Ω-GAN: Object Manifold Embedding GAN for Image Generation via Disentangling Parameters into Pose and Shape Manifolds

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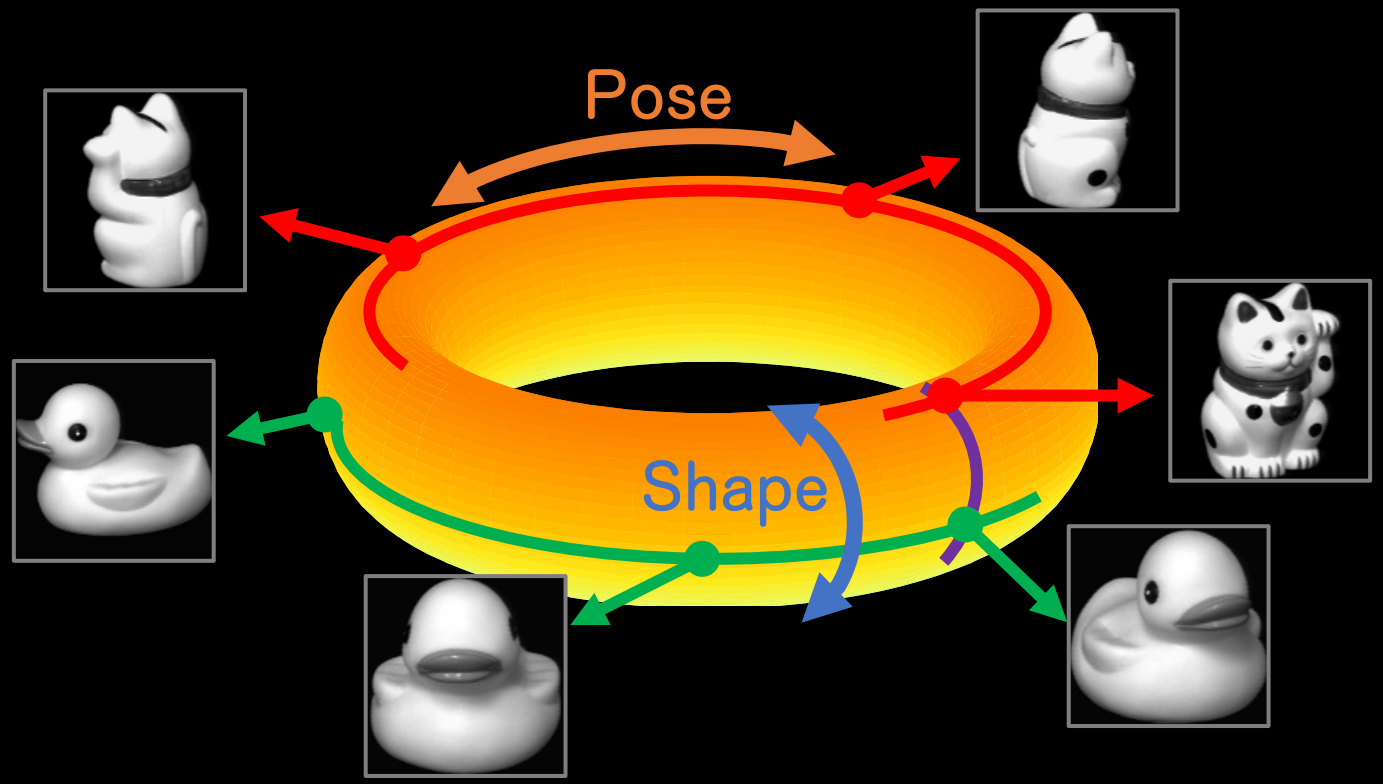
Goal: Image Generation by controlling the pose and shape parameters



Ω-GAN: Object Manifold Embedding GAN

- Contribution 1: Parametric Manifold Embedding
  - Difficulty: The pose has circularity.

Sampling the noise variables from a distribution over the pose⊗shape manifold.

