CVPR 2017
Paper Reading Group

Vision@OUC
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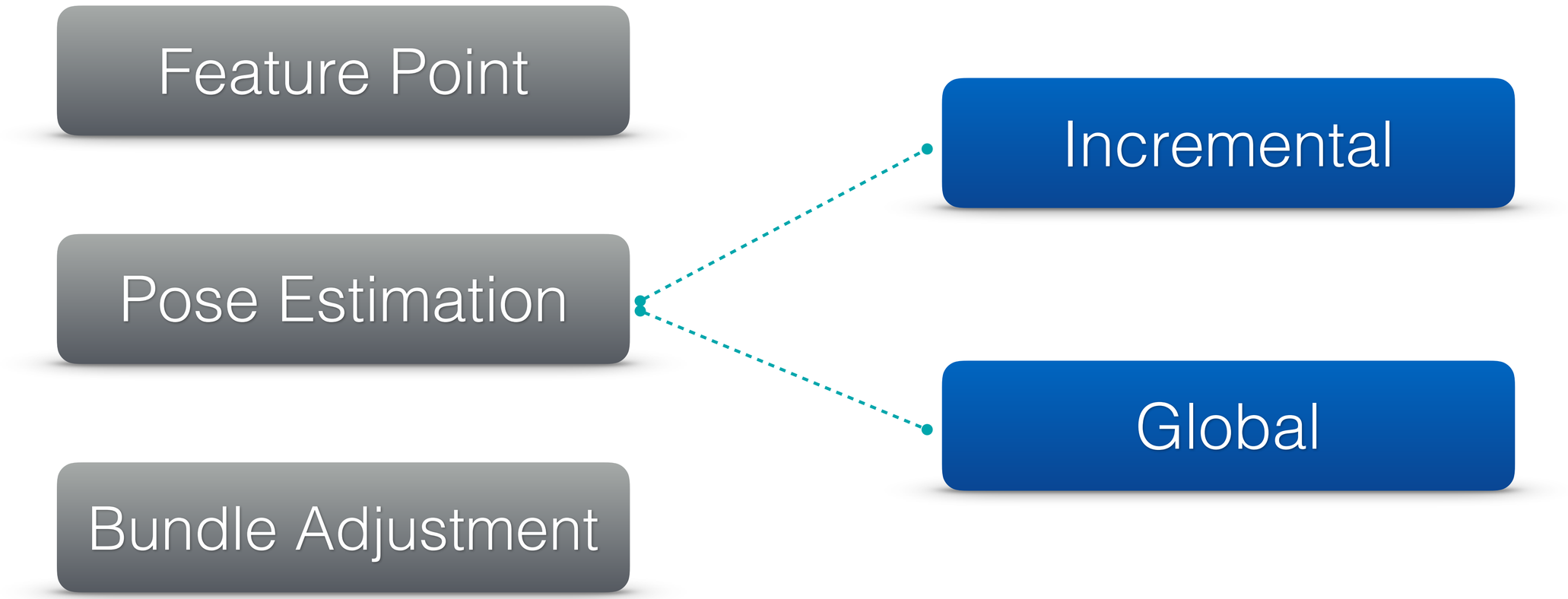
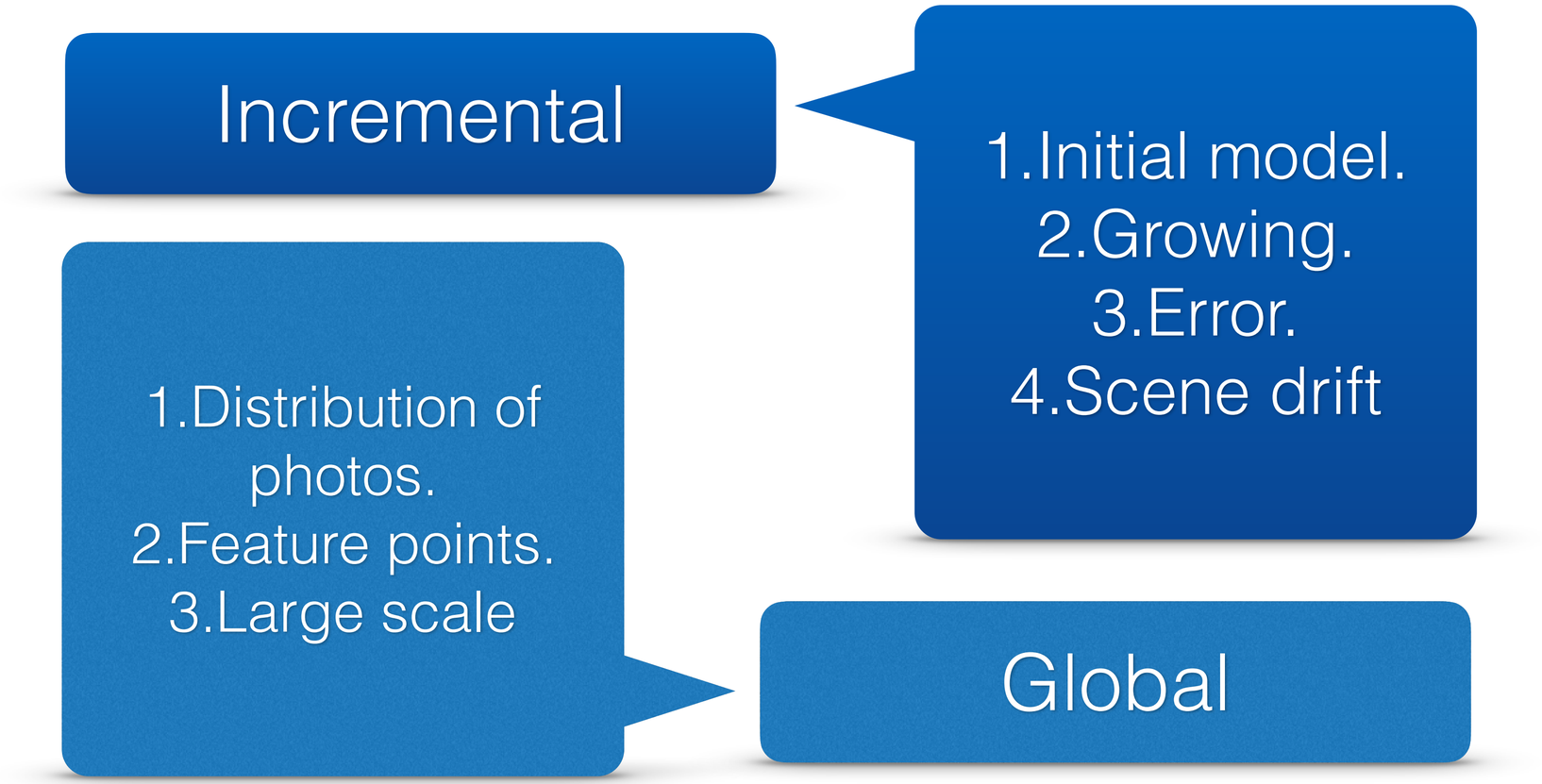
3D in CVPR 2017

