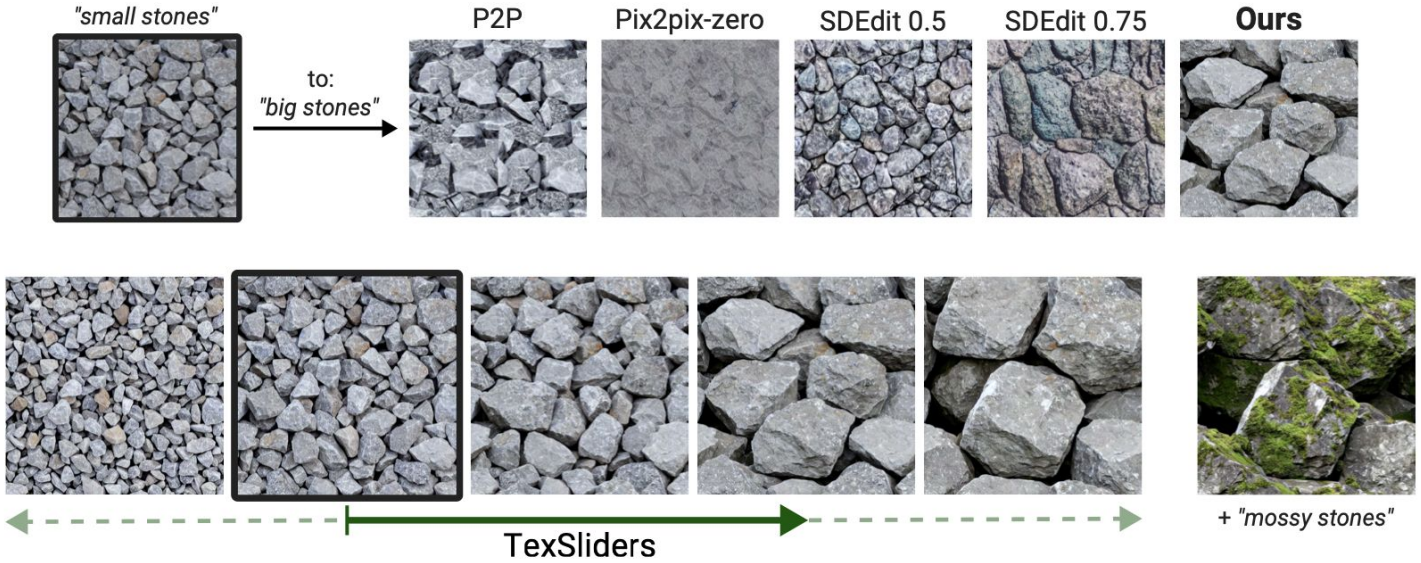
Mid-Term Project Presentation
Image Texture Editing with TexSliders

Team4
Chanryeol Lee, Chanhyuk Lee

Brief Introduction: TexSliders

TexSliders: Diffusion-Based Texture Editing in CLIP Space
J. Guerrero-Viu et al., SIGGRAPH 2024

