Drag Your GAN: Interactive Point-based Manipulation on the Generative Image Manifold

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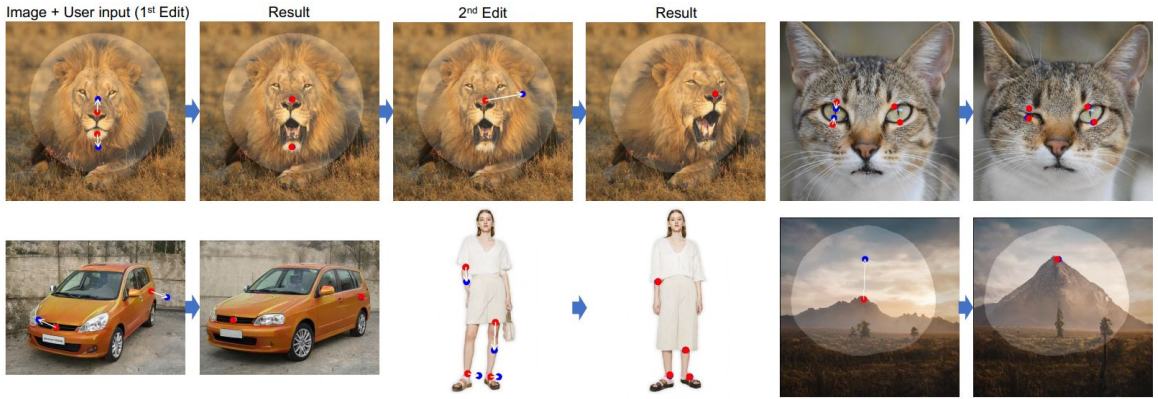
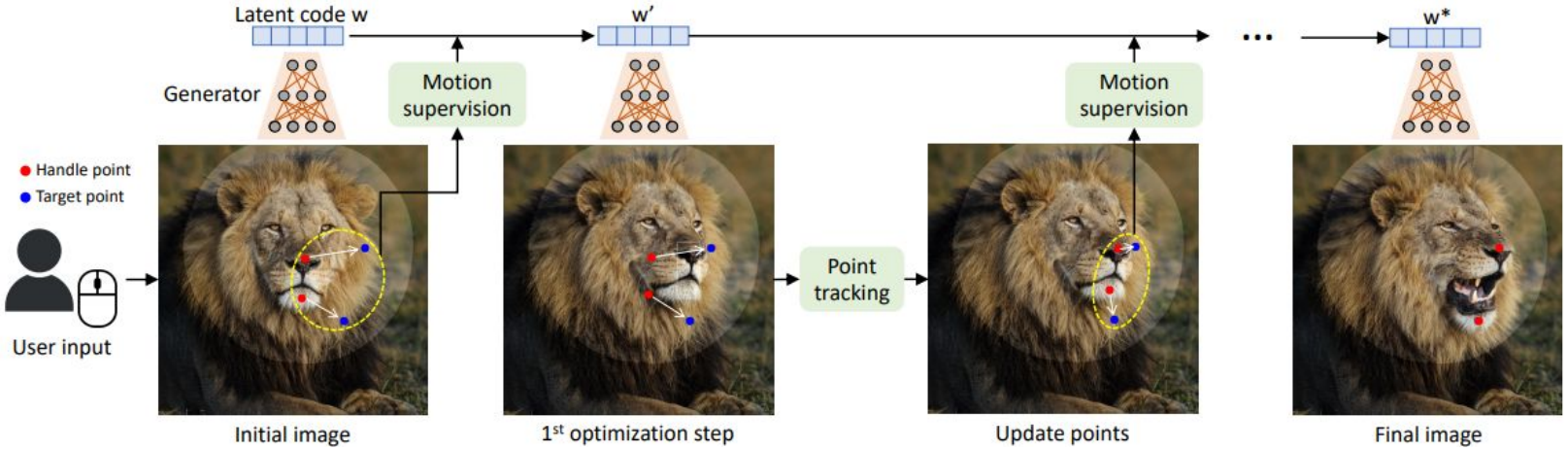
ABSTRACT

GOAL:
Deform an image with precise control over where pixels go, thus manipulating the pose, shape, expression, and layout of diverse categories.