3D Object	3D Human	3D Reconstruction	Other
11	11	11	3
1.Detection 2.Classify 3.Depth	1.Face 2.Pose	1.Arithmetic 2.Surface	1.Dataset 2.Video 3.Medicine

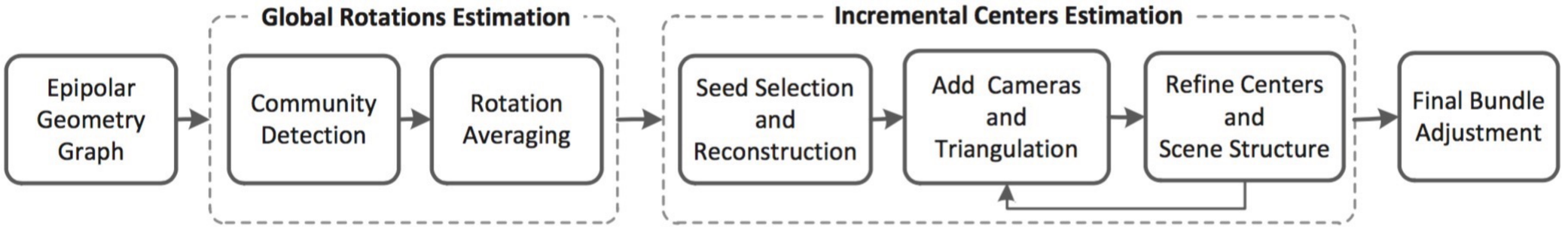
Structure from Motion



Structure from Motion



HSfM : Hybrid Structure from Motion

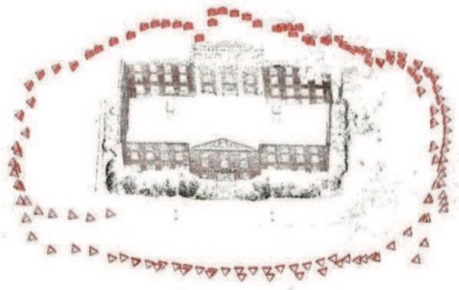
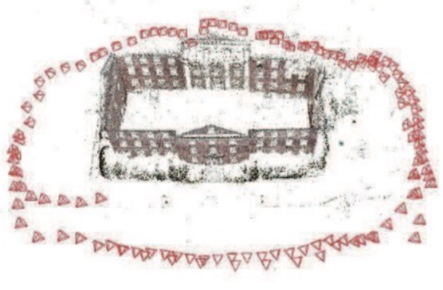


1.Tackle the issues of efficiency, robustness and accuracy.

2.Supply a community-based rotation average method in a global manner.

3.Supply a camera centers estimated method in an incremental way

HSfM : Hybrid Structure from Motion

	COLMAP	LUD	Theia	Our HSfM
 Building				
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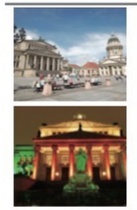
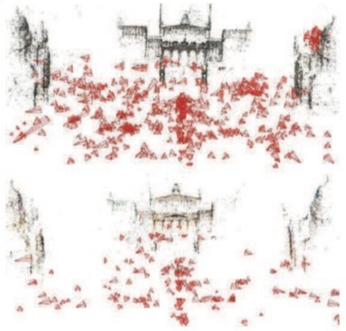
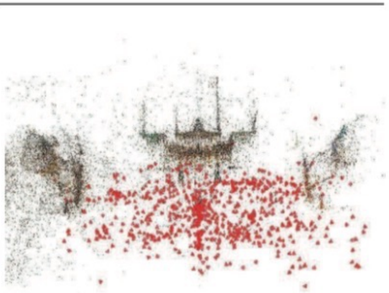
Comparison

HSfM : Hybrid Structure from Motion

	COLMAP	LUD	Theia	Our HSfM	Bundler
 Gendar-menmarkt					
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Comparison

HSfM : Hybrid Structure from Motion

Dataset		1DSfM [44]			LUD [31]			Cui [11]			Sweeney [40]		Theia [39]			Our HSfM		
Name	N_i	N_c	$\tilde{x}$	$\bar{x}$	N_c	$\tilde{x}$	$\bar{x}$	N_c	$\tilde{x}$	$\bar{x}$	N_c	$\tilde{x}$	N_c	$\tilde{x}$	$\bar{x}$	N_c	$\tilde{x}$	$\bar{x}$
Alamo	627	529	**0.3**	2e7	547	**0.3**	2.0	**574**	0.5	3.1	533	0.4	520	0.4	1.8	566	**0.3**	**1.5**
Ellis Island	247	214	**0.3**	3.0	–	–	–	223	0.7	4.2	203	0.5	210	1.7	**2.8**	**233**	2.0	4.8
Metropolis	394	291	0.5	7e1	288	1.5	4.0	317	3.1	16.6	272	**0.4**	301	1.0	**2.1**	**344**	1.0	3.4
Montreal N.D.	474	427	0.4	1.0	435	0.4	1.0	452	**0.3**	1.1	416	**0.3**	422	0.4	**0.6**	**461**	**0.3**	**0.6**
Notre Dame	553	507	1.9	7.0	536	**0.2**	0.7	549	**0.2**	1.0	501	1.2	540	**0.2**	**0.5**	**550**	**0.2**	0.7
NYC Library	376	295	0.4	**1.0**	320	1.4	7.0	338	**0.3**	1.6	294	0.4	291	0.4	**1.0**	**344**	**0.3**	1.5
Piazza del Popolo	354	308	2.2	2e2	305	1.0	4.0	340	1.6	2.5	302	1.8	290	**0.8**	**1.5**	**344**	**0.8**	2.9
Piccadilly	2508	1956	0.7	7e2	–	–	–	2276	**0.4**	2.2	1928	1.0	1824	0.6	**1.1**	**2279**	0.7	2.0
Roman Forum	1134	989	**0.2**	3.0	–	–	–	1077	2.5	10.1	966	0.7	942	0.6	**2.6**	**1087**	0.9	8.4
Tower of London	508	414	1.0	4e1	425	3.3	10.0	465	1.0	12.5	409	**0.9**	439	1.0	**1.9**	**481**	**0.9**	6.4
Union Square	930	710	3.4	9e1	–	–	–	570	3.2	11.7	701	2.1	626	**1.9**	3.7	**827**	2.8	**3.4**
Vienna Cathedral	918	770	**0.4**	2e4	750	4.4	10.0	842	1.7	4.9	771	0.6	738	1.8	3.6	**849**	1.4	**3.3**
Yorkminster	458	401	**0.1**	5e2	404	1.3	4.0	417	0.6	14.2	409	0.3	370	1.2	1.8	**421**	1.2	**1.7**
Trafalgar	5433	4957	–	–	–	–	–	4945	3.6	8.6	–	–	3873	**2.6**	**4.0**	**4966**	**2.6**	7.2
Gendarmenmarkt	742	–	–	–	–	–	–	609	4.2	27.3	–	–	597	2.9	28.0	**611**	**2.8**	**26.3**