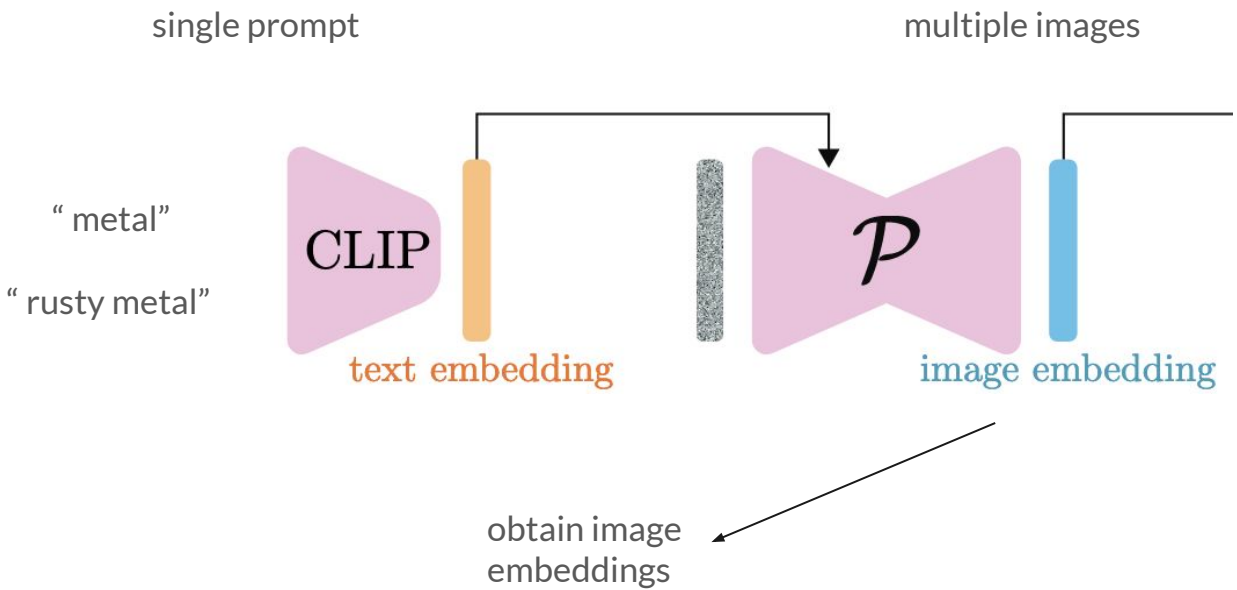


Brief Introduction: TexSliders

Diffusion based method for texture editing

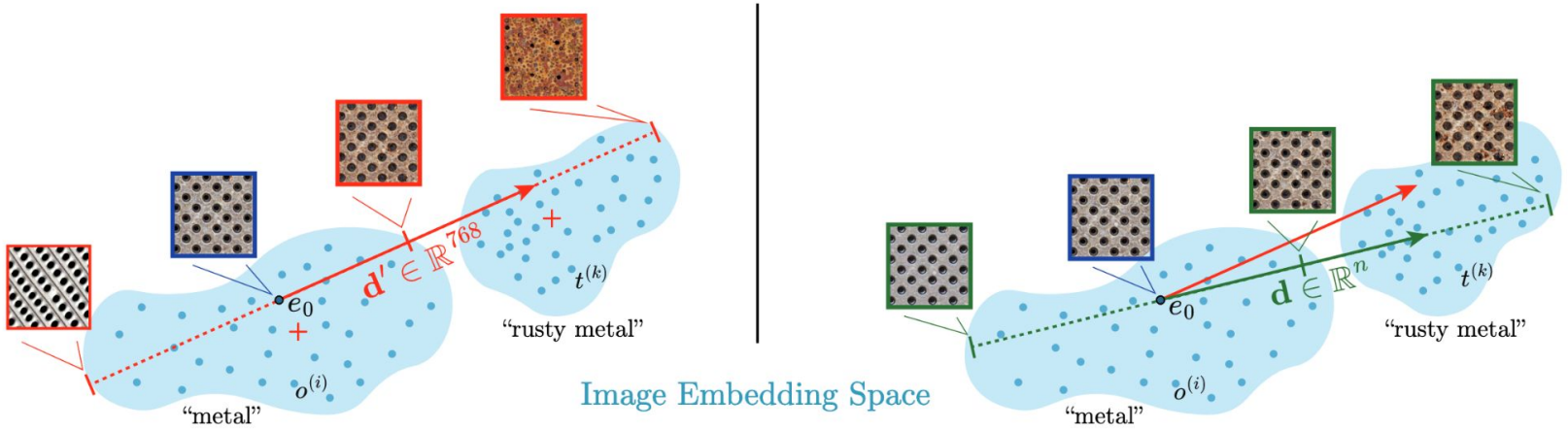
- Makes sliders that edits texture from simple prompts based on editing direction (e.g., “aged wood” to “new wood”), preserving identity & quality
- How to compute editing direction?
  - Map text embedding to CLIP image embedding space
  - Cluster embeddings to get editing direction

Brief Introduction: TexSliders



Brief Introduction: TexSliders

In high-dimensional embedding space..



Finding principal "direction" that changes the feature!

