Beomjun Aaron Bae, Sakshi Agarwal

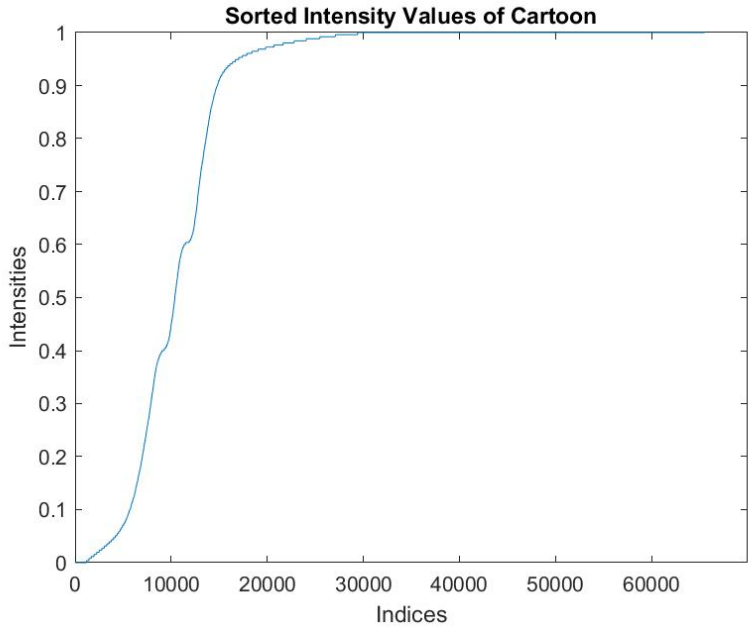
CS211A: Visual Computing

Professor Aditi Majumder

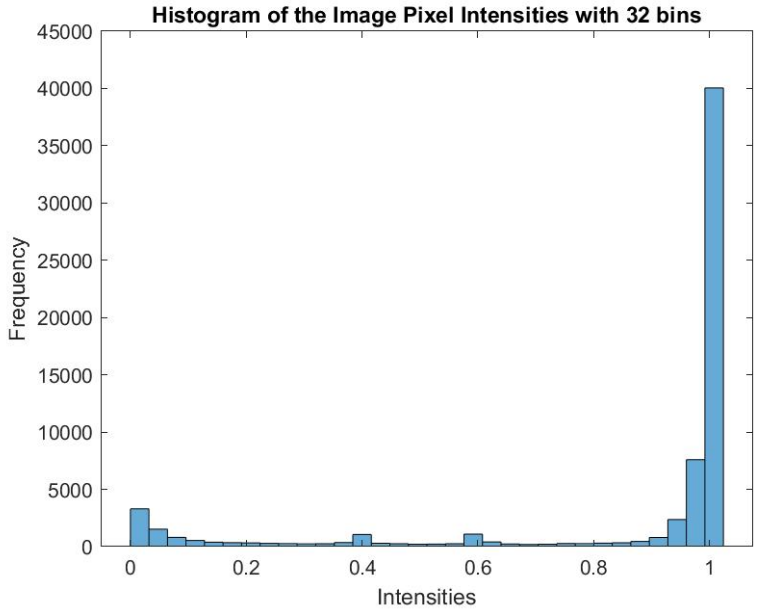
HW1 – Image Processing

Part 0: Getting Started

a. Sort all the intensities in A, put the result in a single 10000-dimensional vector x, and plot the values in x.



b. Display a figure showing a histogram of A's intensities with 32 bins.

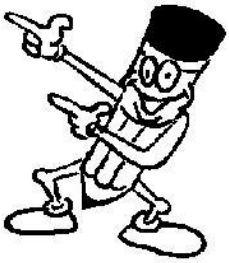


c. Create and display a new binary image with the same size as A, which is white wherever the intensity in A is greater than a threshold t, and black everywhere else.