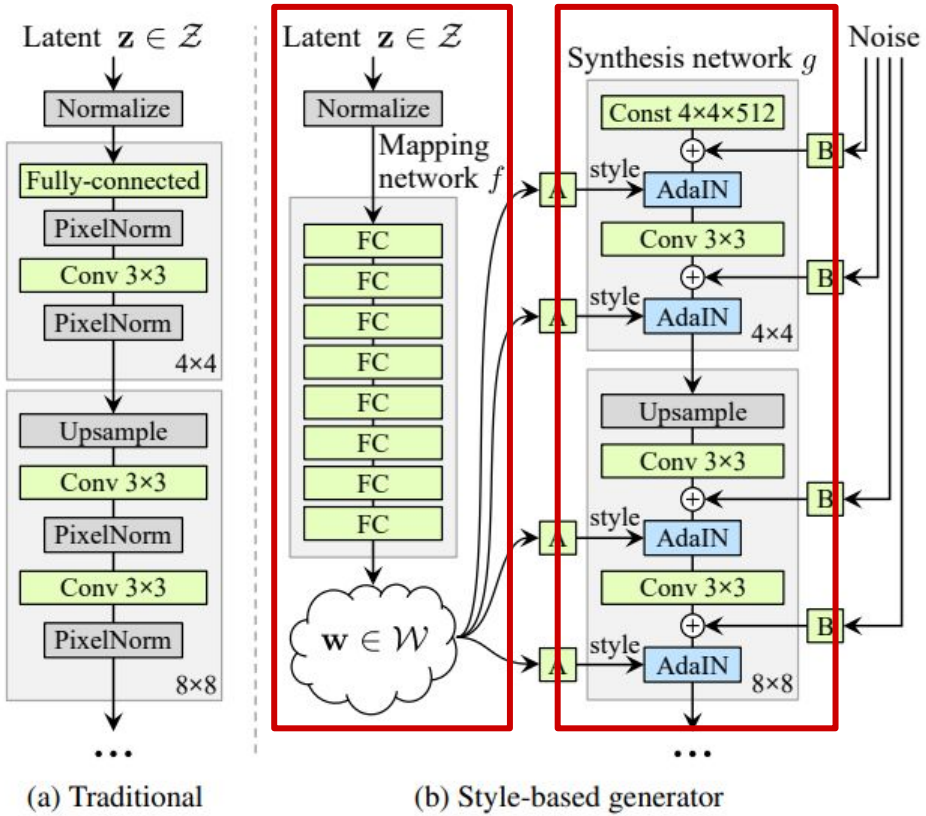


METHOD


Latent code w
w'
w*
Generator
Motion supervision
Motion supervision
Handle point
Target point
User input
Point tracking
Initial image
1st optimization step
Update points
Final image

METHOD

Generator



METHOD

Generator

- A 512 dimensional latent code is mapped to an intermediate latent code
- The latent code is sent to the generator to produce the output image
- The generator learns a mapping from a low-dimensional latent space to a much higher dimension

METHOD

Motion Supervision

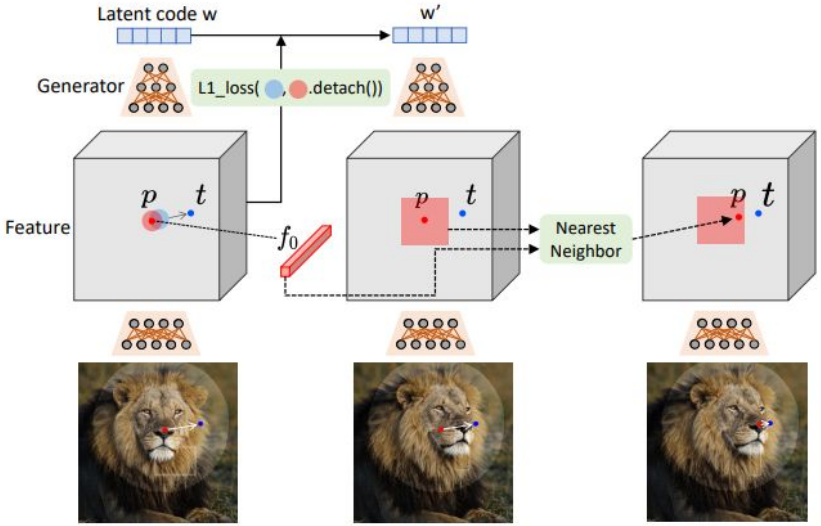
- Goal: Supervise the point motion for a generated image to optimize the latent code
- Use the intermediate features of the generator to calculate
- Loss:

$$\mathcal{L} = \sum_{i=0}^{n} \sum_{\boldsymbol{q}_i \in \Omega_1(\boldsymbol{p}_i, r_1)} \|\mathbf{F}(\boldsymbol{q}_i) - \mathbf{F}(\boldsymbol{q}_i + \boldsymbol{d}_i)\|_1 + \lambda \|(\mathbf{F} - \mathbf{F}_0) \cdot (1 - \mathbf{M})\|_1,$$