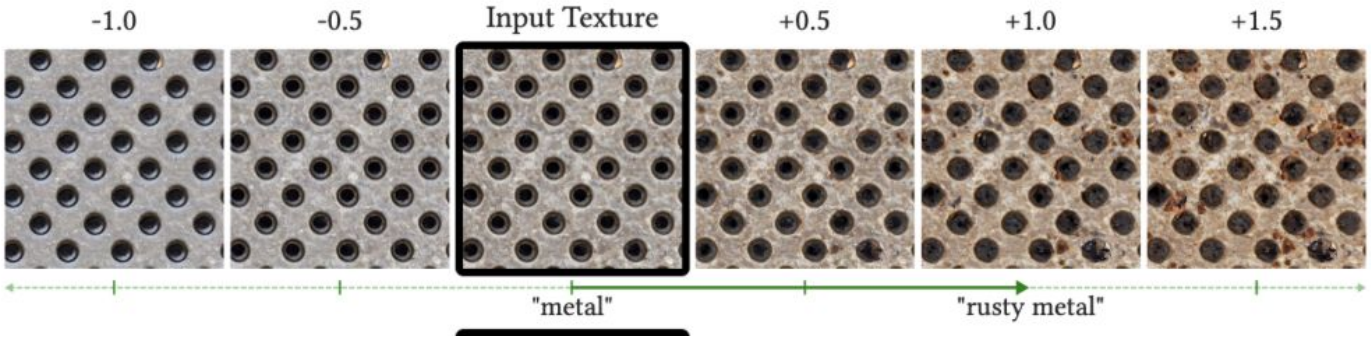
Brief Introduction: TexSliders

“rusty metal” embedding

$$\mathbf{e}_\alpha = \mathbf{e}_0 + \alpha \cdot \mathbf{d},$$

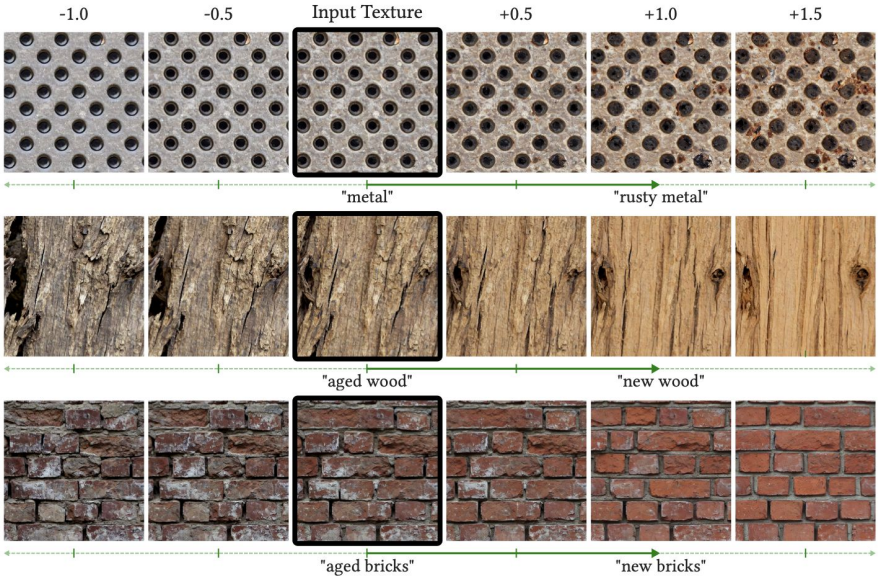
“ metal” embedding

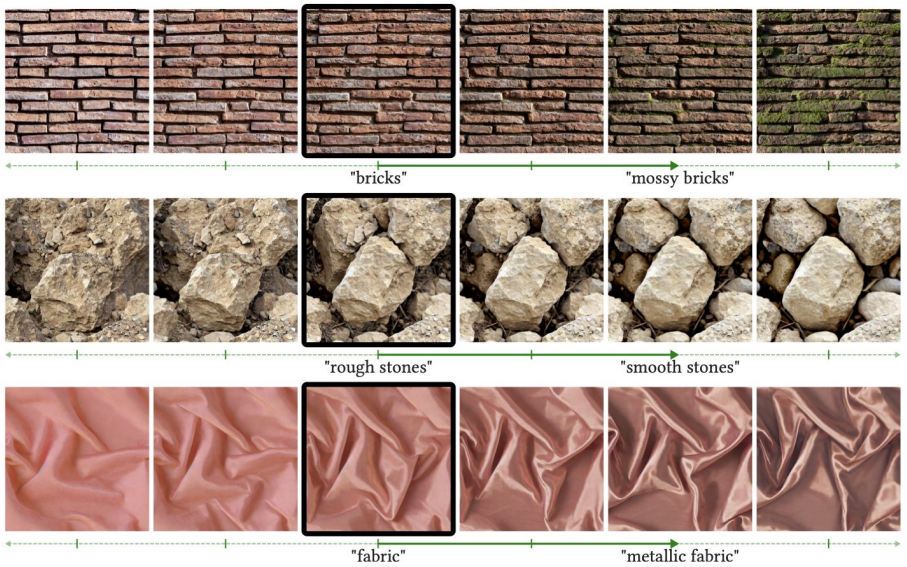
Alpha can work as an “slider” to control amount of “rustiness”



