
Reconstruction vs. Frontalization

Someone else's 3D face shape?

Frontalization results

[3]   [4]
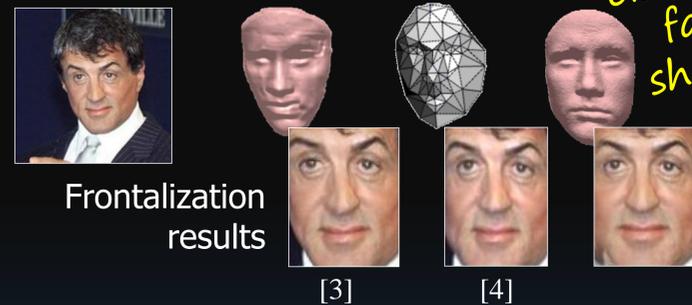
Key observation:

One rough 3D estimate seems as good as another!

Frontalization pipeline

Input

Facial landmark detection

2D Reference landmarks

3D landmarks on **single**, 3D, reference geometry

From 2D-3D matches to est. camera matrix, and frontal view

Soft symmetry

Output
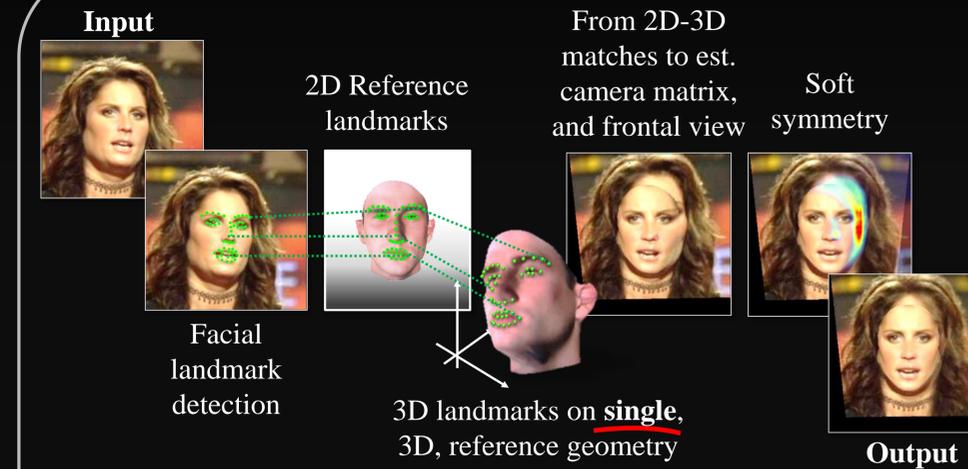
Single 3D shape -> better alignment

Mean LFW images

31 images
236 images
41 images
530 images

Funneled [5]	LFW-a [6]	Deep Funneled [7]	Us, single 3D
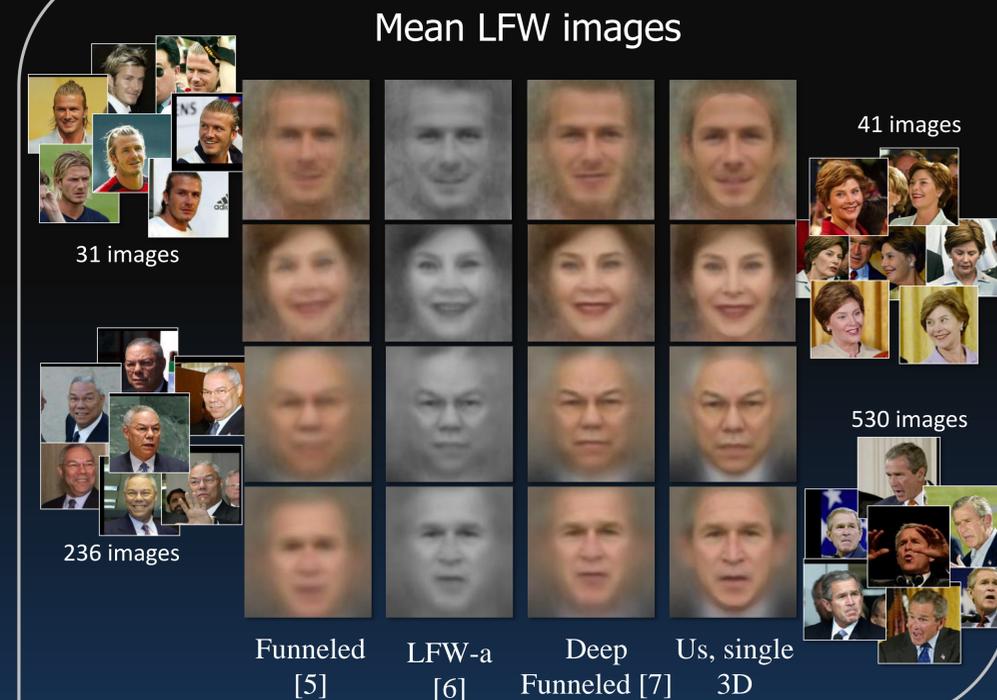
LFW Results

Alignment:	Funneled [6]	LFW-a [6]	Our LFW3D
Method			
Hybrid	.7847 ± .0051	.8255 ± .0031	.8563 ± .0053
Sub-SML [8]	.8973 ± .0038		
Sub-SML+Hybrid		.9165 ± .0104 *	

* Best result on the LFW Image-Restricted, Label-Free Outside Data protocol. More results in the paper.

Adience gender classification

Alignment:	Adience-aligned [9]	Adience3D
Method		
LBP	.734 ± .007	.800 ± .007
FPLBP	.726 ± .009	.753 ± .010
LBP+FPLBP+Dropout 0.5	.761 ± .009	.793 ± .008

Conclusions

Shape vs. appearance: Accurate estimation of 3D facial shape does not seem beneficial for face recognition in the wild.

For code, data, more results and info, see goo.gl/RAZU67