Multi-view to Novel view: Synthesizing Novel Views with Self-Learned Confidence

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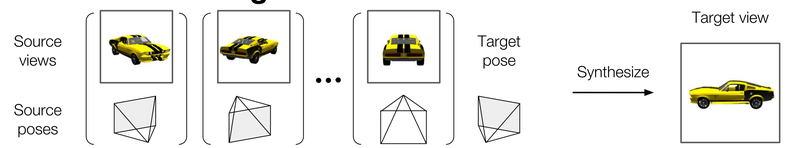
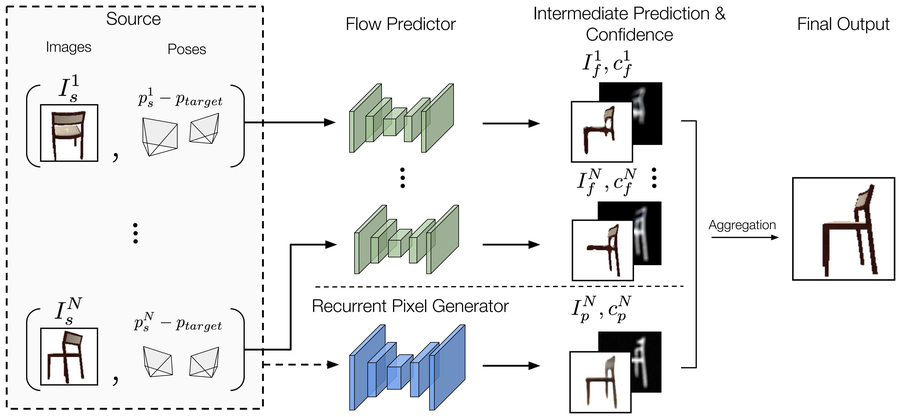
Code and data are available at https://github.com/shaohua0116/multiview2novelview

Multi-view Novel View Synthesis

Goal: given **multiple source views** and an arbitrary target pose, synthesize **a novel target view.**



Model Overview



Flow predictor

- Reuse the pixels presented in source images

Recurrent pixel generator

- Hallucinate the missing pixels

Self-learned confidence aggregation

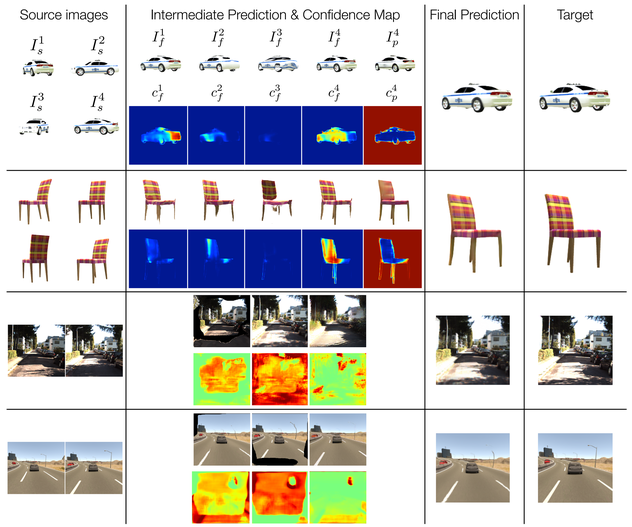
- Aggregate intermediate predictions from both the two modules

Reference

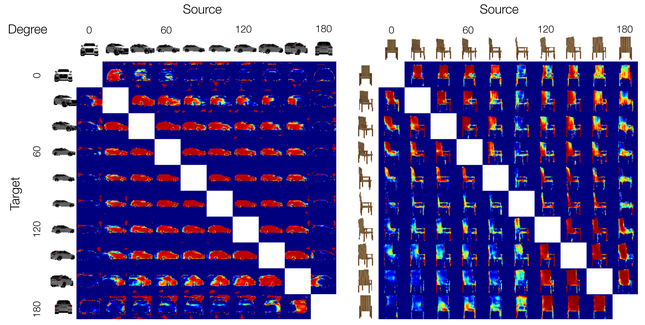
[L1] Tatarchenko et al., "Multi-view 3D Models from Single Images with a Convolutional Network," CVPR 2016
[AF] Zhou et al., View Synthesis by Appearance Flow, ECCV 2016
[TVSN] Park et al., Transformation-Grounded Image Generation Network for Novel 3D View Synthesis, CVPR 2017