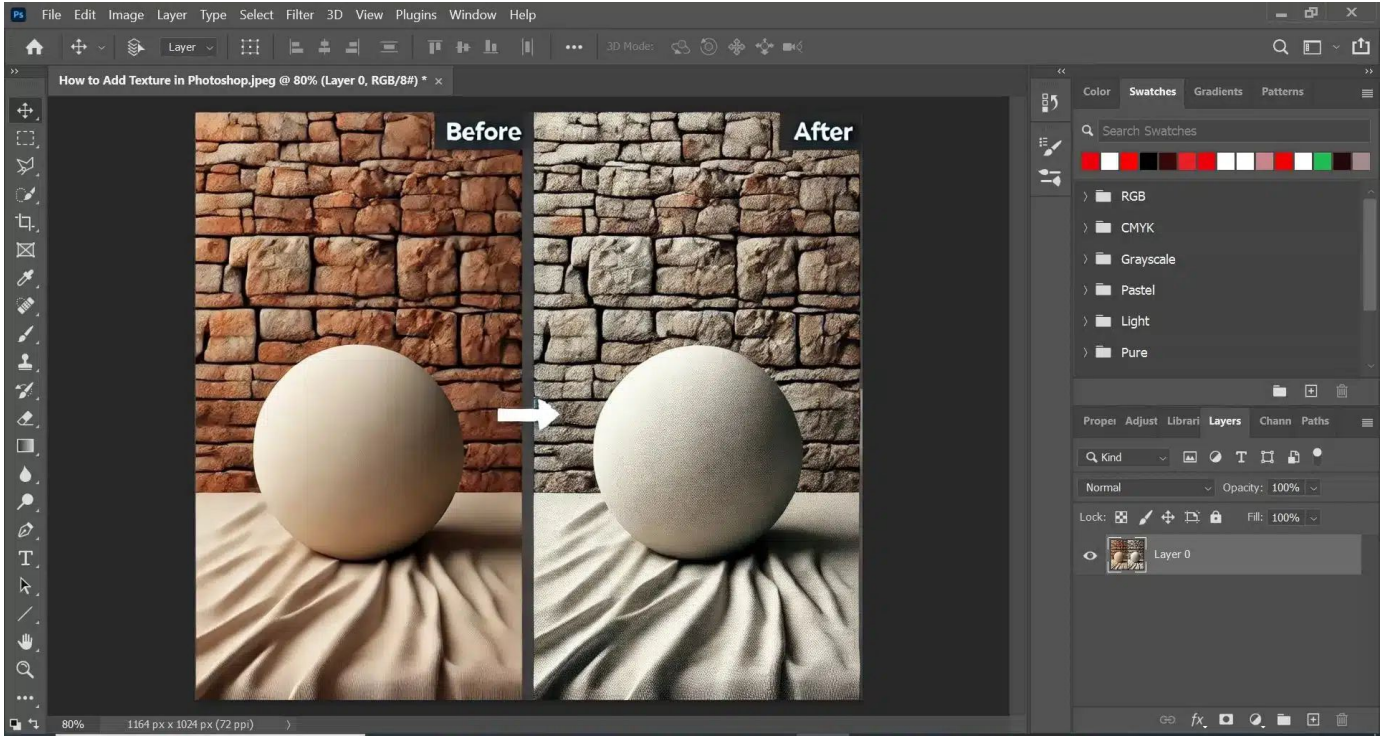
Brief Introduction: TexSliders

Results





Expand to Image Texture Editing



Previous Editing(Inpainting) Works

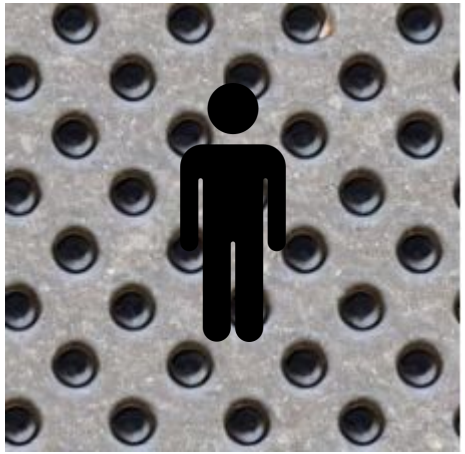
Figure 1. **We use Denoising Diffusion Probabilistic Models (DDPM) for inpainting.** The process is conditioned on the masked input (*left*). It starts from a random Gaussian noise sample that is iteratively denoised until it produces a high-quality output. Since this process is stochastic, we can sample multiple diverse outputs. The DDPM prior forces a harmonized image, is able to reproduce texture from other regions, and inpaint semantically meaningful content.

Usually Targets modifying the object/background

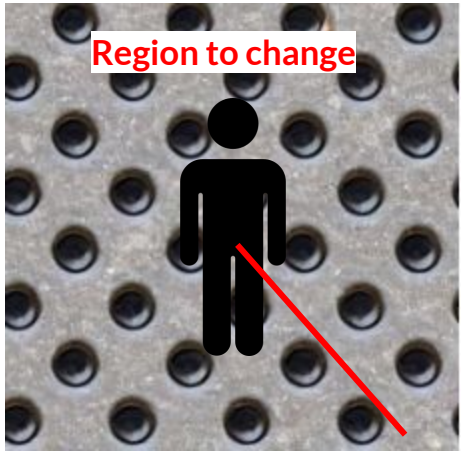
Maintaining the geometry and controlling only the feature is hard

