Synergy between 3DMM and 3D Landmarks for Accurate 3D Facial Geometry

Cho-Ying Wu Qiangeng Xu Ulrich Neumann

University of Southern California, Viterbi School of Engineering

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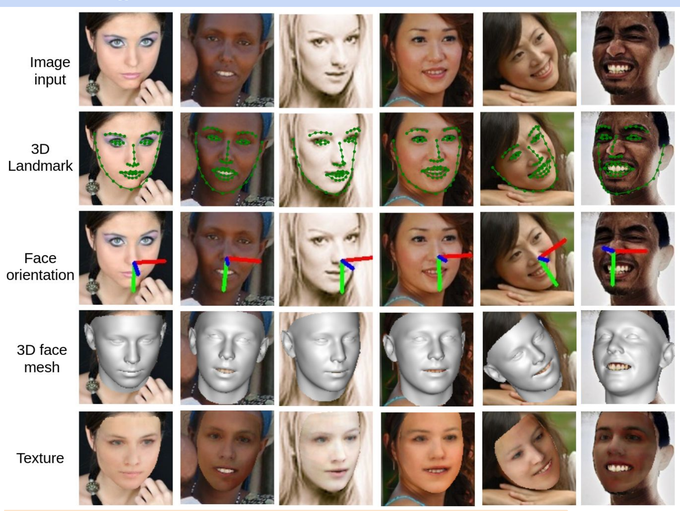
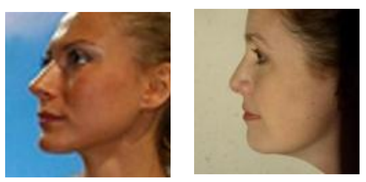
#FacialAlignment #HeadPose #3DFaceModeling



Motivation

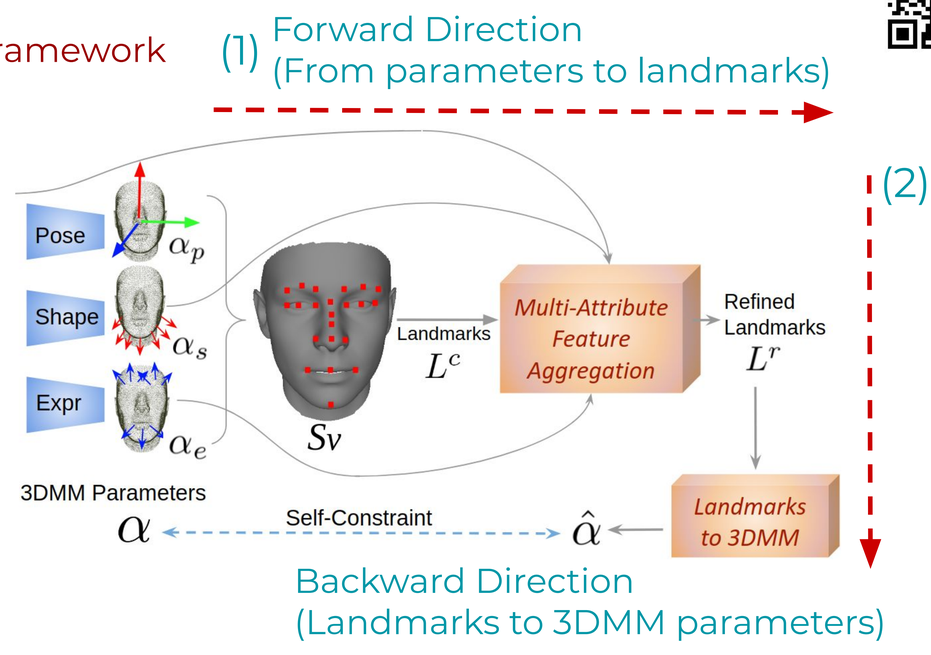
1. Previous methods only directly extract 3D landmarks, which can be further refined.

2. 3DMM parameters regressed from 3D spaces can free from self-occlusion issues



Self-Occlusion on the image domain

Framework



Codes and Data

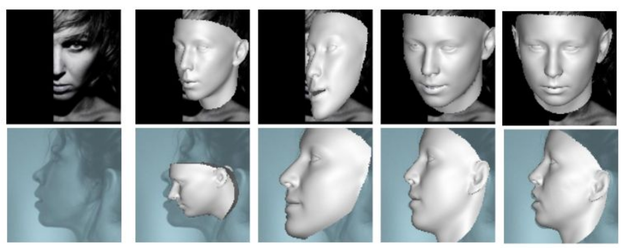
Best on benchmarks

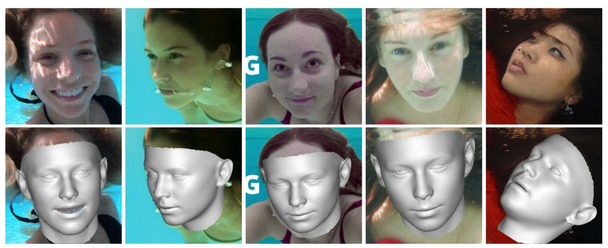
AFLW2000-3D Original	0 to 30	30 to 60	60 to 90	All
ESR [6]	4.60	6.70	12.67	7.99
3DDFA [70]	3.43	4.24	7.17	4.94
Dense Corr [67]	3.62	6.06	9.56	6.41
3DSTN [3]	3.15	4.33	5.98	4.49
3D-FAN [4]	3.16	3.53	4.60	3.76
3DDFA-PAMI [71]	2.84	3.57	4.96	3.79
PRNet [17]	2.75	3.51	4.61	3.62
2DASL [49]	2.75	3.46	4.45	3.55
3DDFA-V2 (MR) [20]	2.75	3.49	4.53	3.59
3DDFA-V2 (MRS) [20]	**2.63**	3.42	4.48	3.51
SynergyNet (our)	**2.65**	**3.30**	**4.27**	**3.41**

