D4-03

Ramen as You Like :
Sketch-based Food Image Generation and Editing

Jaehyeong Cho   Wataru Shimoda   Keiji Yanai
The University of Electro-Communications, Tokyo

UEC TOKYO

INTRODUCTION

· People often try to edit photos to make more attractive
· **However**, photo editing requires a lot of time and skill
 → **Make possible to edit images quickly and easily using Deep Learning**
· Image generation based on sketched mask images
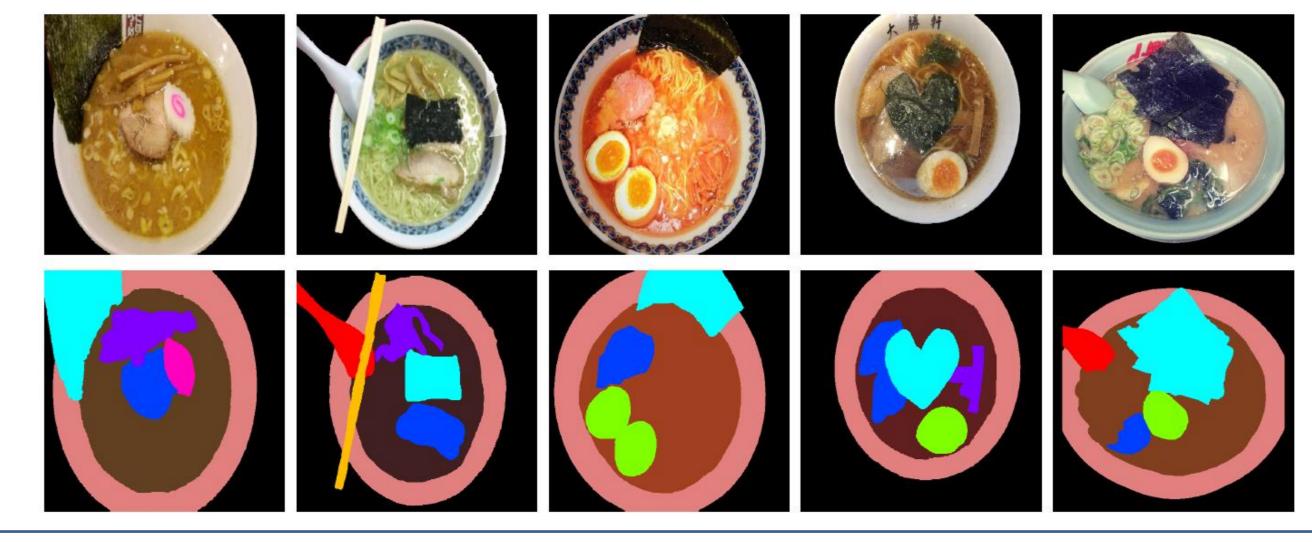· Image editing based on segmentation mask images generated from real images

I want to add more toppings to make it more delicious.

Easy and fast!!

Image editing using Deep Learning

DATASET: UEC-Ramen555

· Created a dataset consisting of 555 pairs of ramen and mask images
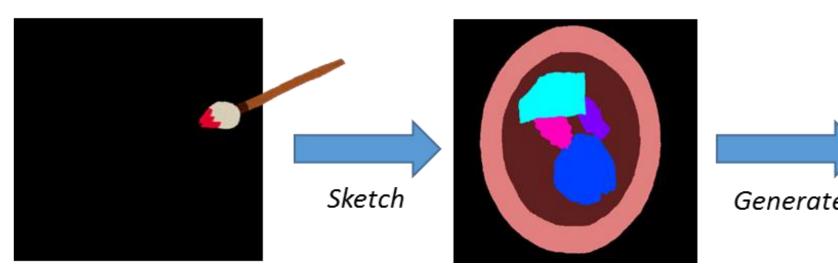· Mask images include 15 class label
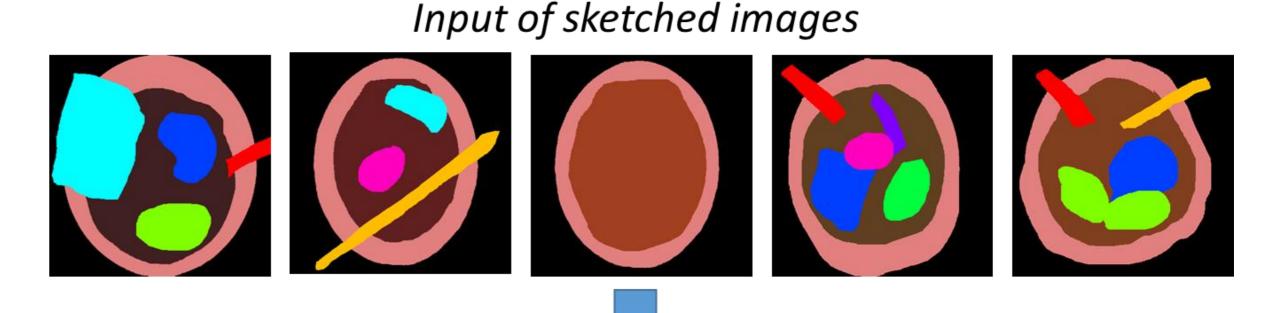· Used 500 pairs for training

