Iconify: Converting Photographs into Icons

Takuro Karamatsu[1], ***Gibran Benitez-Garcia[2,3]***, Keiji Yanai[2], and Seiichi Uchida[1]

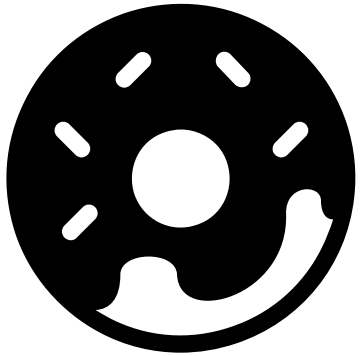
Kyushu University[1], The University of Electro-Communications[2], OMRON SINIC X Corporation[3]

MMArt-ACM '20 2020.10.26

Motivation

– *Automatic **generation of icons** from segmented images, capable of showing sufficient **abstraction and simplification** of the original object appearance.*






Difficulties

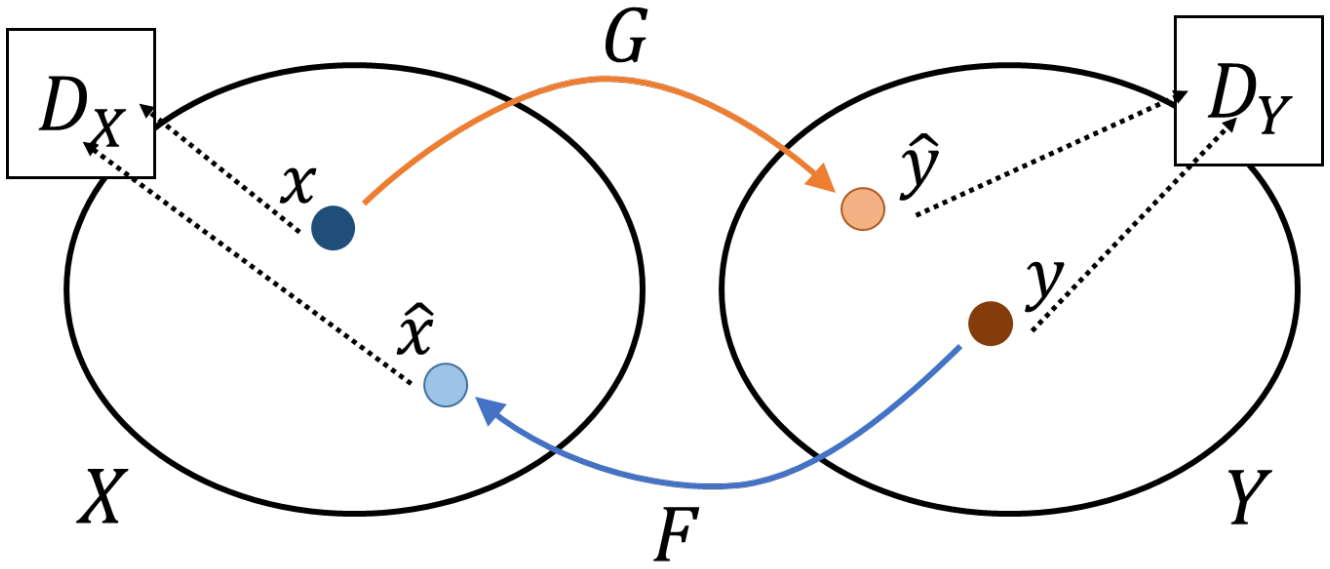
- *A **domain conversion** task between two different sample sets, natural images & icons (no paired data between both sets).*
- ***Large style difference** between both domains (severe abstraction).*
- ***Large appearance variations** in each domain. Even icons have large variations in their shapes to represent various objects.*

