Texture Mixer: A Network for Controllable Synthesis and Interpolation of Texture

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https://github.com/ningyu1991/TextureMixer

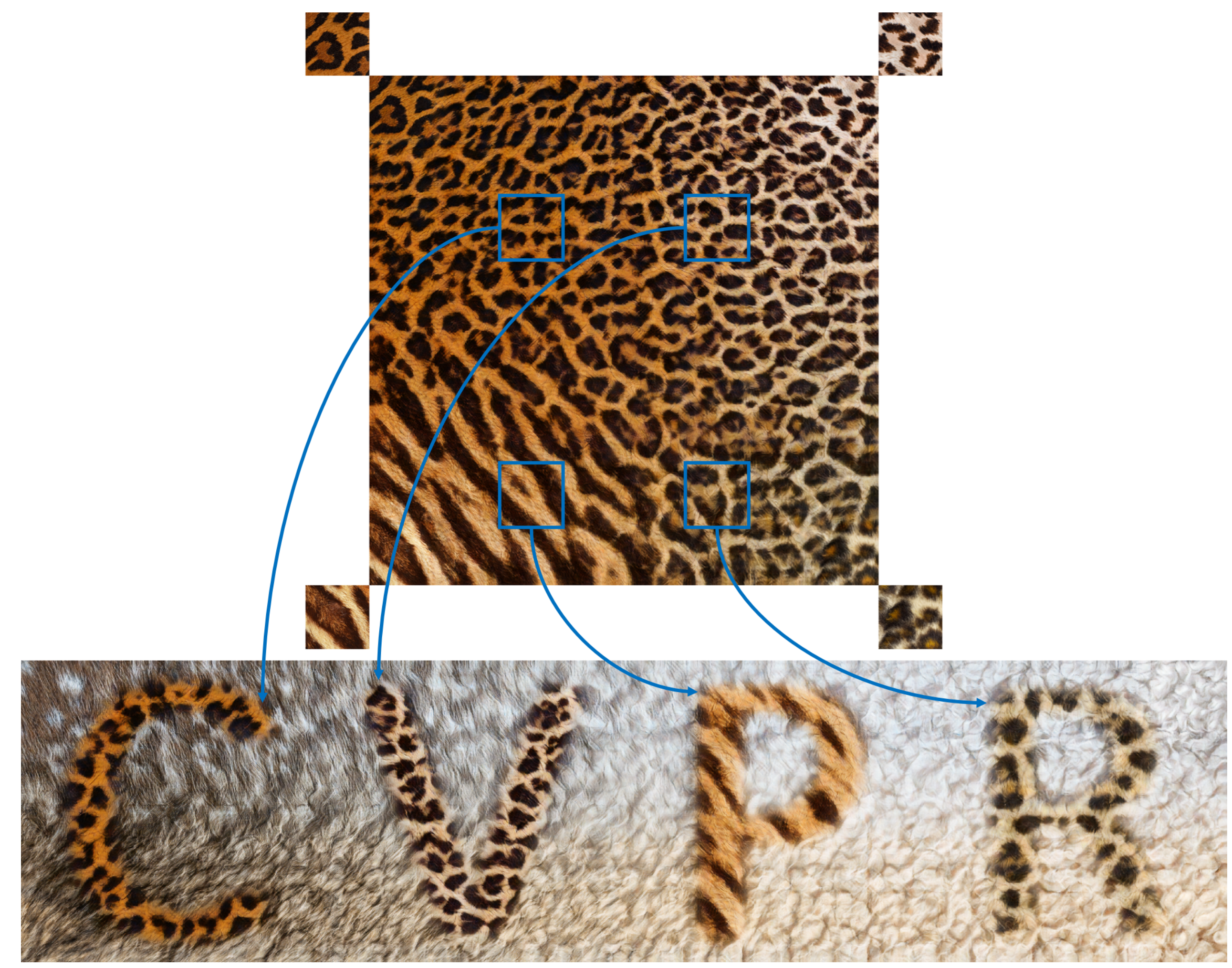CVPR LONG BEACH CALIFORNIA June 16-20, 2019