AFLW2000-3D	Yaw	Pitch	Roll	Mean
PnP-landmark	5.92	11.76	8.27	8.65
FAN-12 point [4]	6.36	12.30	8.71	9.12
HopeNet [40]	6.47	6.56	5.44	6.16
SSRNet-MD [65]	5.14	7.09	5.89	6.01
FSANet [64]	4.50	6.08	4.64	5.07
QuatNet [22]	3.97	5.62	3.92	4.15
TriNet [7]	4.20	5.77	4.04	3.97
RankPose [10]	**2.99**	4.75	3.25	3.66
3DDFA-TPAMI [71]	4.33	5.98	4.30	4.87
2DASL [49]	3.85	5.06	3.50	4.13
3DDFA-V2 [20]	4.06	5.26	3.48	4.27
SynergyNet (our)	3.42	**4.09**	**2.55**	**3.35**

Result and Comparison

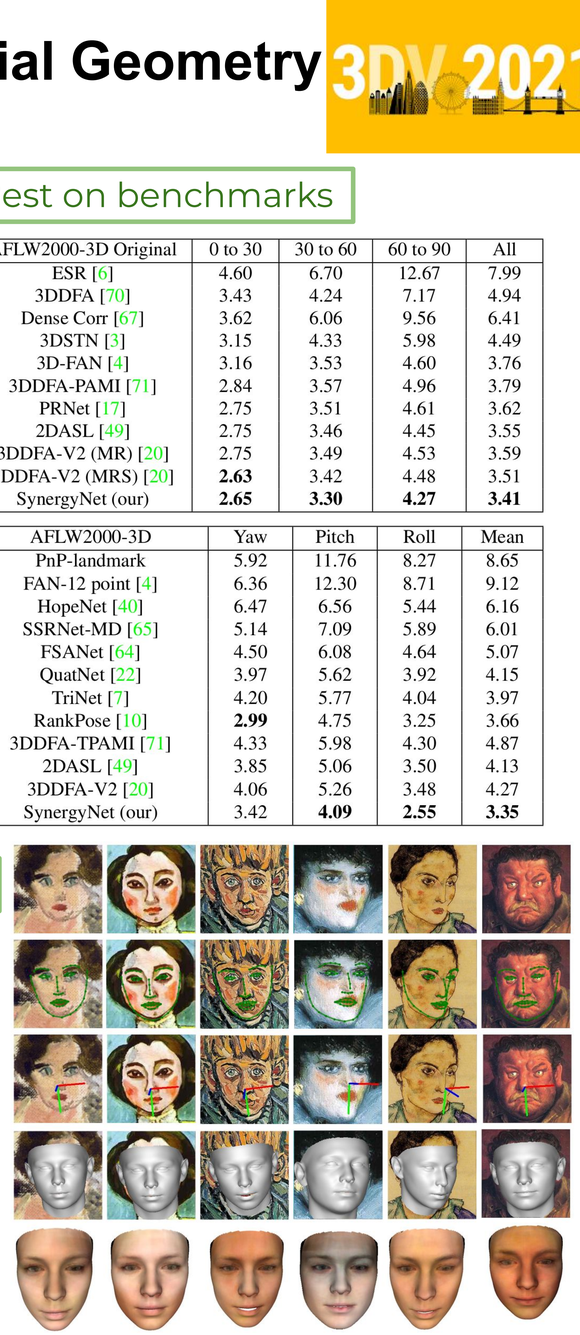
Extreme Cases





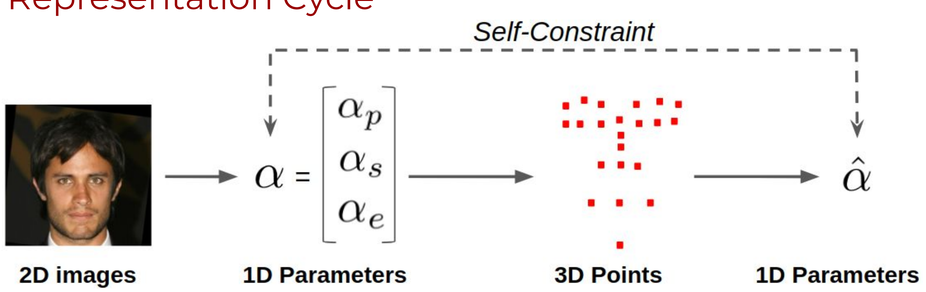
Ours for underwater images

Portraits



Method & Contribution

Representation Cycle



Comparisons