CIS 581
Project 3 Part B
Report

Object of Interest Removal and Its Enhancement

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Abstract

Image processing Apps today often contains several functions in one, such as stickers, beauty and filters. We here present a multi-functional application of image processing for clean, concise, and filtered images. In practice, images often include several redundant objects, for example, there might be several inevitable pedestrians in a photo of you. Instead of manually picking them, our application could first automatically detect objects and remove the unwanted ones, and then it would enlarge and filter the image, in order to enhance the performance of object removement as well as to decorate the images with various effects via different filters.

1 Introduction

We presented a method to first automatically detect all the people in the scene and interact with user to choose the unwanted one. Then we added mask via canny edge detection to the region of removal, changing energy map of the labeled region and doing seam carving. For the image enlarging part, we searched the n, say 100, lowest energy seams and added the average intensity of the two seams beside it. Finally, user can choose to implement filters on their photos, such as artistic change, adjusting color tones, contrast or brightness.

2 Related Work

1. Object of interest removal using seam carving
2. Seam carving and image enlarging method referring to project 3 part A
3. Body detection method referring to the opencv built-in methods to perform pedestrian detection
4. Adding filter using OpenCV pacakge and convolution methods

3 Implemented Methodology

1. Input an image with target people and unwanted pedestrian
2. Body detection based on pre-trained HOG and Linear SVM model using packages such as cv2 and imutils

Cite:https://www.pyimagesearch.com/2015/11/09/pedestrian-detection-opencv/

3. Marking the regions of preserved people and pedestrian removal

   comparison: instead of removing the whole rectangular region detected above, we refined the mask using canny edge detection, drawing thick contour and filling the inner holes.

4. Changing energy map: reducing energy of seams passing through the region to remove, and increasing the energy of seams passing through region to protect

   comparison: instead of directly changing energy map, we added label on the removal region and carved the label simultaneously to guarantee the total removal of the region.

5. Implementing seam carving

   comparison: in addition to seam carve the image, we also enlarged image in order to remain the original size of the photo.

6. Implementing filter

   comparison: after seam carving and enlarging the image, we provided choices for user to add different filters to automatically retouch the image.

   a. Brightness enhancement: enhanced the intensity of the region with 90% higher magnitude.
   b. Painting performance: utilized the morphologyEx method in OpenCV to morph the close pixels.
   c. Sharpen: convolved the center enhanced kernel with the region with 50% higher energy in the image.
   d. Blur: implemented gaussianblur to the image.
   e. Magic color: picked ratio of rgb values randomly

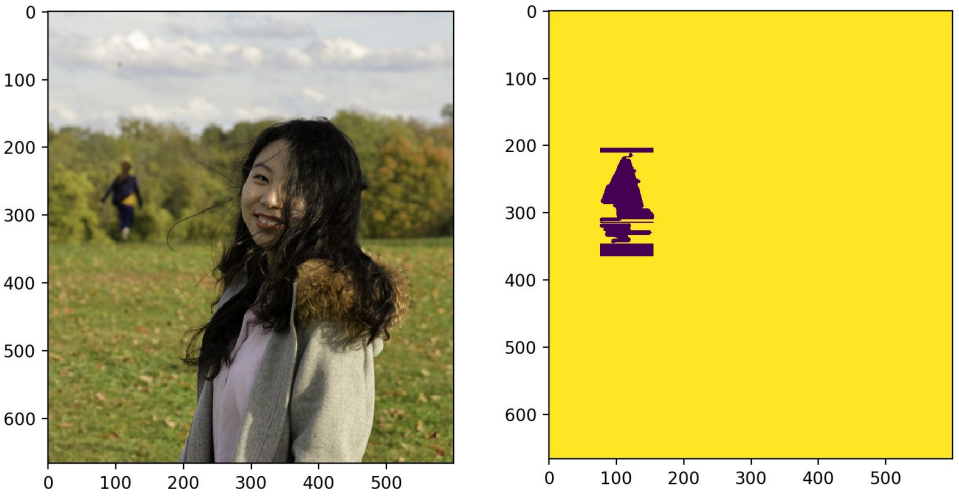
4 Achieved Results

4.1 Pedestrian Detection

As shown in the above figure, first of all, almost all the pedestrians, i.e. people in the picture would be detected and shown in a box. Then with the number shown on upper-left corner of each image, it offers choices to remove either one from the picture.