Problem Statement

We address the problem of interpolating visual textures. We formulate this problem by requiring (1) by-example **controllability** and (2) **realistic** and **smooth interpolation** among an arbitrary number of texture samples.
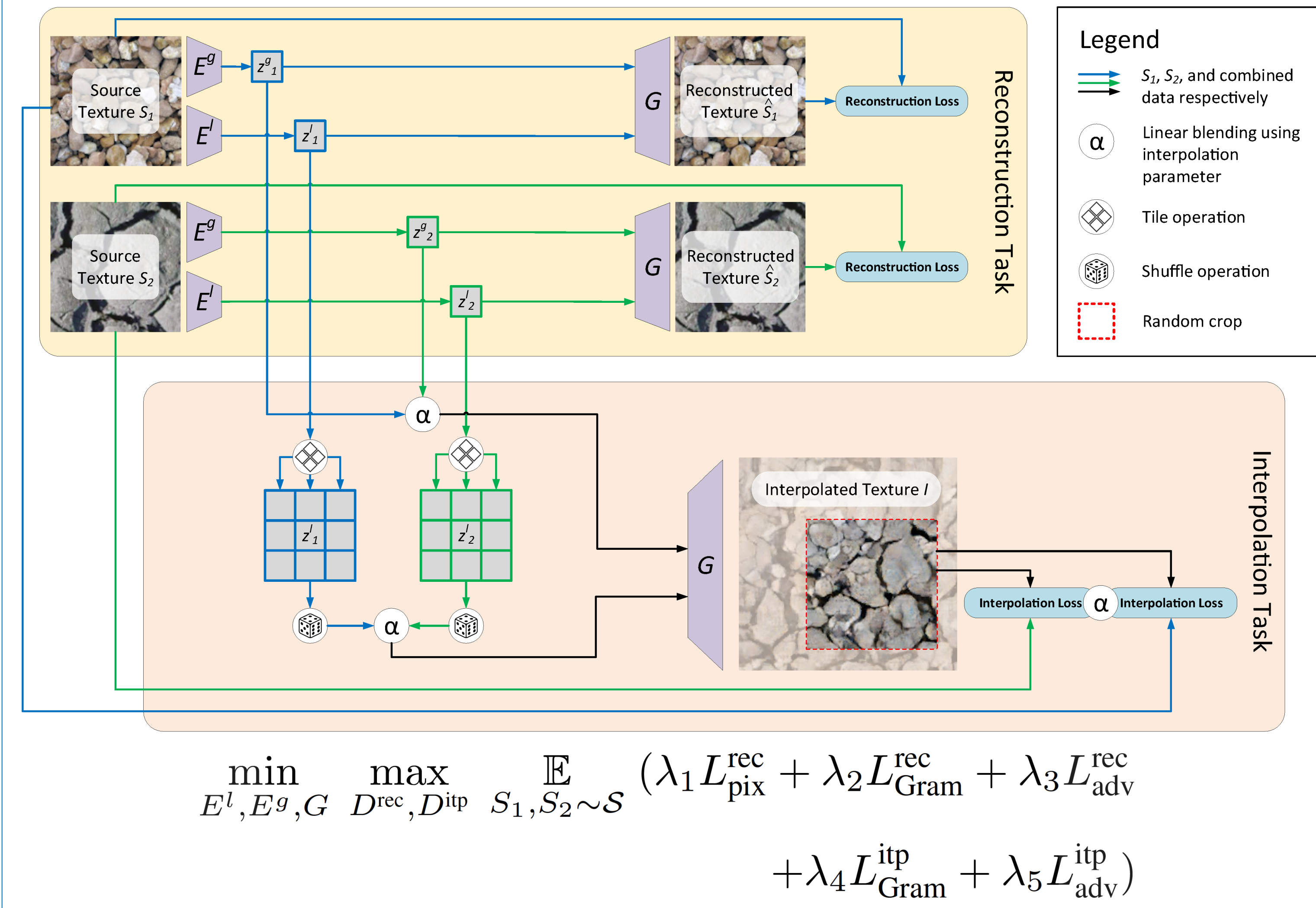
Contributions

➤ A novel interactive technique that allows both user control and interpolation of texture.