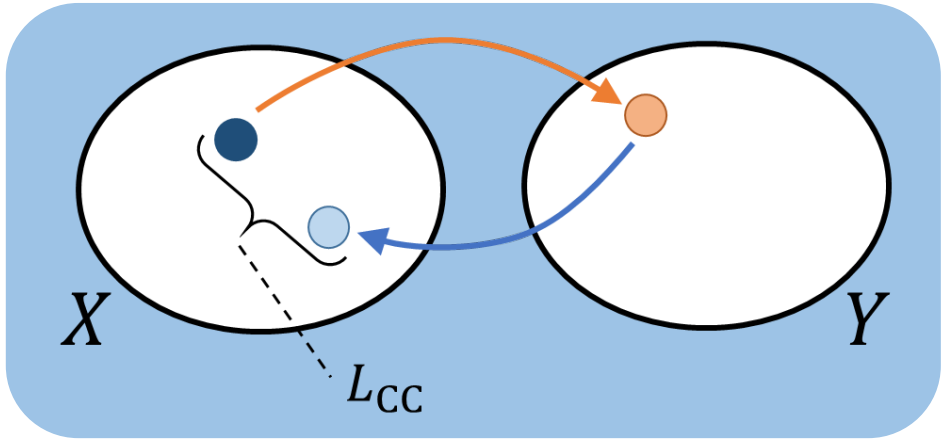
Proposal

- ***Objective:***
  - *Generate icon images automatically from natural photographs by using machine learning techniques (Generative Adversarial Networks)*
- ***Approach:***
  - *No paired data of photos and icons is provided. Therefore, we have to adopt unsupervised image-to-image translation methods, such as CycleGAN.*

Generative Adversarial Networks

- ***CycleGAN***:*
  - *Based on a **mapping between two image sets**, X and Y, without giving any image-to-image correspondence. Introducing the **cycle consistency loss**.*