Self-Learned Confidence

Aggregate Intermediate Predictions



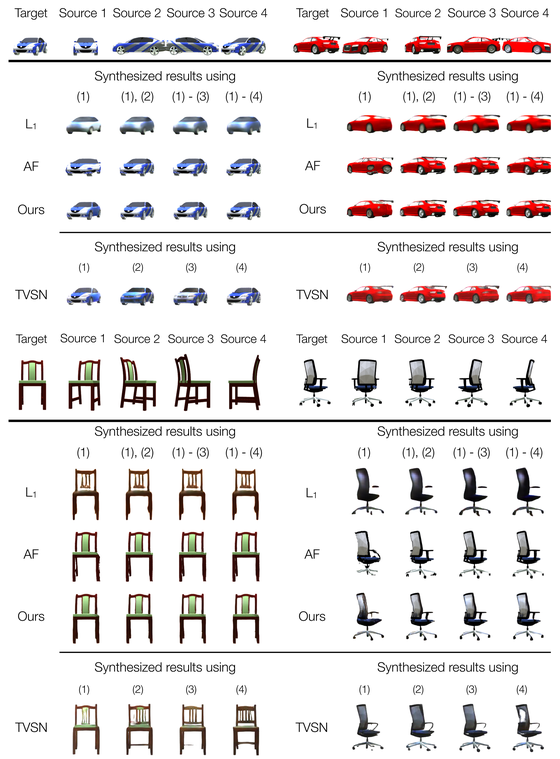
Visibility Maps



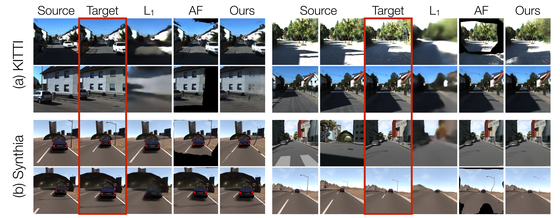
Confidence

Qualitative Result

Objects



Scenes



Quantitative Result

Objects

Views	Methods	Car		Chair	
		L_1	SSIM	L_1	SSIM
1	L_1	.139	.875	.223	.882
	AF	.148	.877	.229	.871
	TVSN	.119	.913	.202	.889
	Ours	**.098**	**.923**	**.181**	**.895**
2	L_1	.124	.883	.209	.890
	AF	.107	.901	.207	.881
	Ours	**.078**	**.935**	**.141**	**.911**
3	L_1	.116	.887	.197	.898
	AF	.089	.915	.188	.887
	Ours	**.068**	**.941**	**.122**	**.919**
4	L_1	.112	.890	.192	.900
	AF	.081	.924	.165	.891
	Ours	**.062**	**.946**	**.111**	**.925**

Scenes

Views	Methods	KITTI		Synthia	
		L_1	SSIM	L_1	SSIM
1	L_1	.295	.505	.175	.612
	AF	.418	.504	.221	.636
	Ours	**.203**	**.626**	**.141**	**.697**
2	L_1	.283	.511	.172	.615
	AF	.259	.626	.154	.702
	Ours	**.163**	**.691**	**.118**	**.737**

Ablation Study

Objects

Views	Methods	Car		Chair	
		L_1	SSIM	L_1	SSIM
1	Pixel	.111	.911	.187	.892
	Flow	.119	.916	.208	.883
	Ours	**.098**	**.923**	**.181**	**.895**
2	Pixel	.095	.919	.148	.907
	Flow	.097	.927	.180	.890
	Ours	**.078**	**.935**	**.141**	**.911**
3	Pixel	.087	.923	.130	.915
	Flow	.086	.933	.164	.895
	Ours	**.068**	**.941**	**.122**	**.919**
4	Pixel	.082	.925	.119	.919
	Flow	.079	.938	.152	.900
	Oracle	.070	.941	.112	.923
	Ours	**.062**	**.946**	**.111**	**.925**

Scenes

Views	Methods	KITTI		Synthia	
		L_1	SSIM	L_1	SSIM
1	Pixel	.259	.505	.183	.622
	Flow	.397	.539	.211	.652
	Ours	**.203**	**.626**	**.141**	**.697**
2	Pixel	.234	.525	.168	.628
	Flow	.249	.656	.149	.720
	Oracle	.199	.658	.140	.718
	Ours	**.163**	**.691**	**.118**	**.737**