METHOD

· **Image Generation**
 - **Pix2Pix [2]**
  · pix2pix architecture consists of U-Net[4] which has an Encoder-Decoder with skip connections
  · Input sketched image in Generator
  · Discriminator learns loss function

$$\mathcal{L}_{cGAN}(G, D) = \mathbb{E}_{x,y}[\log D(x, y)] + \mathbb{E}_{x,z}[\log(1 - D(x, G(x, z)))]$$

$$\mathcal{L}_{L1}(G) = \mathbb{E}_{x,y,z}[\|y - G(x, z)\|_1]$$

$$G^* = \arg\min_G \max_D \mathcal{L}_{cGAN}(G, D) + \lambda\mathcal{L}_{L1}(G)$$

Sketch image   *Mask images*   *Generator*   *Generated image*   *Discriminator* → *Real/Fake*   *Original image*

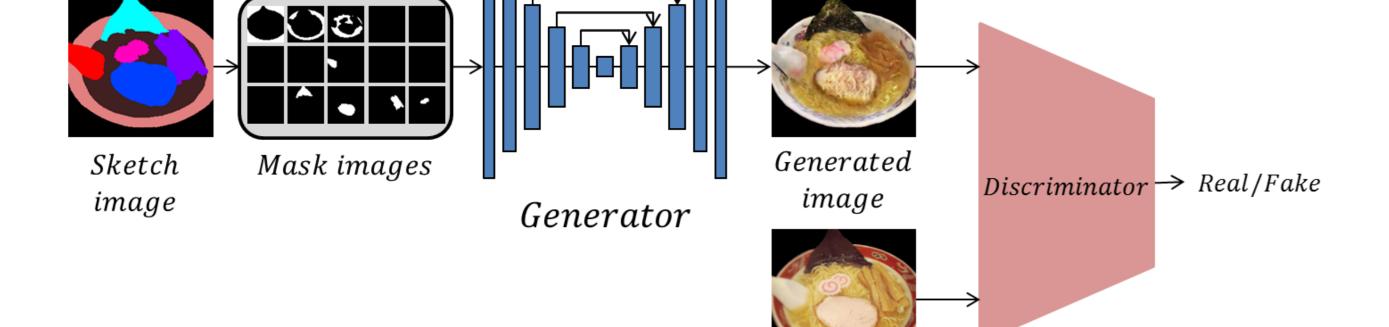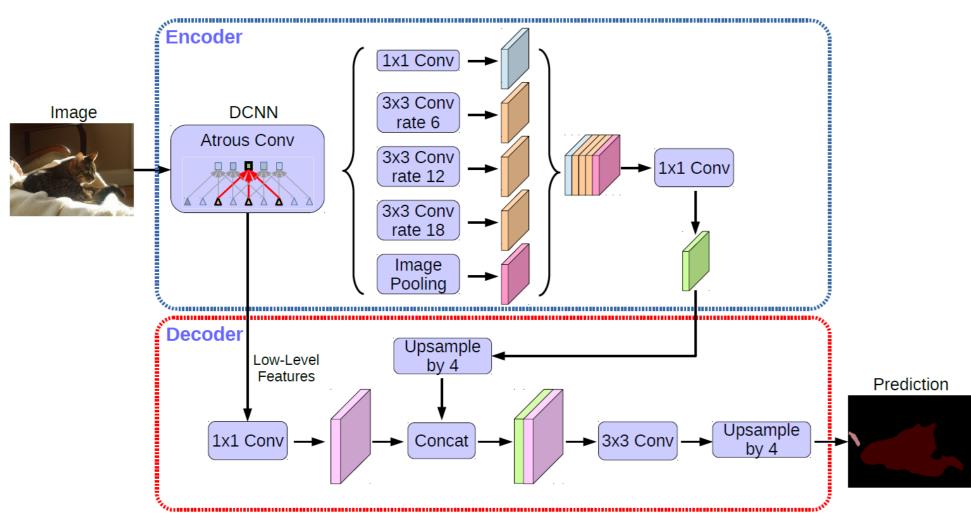· **Image Segmentation**
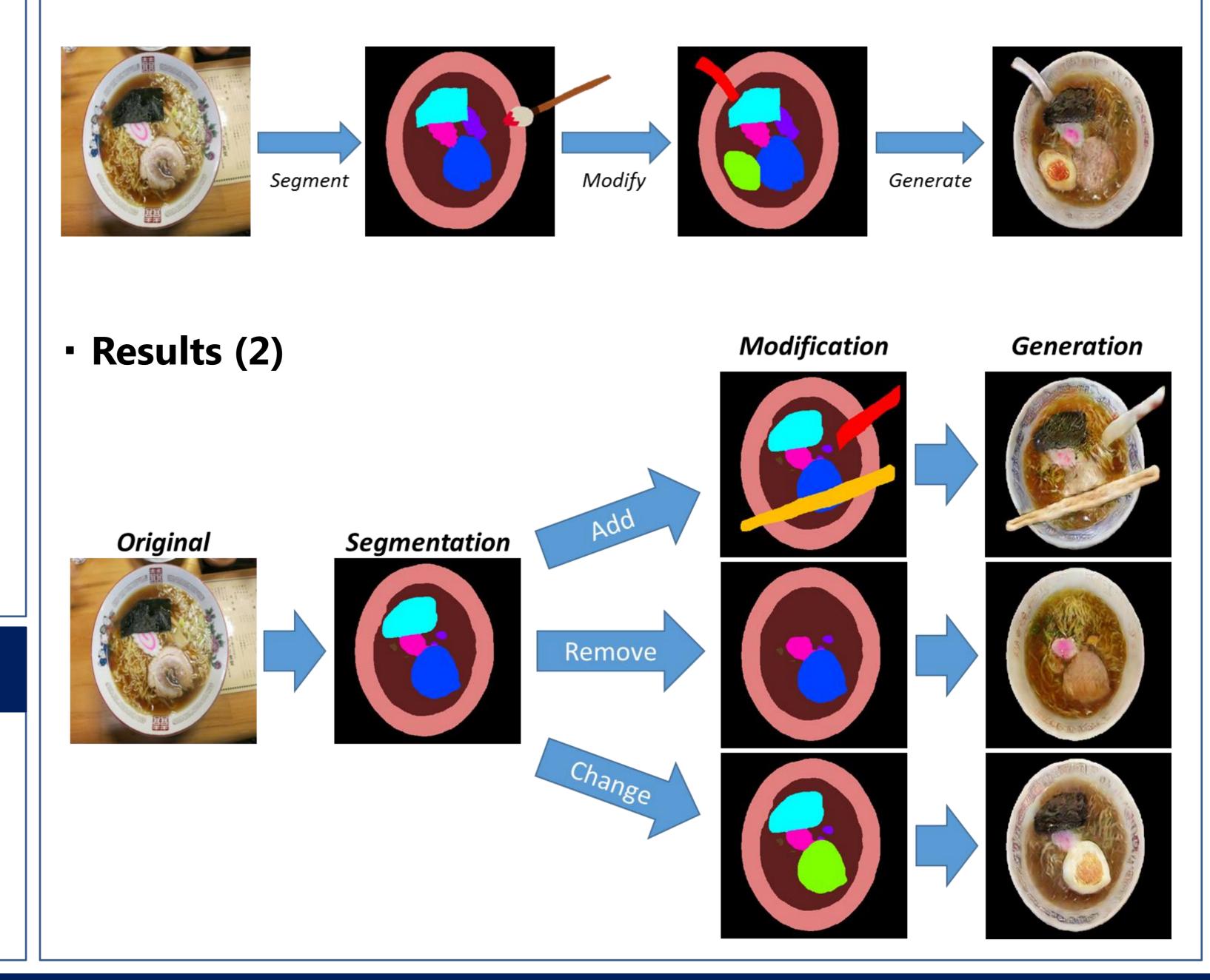 - **Deeplab V3+ [3]**
  · Semantic segmentation model with powerful encoder and a simple yet effective decoder
  · Generates a mask image obtained by segmenting each element of the input image

CONCLUSIONS AND FUTURE WORK

· We have presented an application which can generate and edit food images from mask images sketched interactively
· Style extraction from input image
· Image generation considering the input image style
· Improve quality of generated images

EXPERIMENTS

· **Experiment (1)** *Sketch-based image generation*

Sketch   *Generate*

· **Results (1)**

Input of sketched images

Results of food images

· **Experiment (2)** *Semantic image editing*

Segment   *Modify*   *Generate*

· **Results (2)**

Modification   *Generation*

Original   *Segmentation*   *Add*   *Remove*   *Change*

REFERENCES

[1] Goodfellow, Ian, et al. "Generative adversarial nets." *NIPS*. 2014.
[2] Isola, Phillip, et al. "Image-to-image translation with conditional adversarial networks." *CVPR*. 2017.
[3] Chen, Liang-Chieh, et al. "Encoder-decoder with atrous separable convolution for semantic image segmentation." *ECCV*. 2018.
[4] Ronneberger, Olaf, Philipp Fischer, and Thomas Brox. "U-net: Convolutional networks for biomedical image segmentation." *MICCAI*. 2015.