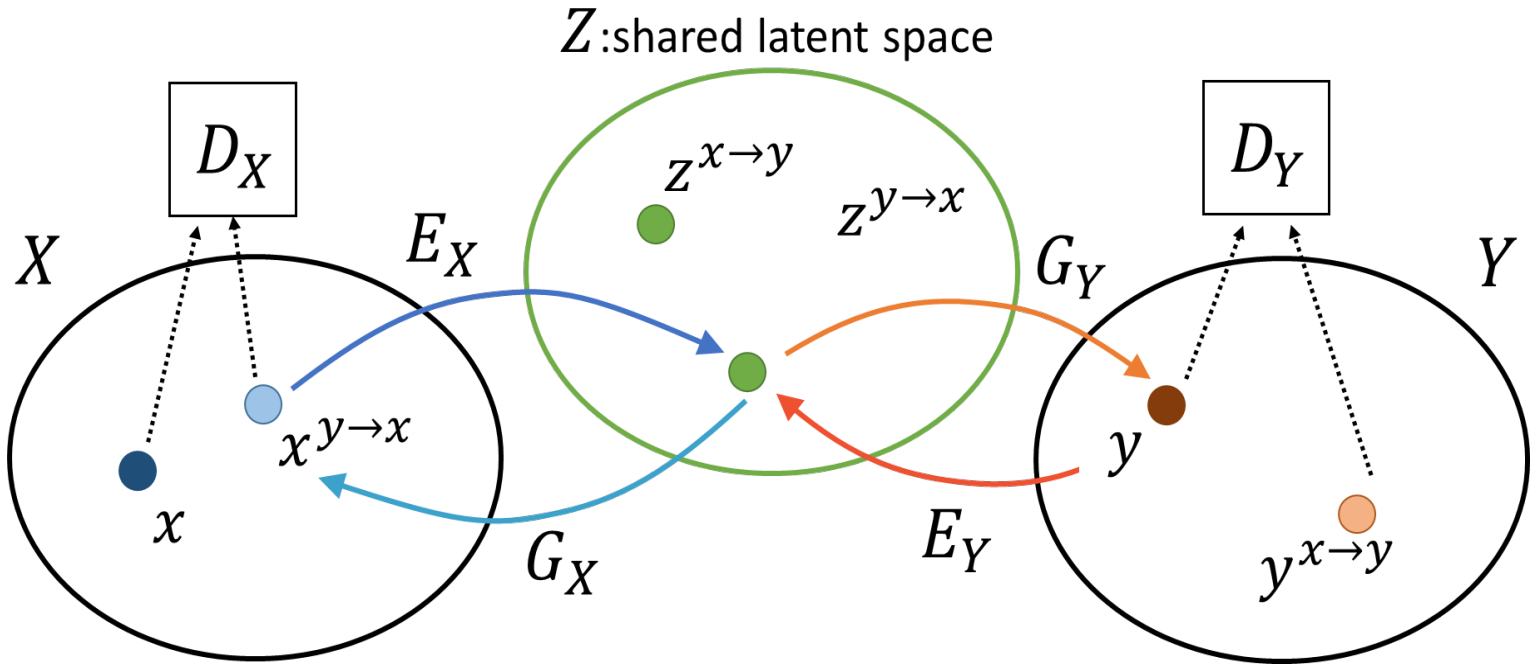


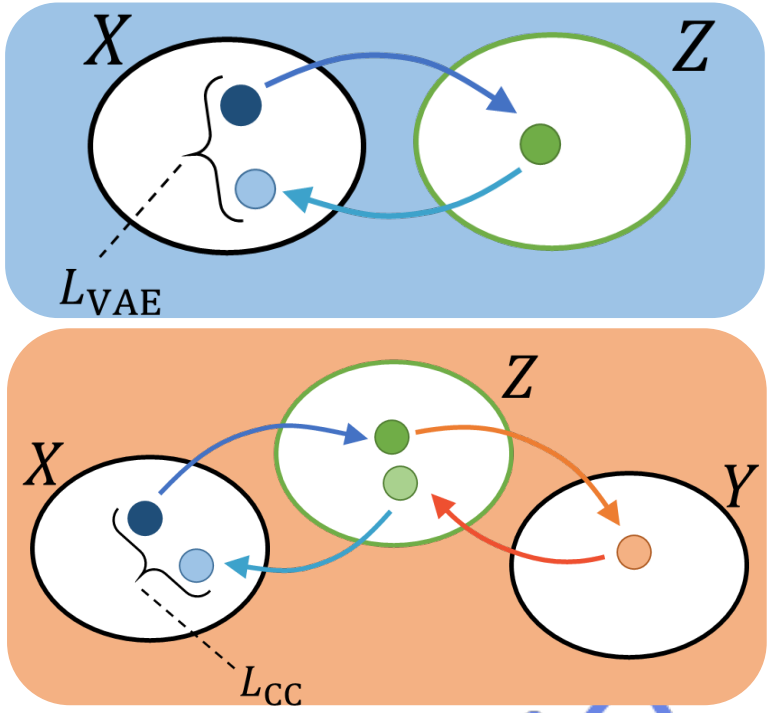


* Zhu, Jun-Yan, et al. "Unpaired image-to-image translation using cycle-consistent adversarial networks." ICCV 2017.

Generative Adversarial Networks

- ***UNIT***:*
  - *Based on CycleGAN, introducing a condition that both input and output should be represented by the **same variable in the latent space** $\mathcal{Z}$.*





* Liu, Ming-Yu, et al. "Unsupervised image-to-image translation networks." NIPS 2017.

Datasets to Iconify

- ***Photograph data:***
  - *11,041 individual objects from 5,000 images of the **MS-COCO dataset***

- ***Icon data:***
  - *8,830 augmented **black & white icons** from MS Power Point*

- ***Logo data:***
  - *20,000 color logos randomly chosen from the **LLD-logo dataset****

* S, Alexander, et al. "Logo synthesis and manipulation with clustered generative adversarial networks." CVPR 2018.

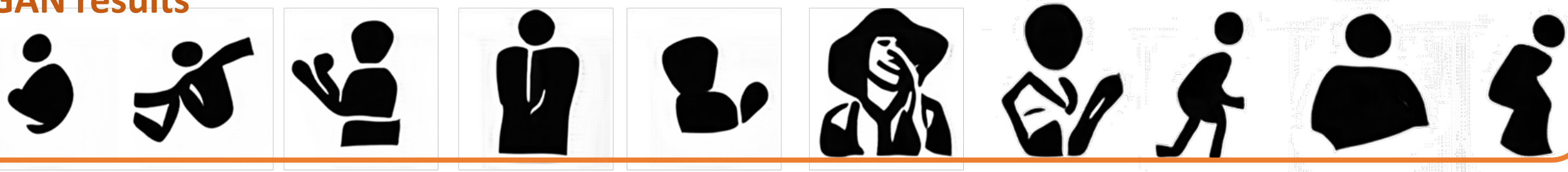
Iconify human photos (i)

- *Train both models **CycleGAN and UNIT** with the same dataset, and hyperparameters from original implementations*
- *1,440 augmented icon images (from 72 original icons), and 1,684 person photos*
- *All images resized to 256x256 pixels*

Iconify human photos (Results)

Input

GAN results



UNIT results

Iconify general objects

– *Train **CycleGAN** in a coarse-to-fine strategy with the complete datasets*

Iconify general objects to logos

– *Train **CycleGAN** in a coarse-to-fine strategy with the complete datasets*

Conclusion

- ***Conclusions:***
  - *We experimentally proved that the transformation of natural photos into icon images is possible by using GANs.*
  - *CycleGAN has a sufficient "abstraction" ability to generate icon-like images*

- ***Future work:***
  - *Subjective and objective quality evaluation of the iconified images*
  - *Generate a larger icon dataset to improve the results quality*
  - Analysis of the trained GANs for understanding how the abstraction has been made

Thank You