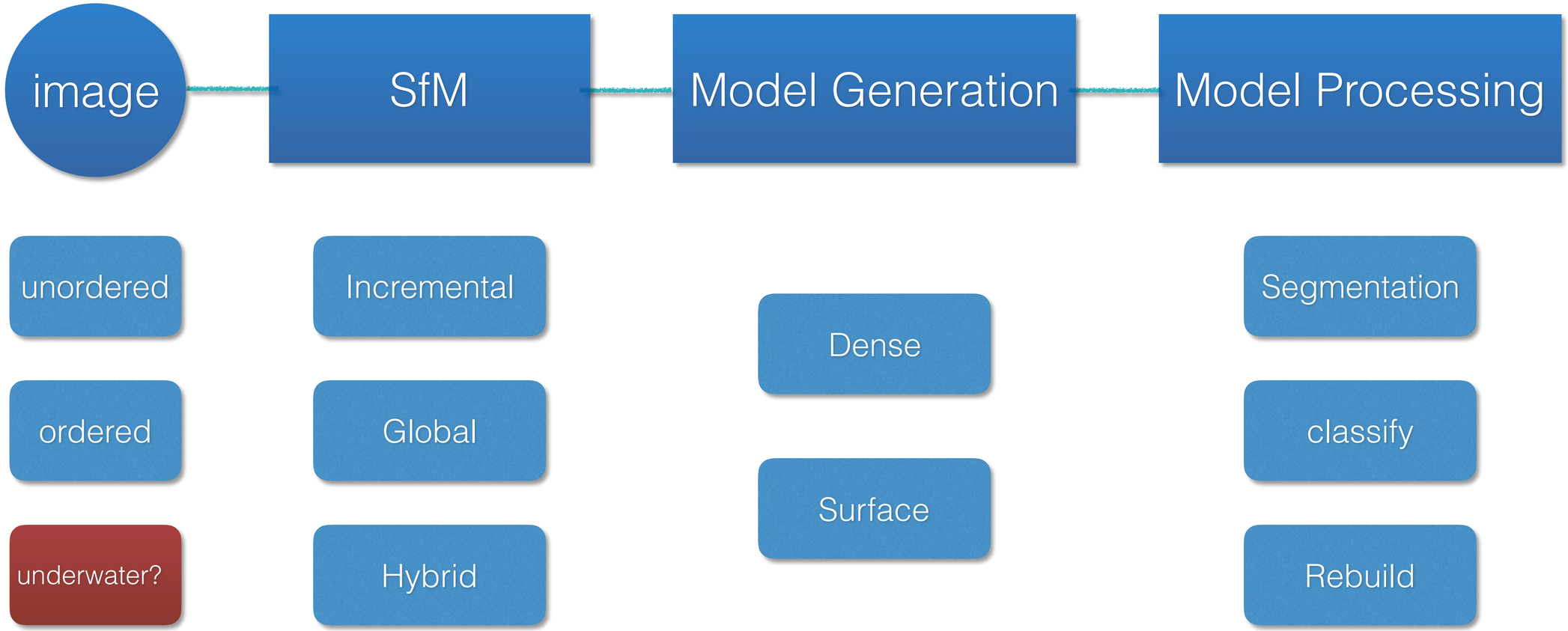
Evaluation

HSfM : Hybrid Structure from Motion

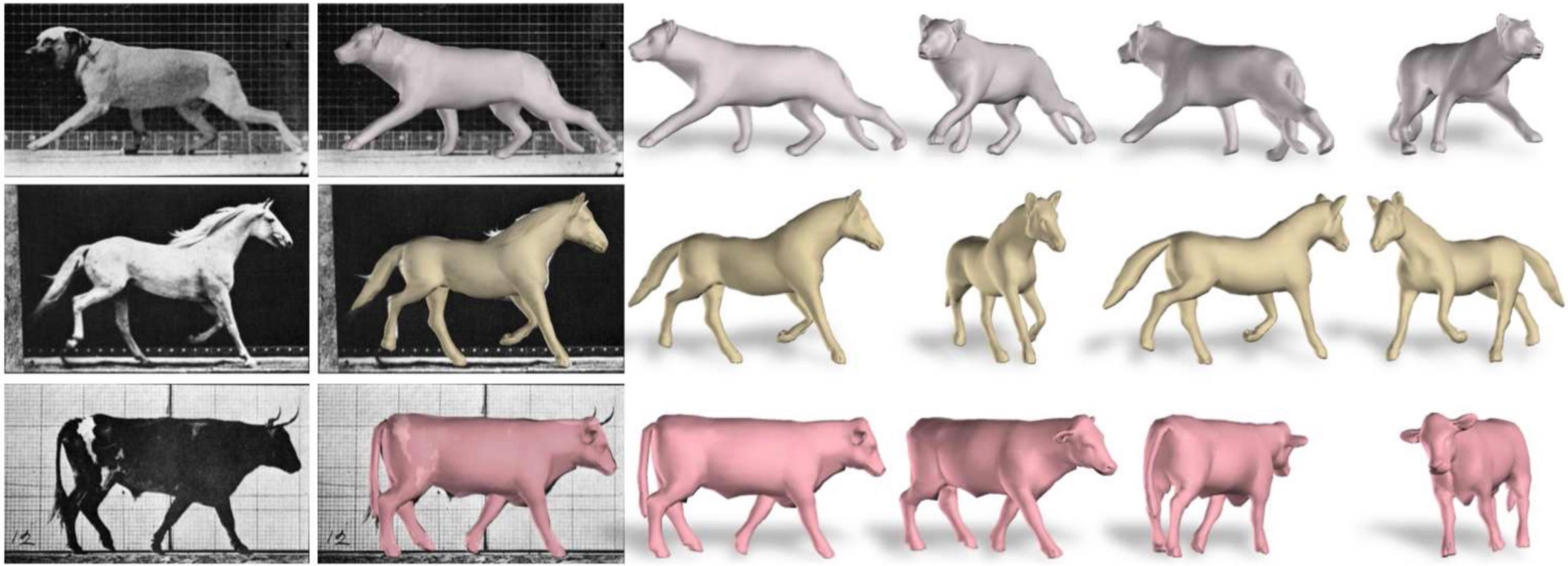
Dataset		Our HSfM					1DSfM [44]	LUD [31]	Cui [11]	Sweeney [40]	Theia [39]	Bundler [38]
Name	Q_{max}	T_D	T_R	T_C	T_{BA}	T_Σ	T_Σ	T_Σ	T_Σ	T_Σ	T_Σ	T_Σ
Alamo	0.12	1	27	332	20	380	910	750	578	198	1271	1654
Ellis Island	0.08	1	6	120	10	137	171	–	208	33	213	1191
Metropolis	0.31	1	12	108	13	134	244	142	60	161	294	1315
Montreal N.D.	0.10	1	11	472	25	509	1249	553	684	266	1110	2710
Notre Dame	0.08	1	25	298	93	417	1599	1047	552	247	2726	6154
NYC Library	0.19	1	6	173	13	193	468	200	213	154	453	3807
Piazza del Popolo	0.08	1	8	73	17	99	249	162	194	101	292	1287
Piccadilly	0.27	23	277	2405	588	3293	3483	–	1480	1246	3698	44369
Roman Forum	0.59	5	4	501	72	582	1457	–	491	1234	2004	4533
Tower of London	0.41	1	2	312	51	366	648	228	563	391	975	1900
Union Square	0.47	2	3	201	27	233	452	–	92	243	698	1244
Vienna Cathedral	0.12	2	110	270	40	422	3139	1467	582	607	3183	10276
Yorkminster	0.32	1	13	242	38	294	899	297	663	102	858	3225
Trafalgar	0.53	49	318	3850	631	4848	12240	–	2901	–	10210	29160
Gendarmenmarkt	0.41	2	3	161	30	196	–	–	214	–	799	–