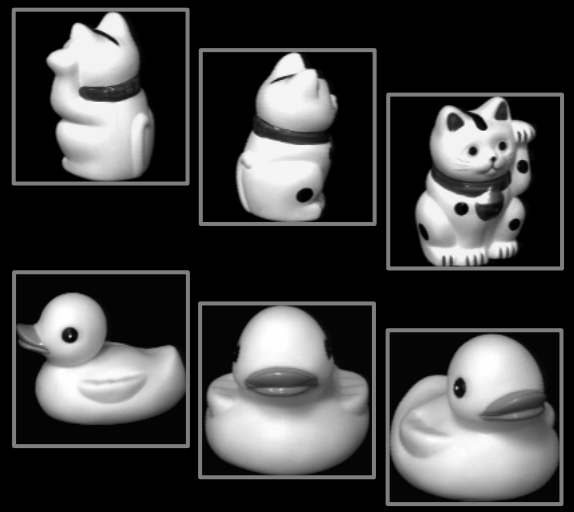
- Contribution 2: Object Identity Loss
  - Difficulty: Object shape may change when changing the pose parameter.

Preserving the shape while changing the pose only.

Contribution 1: Parametric Manifold Sampling

Sampling the noise variables from a distribution over the pose⊗shape manifold.

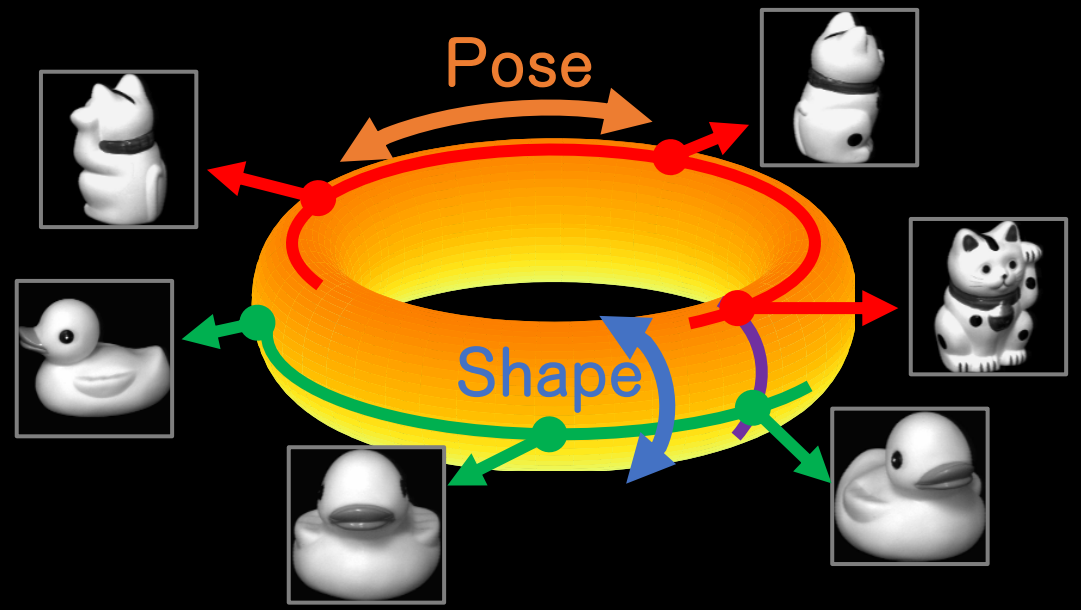
Input images



Discriminator

Real / Fake ?

Generator of the Ω-GAN



Contribution 2: Object Identity Loss

Preserving the shape while changing the pose only.

