A Calorie Estimation System for Food Images

1. Introduction

With the improvement of living standards, the obesity rate is also growing rapidly reflecting people's health risks. People need to control their daily calorie intake by eating healthier, which is the most basic way to avoid obesity. However, obese patients often have trouble controlling their calorie consumption due to lack of relevant nutritional information or other reasons. Despite the nutritional and calorie labels on the food packaging, it is still not very convenient for costumers to refer to.

Therefore, our team proposes to implement a calorie estimation system for food images using dataset provided by Y. Liang and J. Li [4]. Based on the dataset, we train a model to classify the objects in the images by the Faster R-CNN and GrabCut algorithm and then we can calculate the total amount of food calories. We also plan to build a web interface to demonstrate our work.

2. Related Work

In recent years, there are a lot of methods based on computer vision proposed to estimate calories [1, 2, 3, 5]. J. Li. and Y. Liang [4] use Faster R-CNN and GrabCut to detect and segment objects and use a One Yuan coin as a calibration object. W. Jia, H. C. Chen, et al use circle plate [3] as their calibration of model. In the other reseach, people's thumb [6] is also used as calibration object by Gregorio Villalobos et al.

Considering dataset, though Food-101, PFID and FOODD can be used to train and test object detection algorithms, it is still hard to utilize them to estimate calories just because they have not prepared the volume and mass as a reference. The ECUSTFD dataset is designed to train a calories estimation model so it satisfies our project. This dataset contains 19 kinds of food and has 2978 images. Each food target has a top view and a side view. For each image, there is only a One Yuan coin as calibration object and no more than two food in it.

3. Technical Overview

- **Two Views Combination**. The calorie estimation process requires two images including a top view and a side view, and each of these images should contain a calibration target.

- **Target Detection**. Faster R-CNN, Yolo, Mask R-CNN and Cornernet.

- **Image Segemntation**. GrabCut.

- **Coin Calibration**. To estimate the volume, we select a One Yuan coin as the calibration target to calculate the scale factors.

- **Calorie Calculation**. Food would be divided into three categories according to the shape: ellipsoid, cylinder, irregular shape. And we would tweak the formula to calculate calorie according to its shape and volume.

4. Expected Outcome

The outcome contains a model and a website.

In the first part, our goal is to implement a calorie estimation model for food images by self-programming according to the dataset and deep learning method Faster R-CNN and GrabCut [4]. However, we also try to improve the deficiencies in the paper. For example, it didn't give the comparison with the results of previous research methods. Therefore, we plan to submit the comparison test result in our final paper.

In the second part, we tend to build a website recommendation system as an interface to interact with users. In the website, users can upload their food images and then get the estimation result.

References

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