Evaluation

SfM Pipeline



Modeling the 3D Shape of Animals



Related Work

Animal shape from 3D scans

1.Little work.

2.The difficulty of handling live animals.

3.Limited realism.

Related Work

Animal shape from photos

STEP

1.Take a lot of photos.

2.Get a low-dimensional model.

3.Optimize their model.

CHALLENGE

1.Variation of body.

2.Get a low-dimensional model.

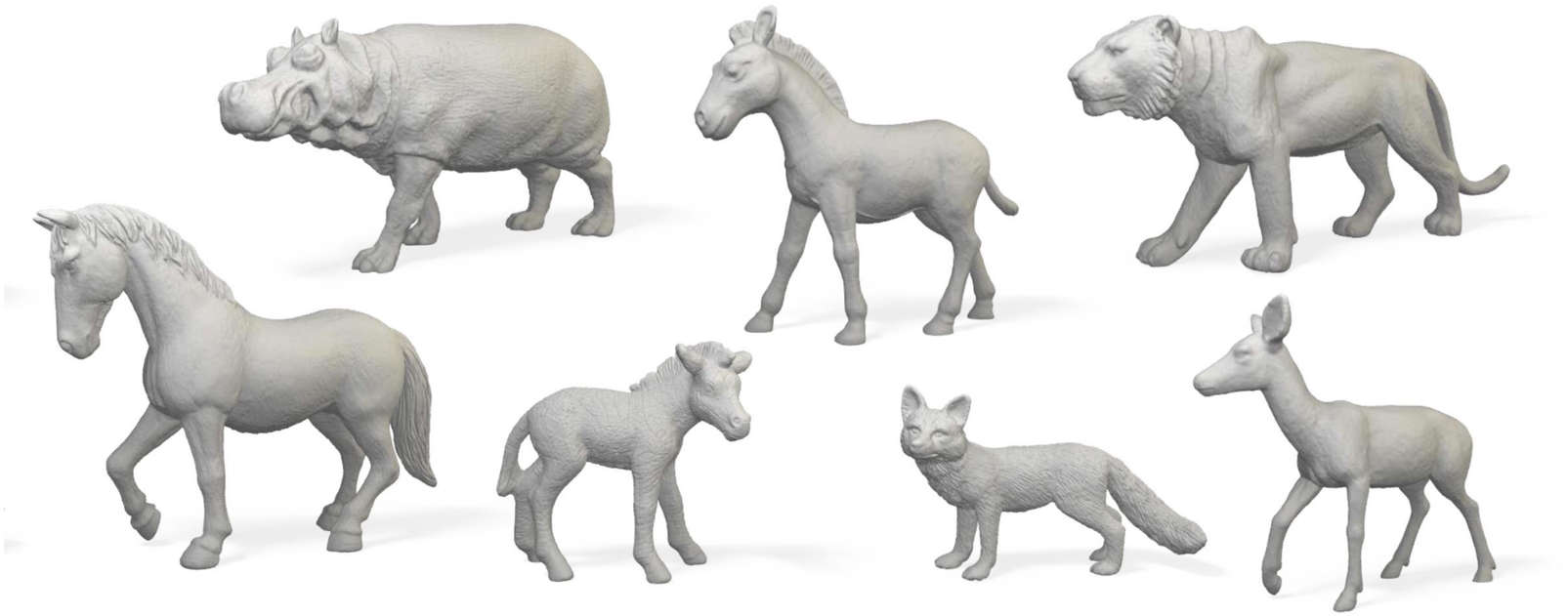
3.Optimize their model.