➤ Several practical and creative applications based on our technique, including texture dissolve, texture brush, and animal hybridization.

➤ A new suite of metrics that evaluate user controllability, interpolation smoothness, and interpolation realism.

➤ The state-of-the-art performance superior to previous work both based on these metrics, and based on a user study.
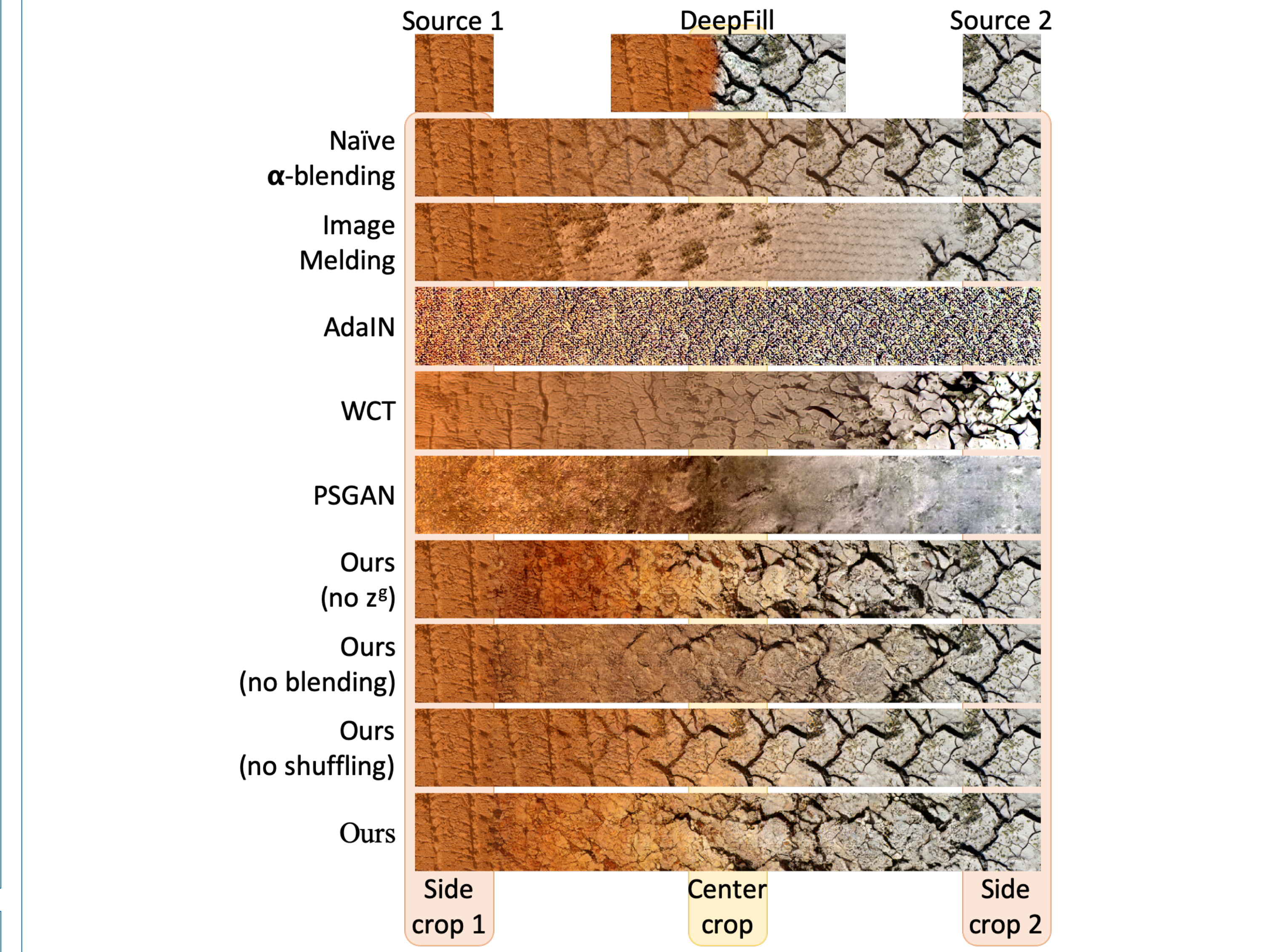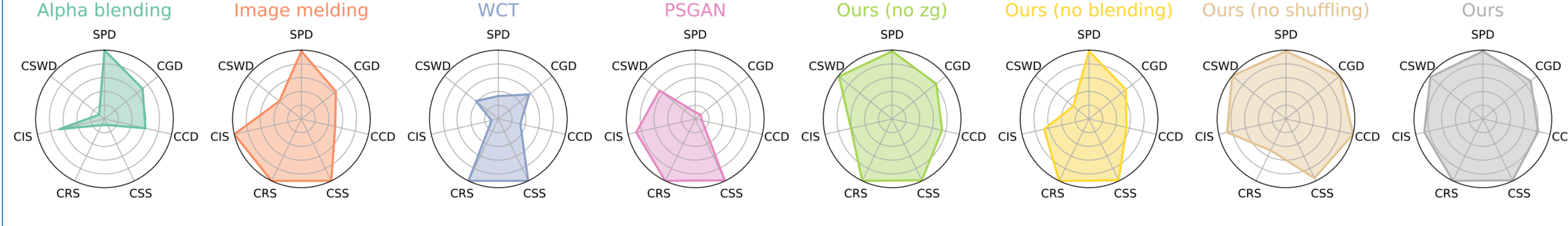
Application: Texture Brush