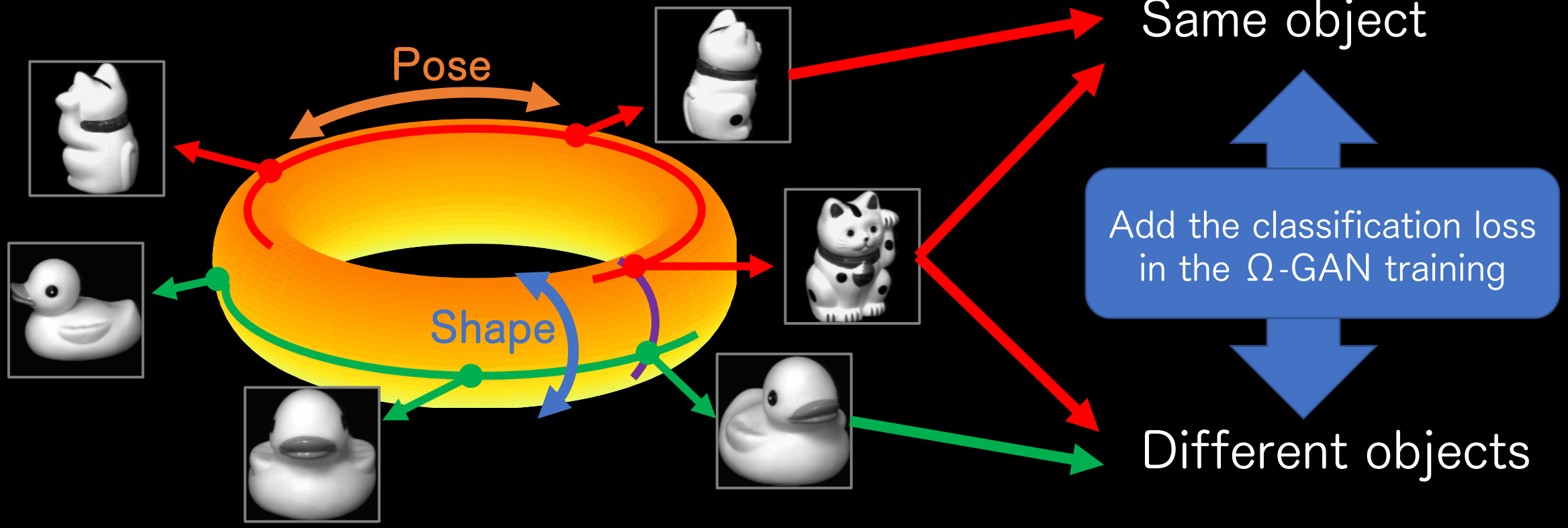


Image Generation Result: COIL-20

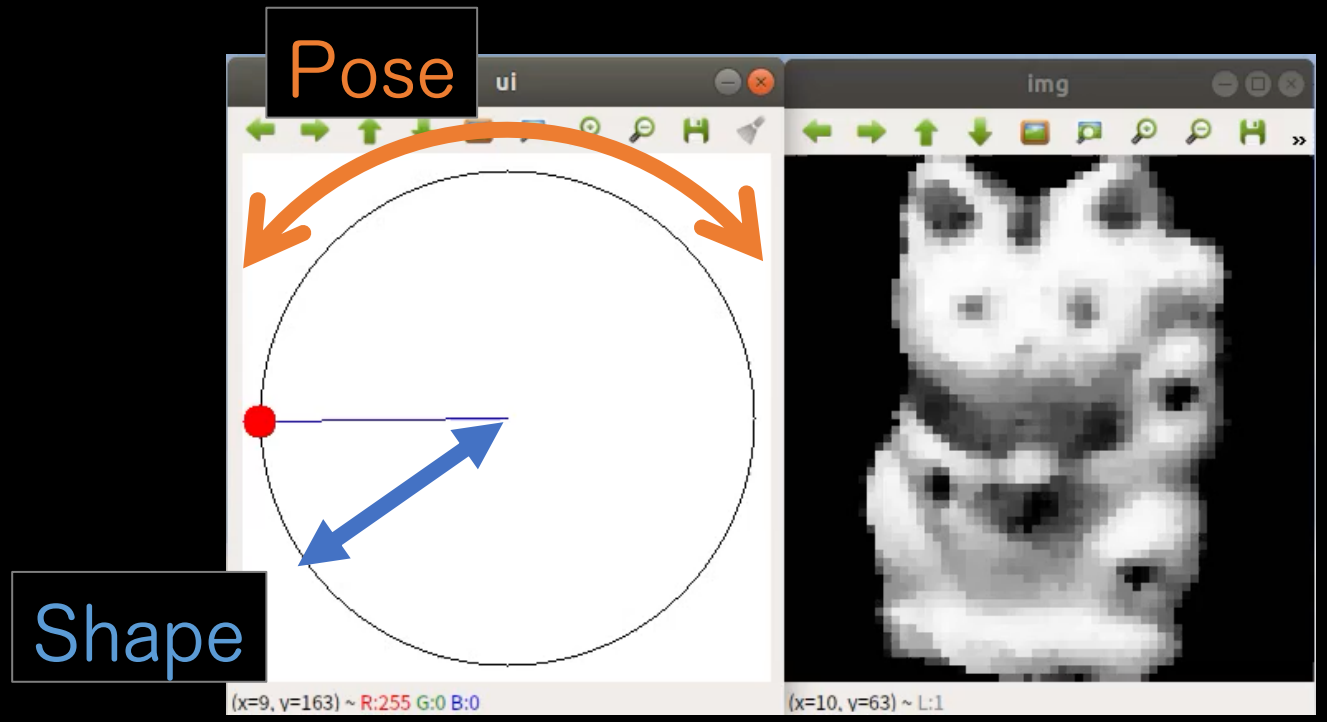
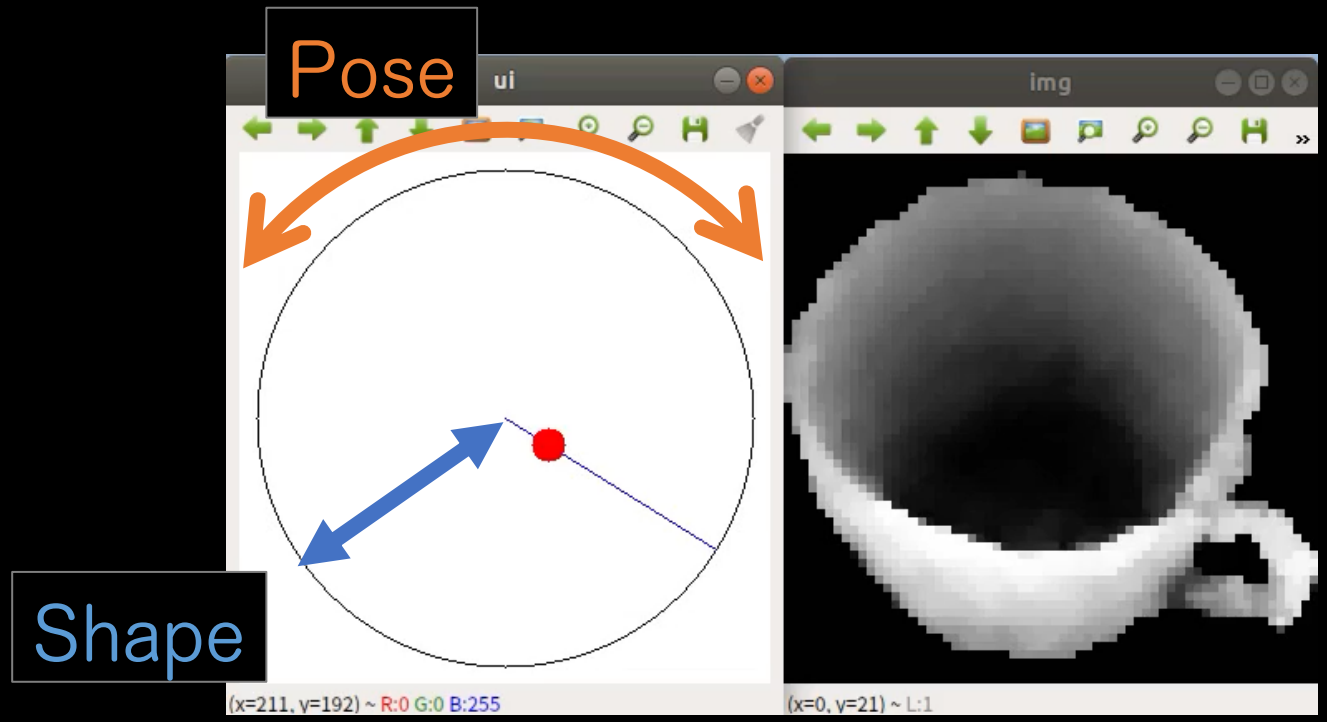


Image Generation Result: Mug dataset



Conclusion

- Ω-GAN (Object Manifold Embedding GAN) is proposed.

  Contribution 1: Parametric Manifold Embedding
  Contribution 2: Object Identity Loss

- Future work: Extend the method to

  Object 3D rotation
  Other applications