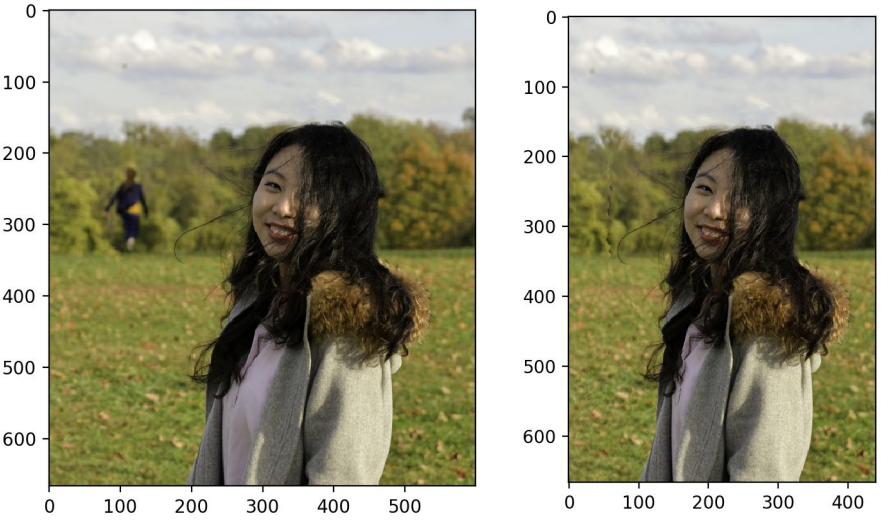
4.2 Auto-refined Mask

Within a selected box, i.e. a rectangular region covering the person of interests, an auto-refined mask would be generated for the person (on the right), compared to the original image (on the left).



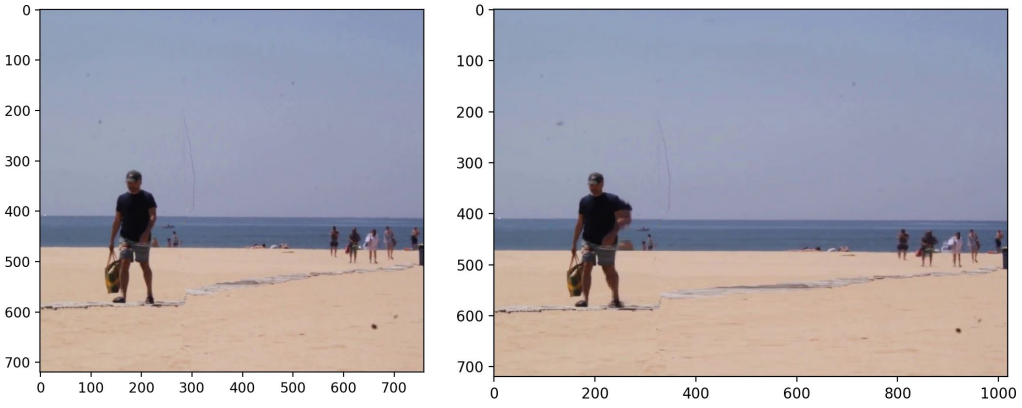
4.3 Object Removement

After seam-carving, the region under mask would be completely removed. The results on the right are shown in comparison to the original image on the left.



4.4 Image Enlarging

To achieve the image size before object removement, image could be enlarged using “inverse” seam carving. Enlarged image is shown on the right, with comparison to the image with object removed, on the left.