METHOD

Point Tracking

- Goal: Update each handle point to avoid accumulation error



METHOD

Point Tracking

- Use the feature maps after the 6 block of StyleGAN2
- The tracked point is obtained by searching for the nearest neighbor of handle points

$$\boldsymbol{p}_i := \underset{\boldsymbol{q}_i \in \Omega_2(\boldsymbol{p}_i, r_2)}{\arg\min} \|\mathbf{F}'(\boldsymbol{q}_i) - \boldsymbol{f}_i\|_1.$$

EXPERIMENTS

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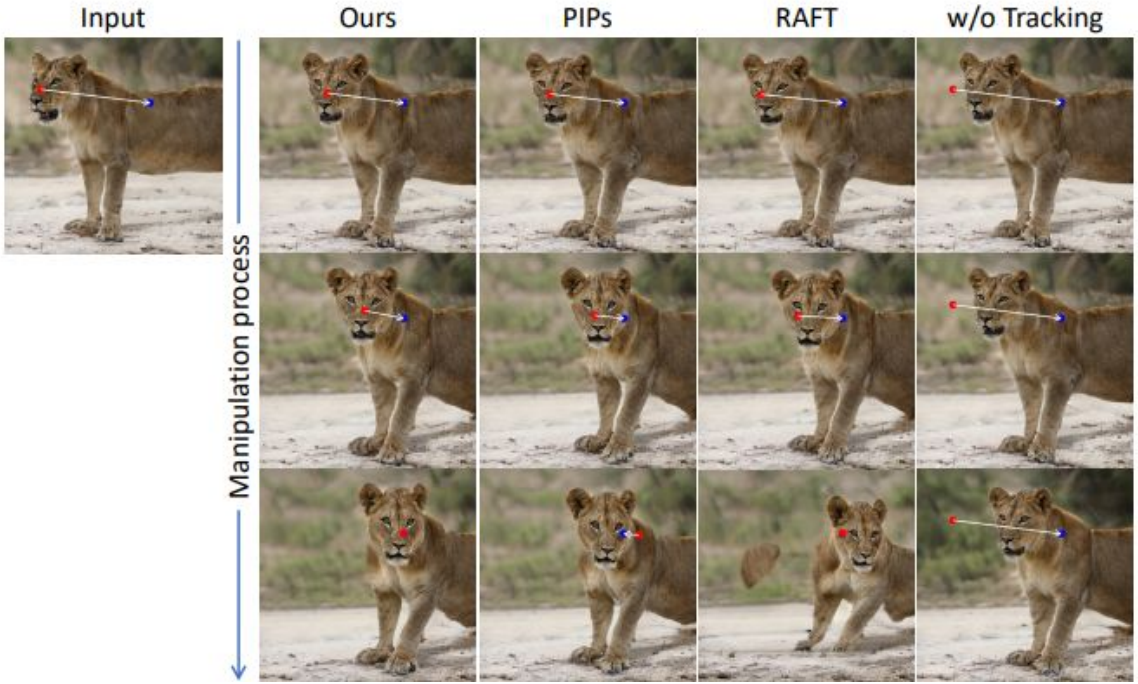

EXPERIMENTS

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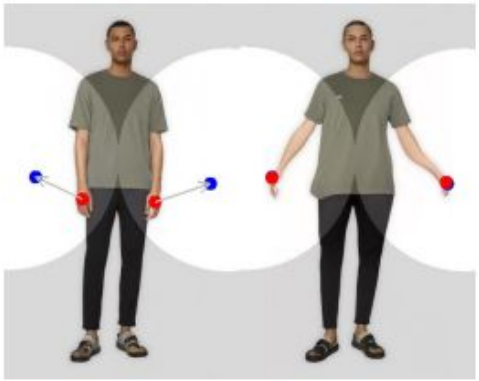

CONCLUSION

- Two novel ingredients: An optimization of latent codes that incrementally moves multiple handle points towards their target locations, and a point tracking procedure to faithfully trace the trajectory of the handle points

END