Method

Legend
- S_1, S_2, and combined data respectively
- α Linear blending using interpolation parameter
- Tile operation
- Shuffle operation
- Random crop

$$\min_{E^l, E^g, G} \max_{D^{rec}, D^{itp}} \mathbb{E}_{S_1, S_2 \sim \mathcal{S}} (\lambda_1 L_{pix}^{rec} + \lambda_2 L_{Gram}^{rec} + \lambda_3 L_{adv}^{rec} + \lambda_4 L_{Gram}^{itp} + \lambda_5 L_{adv}^{itp})$$

Quantitative Comparisons

	Controllability		Smoothness		Realism			User study		Testing time
	SPD ⇓	CGD ⇓	CCD ⇓	CSS ⇓	CRS ⇓	CIS ⇑	CSWD ⇓	PR	p-value	
Naïve α-blending	0.0000	1.255	0.777	0.9953	0.4384	22.35	60.93	0.845	$< 10^{-6}$	0.02 s
Image Melding [8]	0.0111	1.289	0.865	0.0005	0.0004	**29.45**	47.09	0.672	$< 10^{-6}$	6 min
WCT [31]	0.8605	1.321	0.988	0.0020	0.0000	9.86	46.89	0.845	$< 10^{-6}$	7.5 s
PSGAN [3]	1.1537	1.535	1.156	0.0069	0.0000	26.81	35.90	0.967	$< 10^{-6}$	1.4 min
Ours (no z^g)	0.0112	1.207	0.680	0.0078	0.0010	21.04	21.54	-	-	-
Ours (no blending)	0.0103	1.272	0.817	0.0125	0.0009	22.24	52.29	-	-	-
Ours (no shuffling)	0.0107	**1.129**	**0.490**	0.0534	0.2386	26.78	**20.99**	-	-	-
Ours	0.0113	1.177	0.623	0.0066	0.0008	26.68	22.10	-	-	0.5 s

Qualitative Comparisons

Source 1   DeepFill   Source 2

- Naïve α-blending
- Image Melding
- AdaIN
- WCT
- PSGAN
- Ours (no z^g)
- Ours (no blending)
- Ours (no shuffling)
- Ours

Side crop 1   Center crop   Side crop 2

Application: Animal Hybridization

Input: aligned animal region with hole   Our result   Naïve α-blending result