Augmented reality –Painting recognition

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I. Introduction

This Project investigates a technique which recognizes a painting from its snapshot using the given training set of snapshots. The snap shot of the painting might have been taken at a different vantage point and time compared to its snap shots in the training set. These kind of techniques are know as 'Augmented reality' techniques.

II. Overview of the Methodology

The method employed in this project has three main parts.

- Extract painting objects from all the images in training set store them in an array.
- Extract the painting object in the given image,
- Identify the image by correlating with all the images extracted from the training set.

III. Extracting painting

To extract the painting from the given image, first all the objects should be separated from the background. Then the object that contains the middle pixel of the image is the painting. So here the assumption is that usually when the snapshot of a painting is taken it will be in focus and occupies the center part of the snapshot.

Alternate approach I considered is to find the biggest object. But this alternate approach failed in one out of 99 training set images, it failed for the same painting shown bellow.

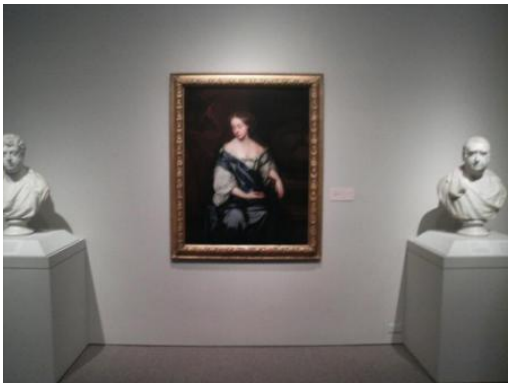
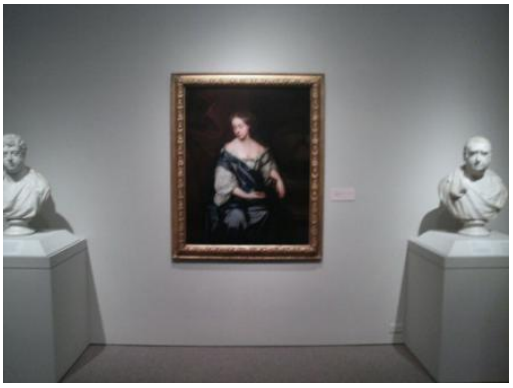


Figure 1 Original Image

Do color balancing on images (even on training set) so that when comparing correlation coefficient will be better.

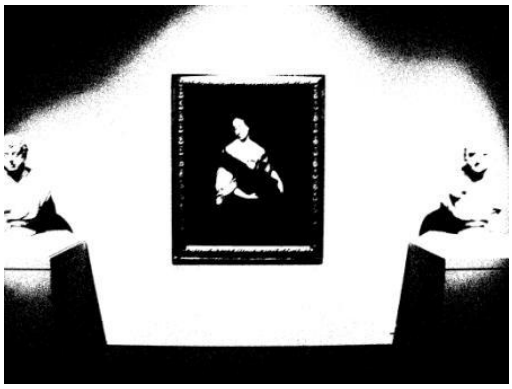


Step 1 color balanced image

Convert the image into a gray-level image.

Step 2 Convert to gray-level image

Convert to the image into a binary image it uses otsu's method to calculate the threshold level.

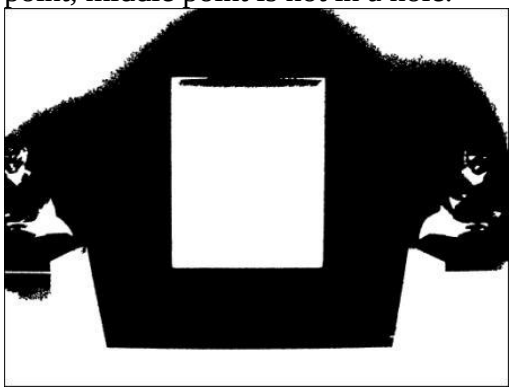


Step 3 Convert to binary

Do binary Close and open to get rid of smaller objects to reduce processing time. Also take binary inverse of the image to interchange 1 and 0.

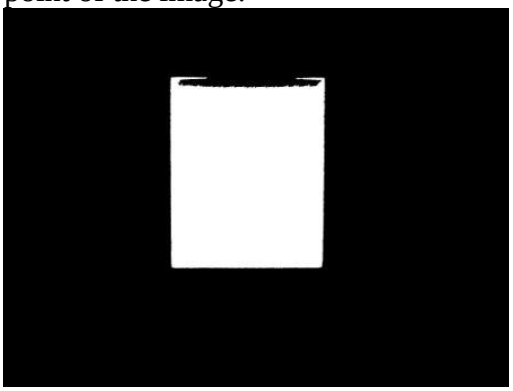
Step 4 remove small objects and inverse 1 and 0

Fill all the holes so that when checking for the object containing the middle point, middle point is not in a hole.



Step 5 Fill the holes

Select the object that contains the middle point of the image.



Step 6 Select the object containing middle of the image

Compute the smallest rectangle that can contain the painting. Then using that rectangle extract the painting from the image we got in the step 1

Step 7 Find the smallest rectangle that can fit painting and extract that rectangle from image in step 1

Taking the rectangle will not be the best approximation when the painting in the photo is in a rotated position. Alternate approach would be to find out the rotation and revoke it using appropriate transform.

IV. Identify the painting

The method chosen here is to find out the correlation coefficient of the image with all the images in the training set. The highest correlation coefficient corresponds to the group to which this image belongs to. Correlation values with the other two images in the group for the above painting is 0.9713 and 0.9688.

V. References

1. http://www.mathworks.com/access/helpdesk/help/toolbox/images/
2. EE368- Digital Image Processing class notes by Prof B. Girod at Stanford University.
3. Textbook. Digital Image Processing 2nd Edition by Gonzalez and Woods