Related Work

Animal shape from video

Human shape from 3D scans

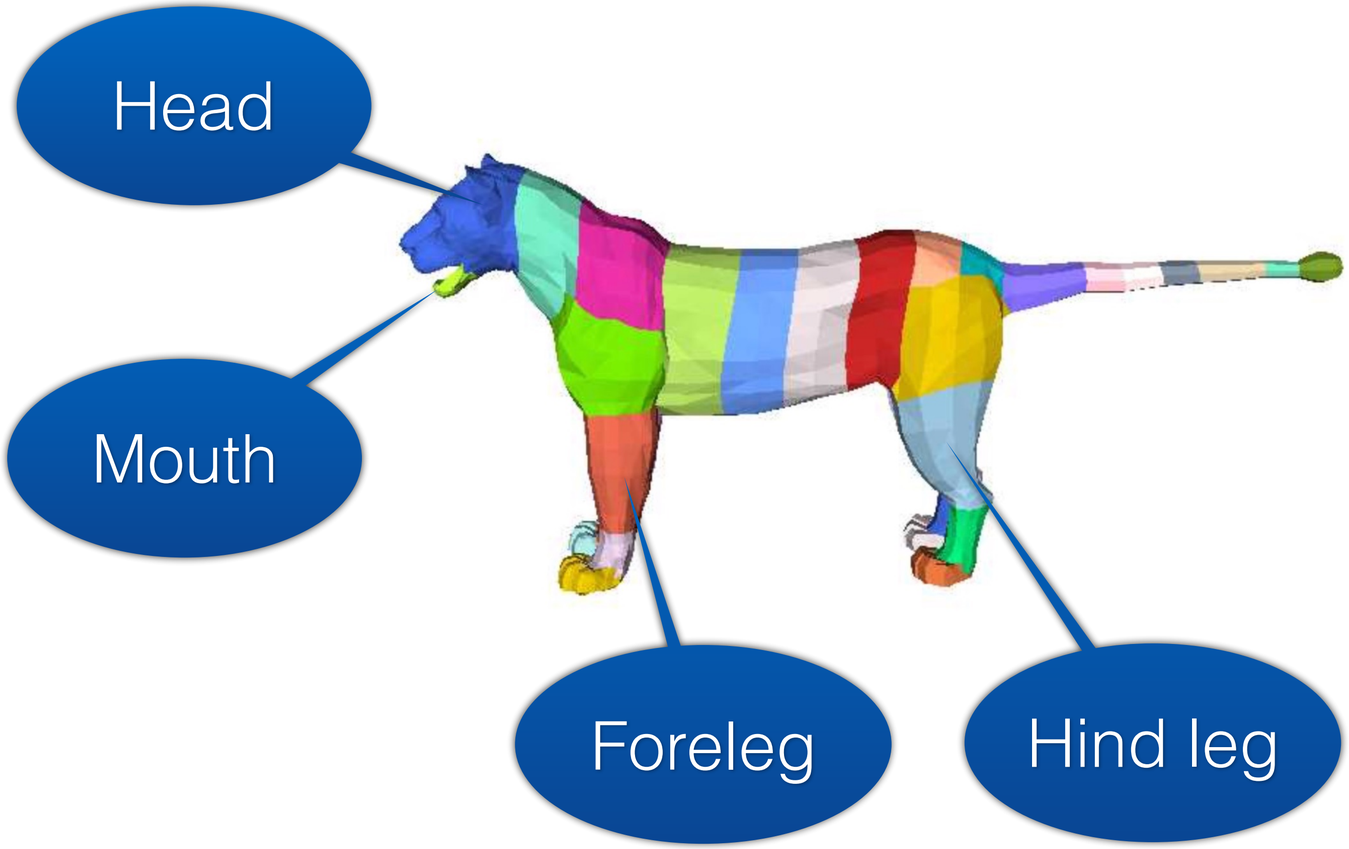
Modeling the 3D Shape of Animals



scan toy figurines

SMPL: A Skinned Multi-Person Linear Model. *TOG*, 2015.

