Image Analysis

PartsAvatar

Enhancing the images

- DeBlur the image
- Crop the image properly
  - Recognize the image area properly
  - What should be the filled area ratio
    - May be different for different aspect ratio (of filled area) Images
- Sharpen the image
- Use inPainting techniques to increase the resolution of bad images.
- Make the Background Complete White if possible

What should be the sequence for doing these operations?

Extracting the best image from a set of images to use as thumbnail image

- Colorful
- Rule of Thirds (https://digital-photography-school.com/rule-of-thirds)
- Properly Exposed (https://www.mathworks.com/help/images/ref/imhistmatch.html)
- In Focus
- High Resolution
- Proper Aspect Ratio
- High Product Area Coverage
- Aesthetically Good - Mix of Curved and Straight Lines on images

Give Weight to each feature and then we can Rank the images using some formula...

Extracting the Problematic images out

- Low resolution images
- Not Proper aspect ratio images
- Dull Color images
- Watermarked images
- Remove duplicated images from the data
  - Keep some good quality images as duplicates as well but place the properly in the image sequence...
-

Image Enhancement

Contrast Adjustment

- Intensity distribution is changed (generally spread out) in some way
- Increases contrast of the image
- Edges become clearer

histeq() Histogram Equalization

- Intensity distribution is spread out uniformly so that the histogram of output approx matches with the input
- What is Histogram Equalization?


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H11-55
Halogen/Halogène
bulb | ampoule | bombilla
1
replacement bulb
ampoule de remplacement
bombilla de repuesto
H11-55
Halogen/Halogène
1
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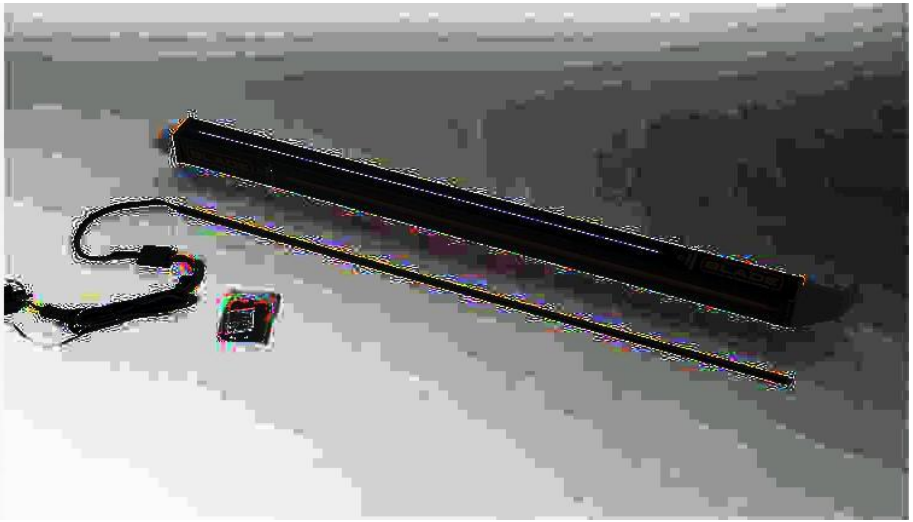
BLADE
BLADE

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adapthisteq()

- `J = adapthisteq(I)` enhances the contrast of the grayscale image `I` by transforming the values using contrast-limited adaptive histogram equalization


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imadjust()

- imadjust(I,[low_in high_in],[low_out high_out])
  - maps intensity values in I to new values in J such that values between low_in and high_in map to values between low_out and high_out
  - By default [0 1] [0 1] respectively
- Imadjust internally uses gamma-correction algorithm


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Comparison

- The results of imadjust() function are significantly better than histeq() or adapthisteq()
  - histeq() blindly spreads out the intensity distribution
  - This may be troublesome for example in the case of a neatly photographed subject with a white background, this method tend to smudge the background
  - imadjust() doesn’t have such problems
  - adapthisteq() tends to lighten the image a bit, but still smudges it
  - For an image with no metadata about the way it is taken imadjust() more suitable for contrast adjustment

Deblurring Image

Blind Deconvolution Algorithm

- Useful when no information about the blurring or noise is known
  - This is our case
- Further if such information is known at some point we can use that to improve deblurring

Segmenting
& Cropping Image

Thresholding

- The most basic type of segmentation
- If a pixel intensity is > X (threshold value), make it white else black
- A body generally has a close range of intensities (band of intensities)
- If background has a band significantly far away from body then during thresholding there is a high chance that body can be separated from background
- By varying threshold value and checking we can get the threshold value which separates the body and background
- This way by different threshold values give different number of bodies (segments)
- imfill() func can be used to fill holes in the picture

Bounding Boxes

- After segmentation, regionprops() func can be used to collect properties of regions (of a black and white logical footprint) like areas, bounding boxes
- Areas can be used to filter out noise
- Using the bounding boxes of each segment, we can build a super bounding box containing all bbs i.e. the border
- The original image can be cropped up to that rectangular frame (with a padding if necessary)
    - Padding has to aesthetically nice
        - General rule : “squarer” border is preferable

Boundaries

- Given the segmented logical footprint we can get boundaries from it using boundarymask() func [not available in R2015b version of matlab]
- Using those, we can get the individual segments, to improve their contrast and deblur them
- Simultaneously, we can make the area other than the segments white

Plan / Workflow

1. Segment the image using basic thresholding [* means completed]
    a. Border Acquisition
        i. *get bounding boxes
        ii. *remove noise in bbs using areas
        iii. *get a border from bounding boxes
        iv. *Implement uniform padding
        v. *Implement best effort padding
        vi. *crop picture with padded border
        vii. make padding smart
    b. Segment Enhancement & Making bg white
        i. get individual segment
        ii. enhance each segment individually
        iii. make bg white
        iv. put the enhanced segments in one picture
    c. improve segmentation using different techniques, [the part after getting a segmented logical footprint is independent of the method of getting the footprint]
    d. This result does not change with the order of execution of steps a & b

Plan / Workflow

1. The image segmentation until now is done using hard coded thresholds, find a way to get proper thresholds based on the image
2. learn about resolution statistics and colorfulness statistics
    a. give measures for above properties

Results of boundingboxes on Large data set

- JPEG images with CMYK colorspace are not currently supported
  - 950-70814.jpg
  - 70239.jpg
- Using thresholds (R, G, B, Gray) = (0.91, 0.91, 0.92, 0.7) & (noiseTh, bbLimit) = (0.01, 5), some images that are not properly segmented due to large number of objects
  - 1035_e.jpg
  - 11164_e.jpg
  - 13002_e.jpg
  - 120062_e.jpg
  - 184180-BOT.jpg
  - 188066-BOT.jpg
- When bbLimit increased to 10, red ones are corrected
  - 1035_e.jpg
  - 11164_e.jpg
  - 13002_e.jpg
  - 120062_e.jpg
  - 188066-BOT.jpg