Paper Digest Meeting

AnyLens: A Generative Diffusion Model with Any Rendering Lens

20240424

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Problem Definition
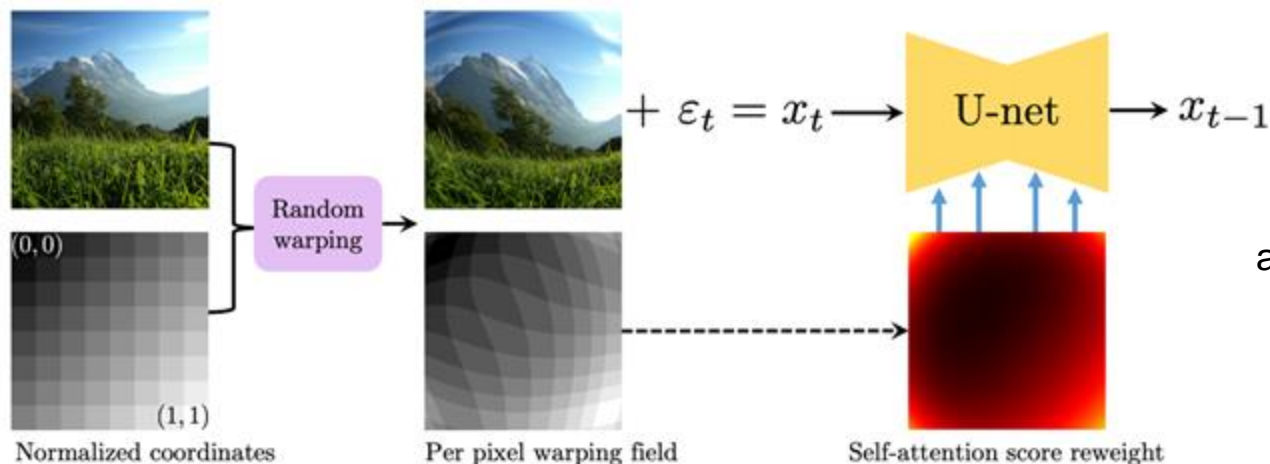

Generate images captured with any type of lens

- Fisheye
- Concave
- 360-Panorama
- Sphere-Texutring

Key Ideas

Generated   Manually warped

Applying warping to generated image results in blurry artifacts

Normalized coordinates   Per pixel warping field   Self-attention score reweight

$(0,0)$

$(1,1)$

Random warping

$+ \; \varepsilon_t = x_t \longrightarrow$ U-net $\longrightarrow x_{t-1}$
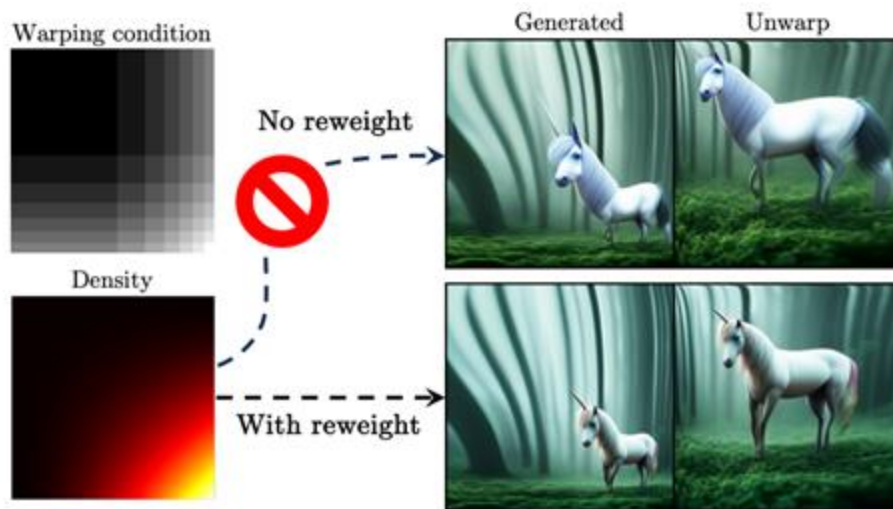
Finetune a diffusion model with additional condition image (warp field)

Key Ideas

$$p_{f(x,y)} = \det \begin{pmatrix} \frac{\partial f_1}{\partial x} & \frac{\partial f_2}{\partial x} \\ \frac{\partial f_1}{\partial y} & \frac{\partial f_2}{\partial y} \end{pmatrix}$$

Warping changes the density of pixels

Warping condition

Generated   Unwarp

No reweight

Density

With reweight

Attention reweight:
Duplicate tokens at high density regions

$$s_{il} = \langle q_i, k_l \rangle \quad w_{ij} = \frac{\exp(s_{ij})}{\sum_{l=1}^{N} \exp(s_{il})} \quad \sum_{j=1}^{N} w_{ij} v_j$$

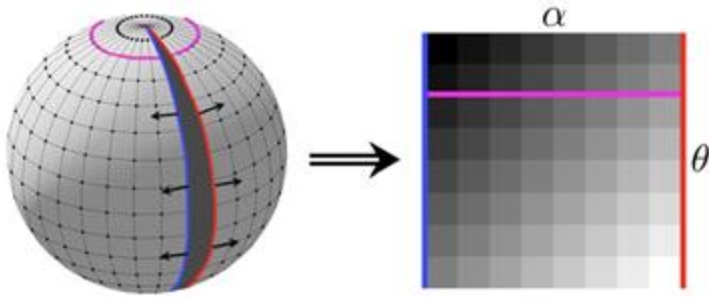$$w'_{ij} = \frac{\exp(s_{ij})}{\exp(s_{in} + \ln d_n) + \sum_{l \neq n} \exp(s_{il})}$$

Key Ideas

Figure 8. Sphere parametrization with polar coordinates. The horizontal segments $\theta = const$ lengths are proportional to $\sin \theta$.

Warp: Unfold sphere surface
to rectangular image

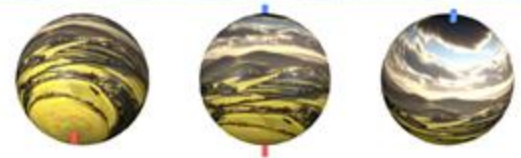Figure 7. Variety of textures generated with the sphere unfolding.

Figure 9. Spherical panoramas generated with the sphere unfolding. Prompt: *"Rolling hills in England, clouds and sun in the sky"*.