RePaint: Inpainting using Denoising Diffusion Probabilistic Models, CVPR 2022

Idea



Metal

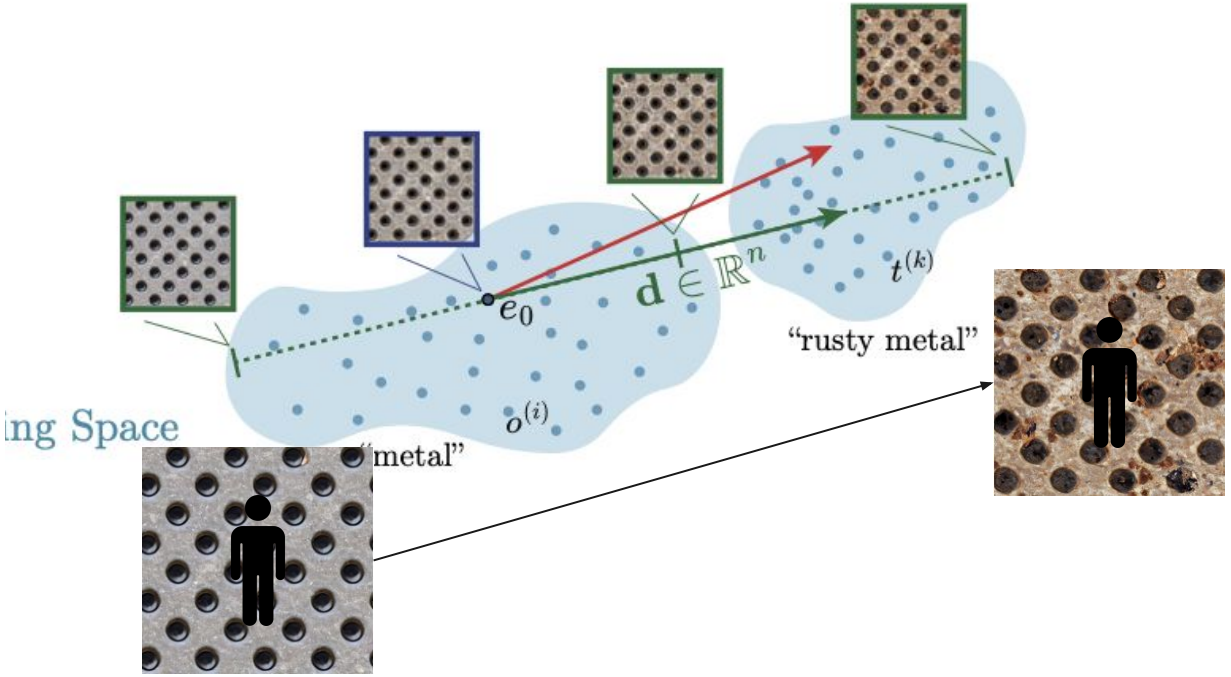


Region to preserve

Rusty metal

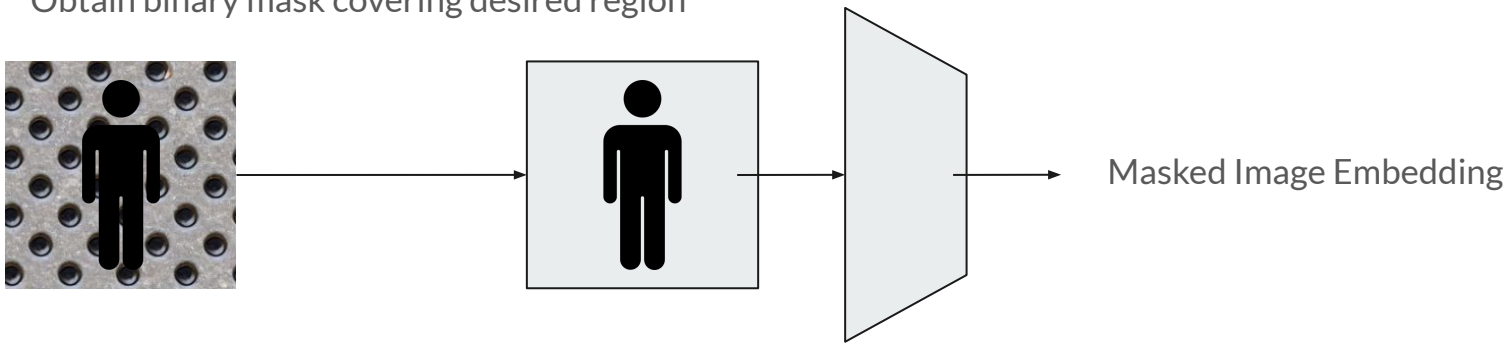
- Input: arbitrary image, desired region (mask), text prompt
- Output: image with modified texture of desired region

Idea



Methods

Obtain binary mask covering desired region



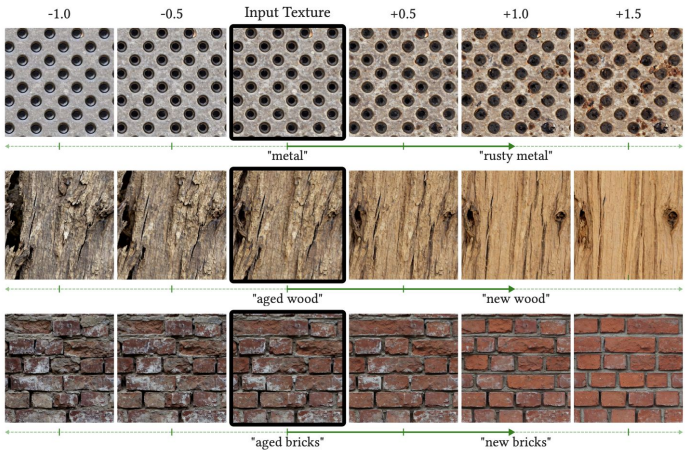
Masked Image Embedding

Encoder (CNN)

CLIP - Pretrained ResNet50

Methods

Obtain slider vector for feature to modify



$$I_{\text{masked}} = M \odot I$$

$$E_{\text{edit}} = E + M_{\text{patch}} \odot (\alpha \cdot \vec{d})$$

Amount of change

"Slider" vector obtained from texsliders

E_{edit} Feed edited embedding to pretrained diffusion model to decode into images.

Contributions

- Chanryeol: Prepare test datasets for image editing, obtaining sliders
- Chanhyuk: building framework for masking and diffusion prior