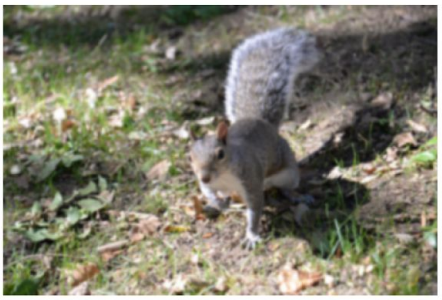
4.5 Filter

a. Brightness enhancement:

b. Painting performance:

c. Sharpen:


d. Blur:

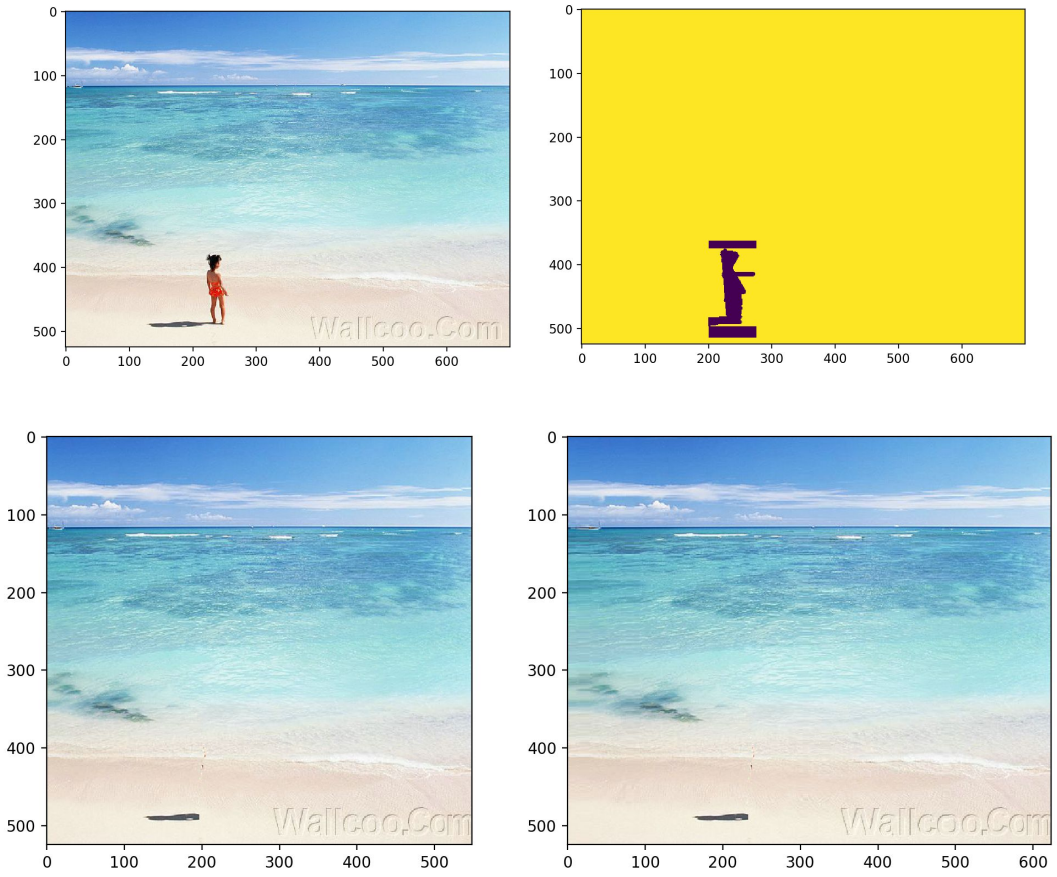
e. Magic color:




5 Future Work and Applications

5.1 Refined Detection

We used the pedestrian detection package as mentioned above to detect the figures. But it only put bounding box around a person, while sometimes object removement involves extra feature correlated to this object. For example, as shown below, the shadow of the girl should also be considered as a part to be removed. So our detection method needs to be refined.



5.2 Expected Applications

Our application could be further utilized for photo-editing and photo-sharing mobile or internet-based applications, such as Instagram and Prisma. Since in order to generate a fascinating image with different effects, the original images are supposed to have a clear focus. Using our application, the process to cut off unwanted features would be effective, since it is automatic, and user-friendly, since the object to remove is a choice of them.

6 Contributions

	Hantian Liu	Jinglei Yu
Pedestrian Detection	√	√
Auto-refined mask	√	√
Object Removement	√	√
Image Enlarging	√	√
Filter	√	√