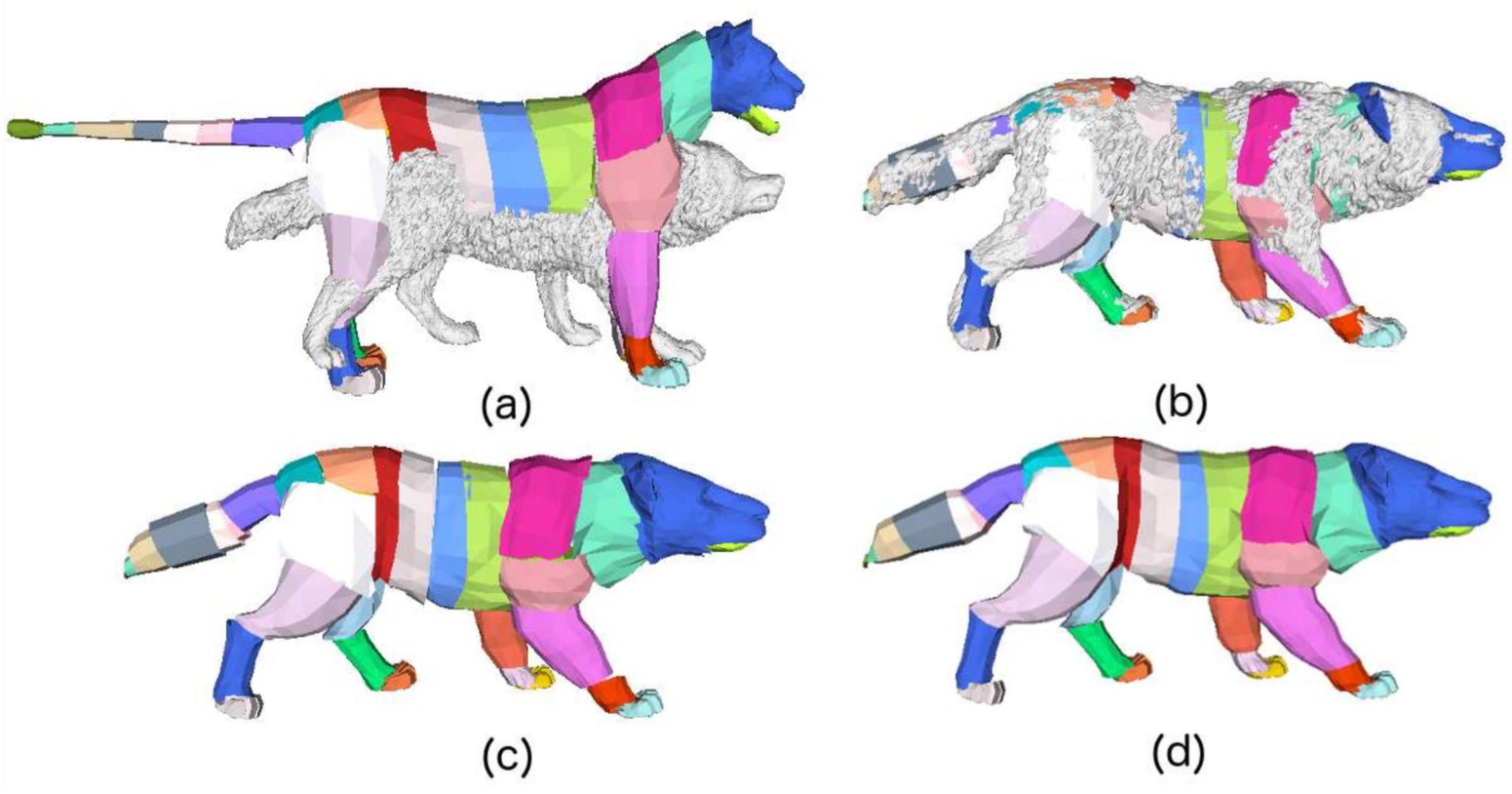
Modeling the 3D Shape of Animals



33
parts

The stitched puppet: A graphical model of 3D human shape and pose. *CVPR*, 2015.

Modeling the 3D Shape of Animals



GLoSS Fitting

Thanks