CalorieCaptorGlass: Food Calorie Estimation Based on Actual Size using HoloLens and Deep Learning

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Background

- There are many studies on applications that estimate calories from images.
- There is a issue.
  - Manual entry of volumes is required for each meal.
  - Limitation of category number.
  - Restrictions on shooting methods.

Proposed System

- Without manual operation, estimate calorie based on real area for each meals at once.
- No restrictions on shooting methods.
- Supports 48 categories.
- Implemented on HoloLens.

System configuration

- This system consist mainly 4 parts.
  ① Image Recognition
  ② Actual size estimation
  ③ Calorie estimation
  ④ Showing meal information

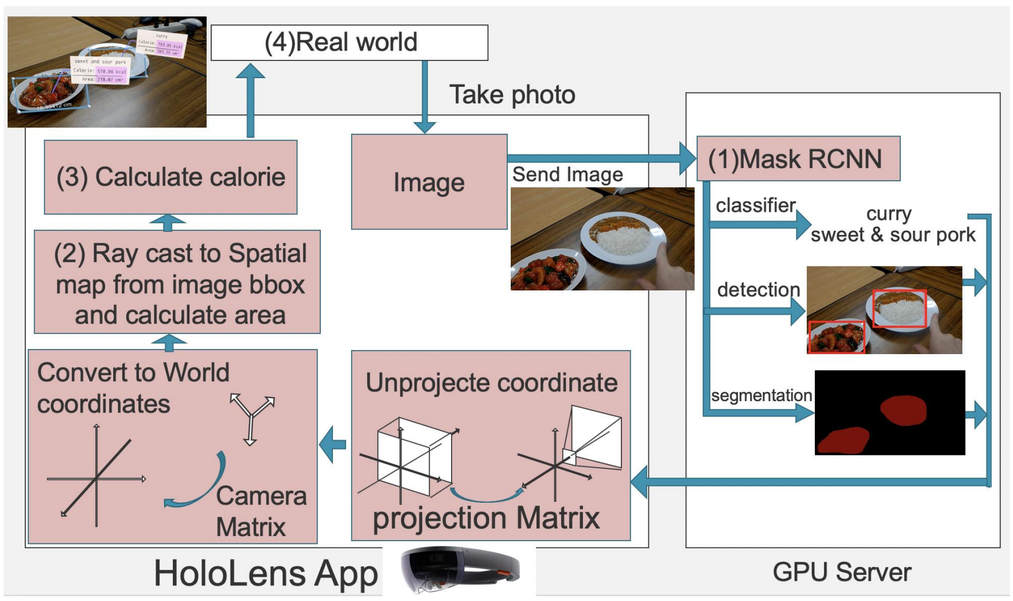
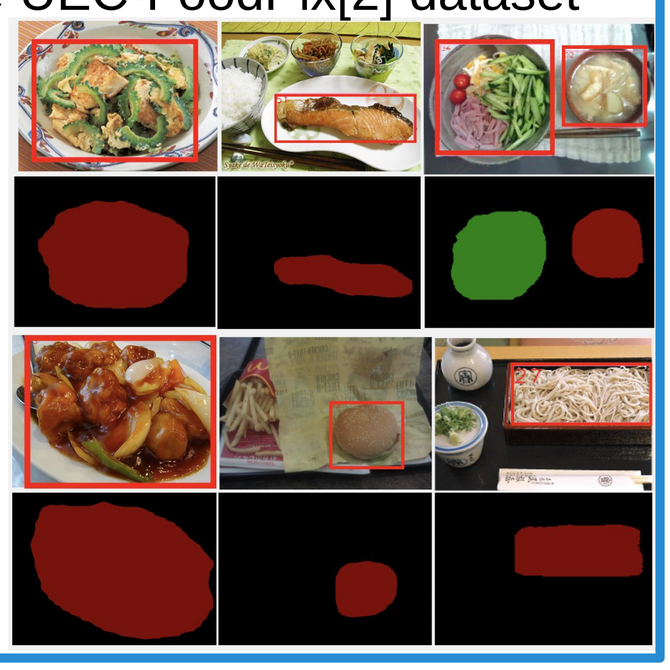


Image Recognition

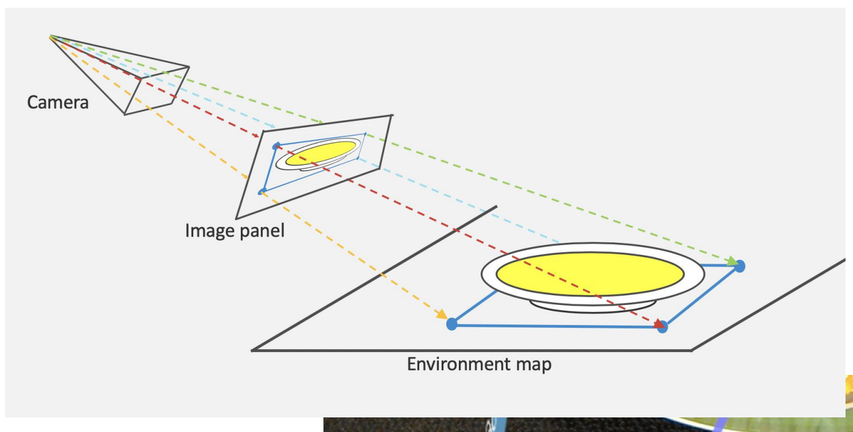
- Using Mask R-CNN[1] to detect, classify and segment foods from image.
- For training, we use UEC-FoodPix[2] dataset

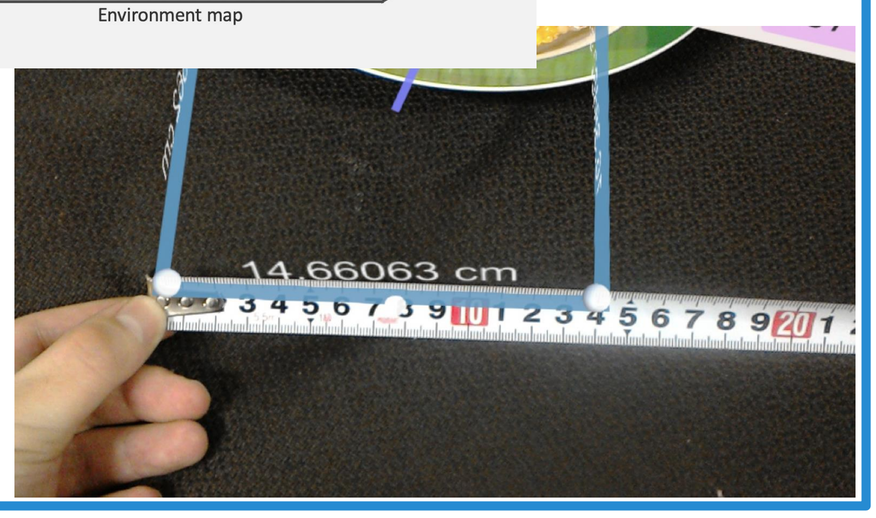
	AP50
Detection	42.8
Segmentation	39.1



Actual size estimation

- Using the camera projection matrix to map the 2D images coordinates to 3D camera coordinates.
- Correspondence with the environment map, calculates where a point on an image is on the 3D world coordinates.



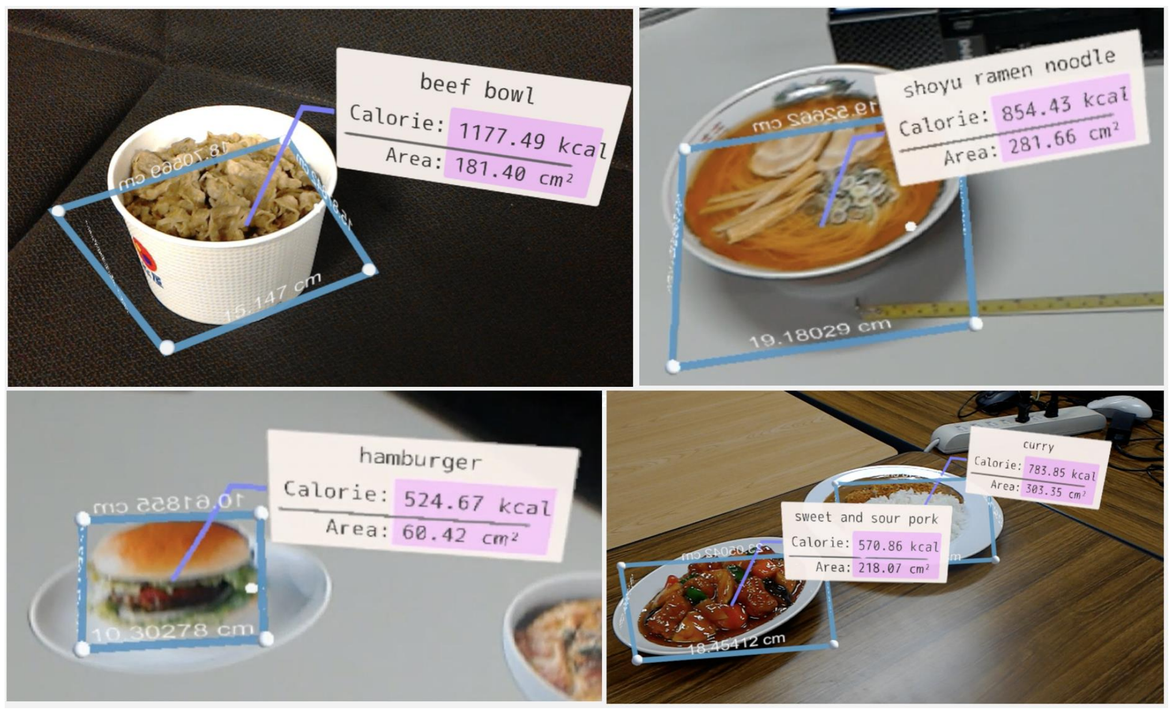


Calorie estimation

- Created a regression equation from a dataset with known meal area and calories.
- Since the real area and meal categories are estimated, we estimate the amount of calories from them and the regression equation.

Showing meal information

- Food category, area, and calorie information display above the meals in the MR space.



References

- [1] K. He, G. Gkioxari, P. Dollˊar, and R. Girshick. Mask R-CNN. InProc.ofIEEE International Conference on Computer Vision, pp. 2961–2969,2017
- [2] T. Ege, W. Shimoda, and K. Yanai. A new large-scale food imagesegmentation dataset and its application to food calorie estimation basedon grains of rice. InProceedings of the 5th International Workshop onMultimedia Assisted Dietary Management, pp. 82–87. ACM, 2019