Binary Of Cartoon With Threshold 0

Binary Of Cartoon With Threshold 0.2

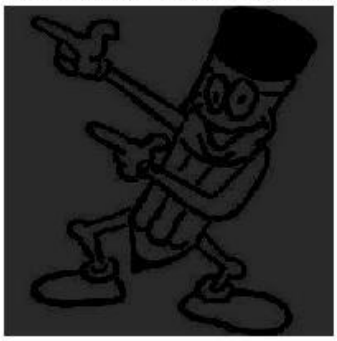
Binary Of Cartoon With Threshold 0.8



Binary Of Cartoon With Threshold 1

d. Generate a new image (matrix), which has the same size as A, but with A's mean intensity value subtracted from each pixel. Set any negative values to 0.

Mean Subtracted Cartoon



e. Let y be the vector: y = [1: 8]. Use the reshape command to form a new matrix s whose first column is [1, 2, 3, 4]', and whose second column is [5, 6, 7, 8]'.

```
Command Window

y =

     1     2     3     4     5     6     7     8


B =

     1     5
     2     6
     3     7
     4     8

fx >>
```

f. Create a vector [1, 3, 5 …, 99]. Extract the corresponding pixel from the image in its two dimensions, i.e., subsample the original image to its half size.

Subsampled Cartoon

g. Use *fspecial* to create a Gaussian Filter and then apply the *imfilter* function to the image with the created Gaussian Filter, by doing so you should see a blurred image. Change three combinations of parameters of the Gaussian Filter and compare the results.

Cartoon With Hsize 10 And Sigma 12

Cartoon With Hsize 20 And Sigma 24

Cartoon With Hsize 30 And Sigma 45

h. Apply the *conv2* instead of *imfilter* function to the same process (for one Gaussian Filter), do you see any changes? Why?

Cartoon With Conv2 Filter

Part 1: Gaussian Pyramid

- Create the Gaussian pyramid for all images in the gallery and put the images in the PDF file. Please consider that all the images in different levels should have same size.

CARTOON Gaussian Pyramid Layer = 0

CARTOON Gaussian Pyramid Layer = 2

CARTOON Gaussian Pyramid Layer = 1

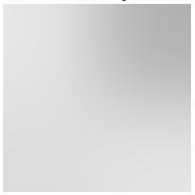
CARTOON Gaussian Pyramid Layer = 3

CARTOON Gaussian Pyramid Layer = 4

CARTOON Gaussian Pyramid Layer = 5

CARTOON Gaussian Pyramid Layer = 6

CARTOON Gaussian Pyramid Layer = 7



CARTOON Gaussian Pyramid Layer = 8

- Flowergray

Flowergray Gaussian Pyramid Layer = 0

Flowergray Gaussian Pyramid Layer = 1

Flowergray Gaussian Pyramid Layer = 2

Flowergray Gaussian Pyramid Layer = 3

Flowergray Gaussian Pyramid Layer = 4

Flowergray Gaussian Pyramid Layer = 5

Flowergray Gaussian Pyramid Layer = 6

Flowergray Gaussian Pyramid Layer = 7

Flowergray Gaussian Pyramid Layer = 8

- Kitty

Kitty Gaussian Pyramid Layer = 0

Kitty Gaussian Pyramid Layer = 1

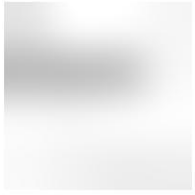
Kitty Gaussian Pyramid Layer = 2

Kitty Gaussian Pyramid Layer = 3

Kitty Gaussian Pyramid Layer = 4

Kitty Gaussian Pyramid Layer = 5

Kitty Gaussian Pyramid Layer = 6

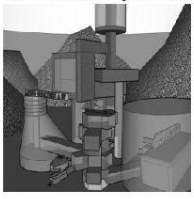


Kitty Gaussian Pyramid Layer = 7

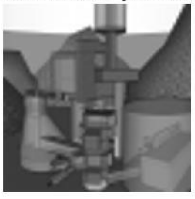
Kitty Gaussian Pyramid Layer = 8

- Plarcities

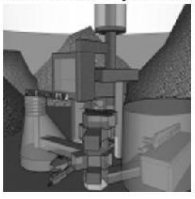
Polarcities Gaussian Pyramid Layer = 0



Polarcities Gaussian Pyramid Layer = 2



Polarcities Gaussian Pyramid Layer = 1



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Polarcities Gaussian Pyramid Layer = 3

Polarcities Gaussian Pyramid Layer = 4

Polarcities Gaussian Pyramid Layer = 5

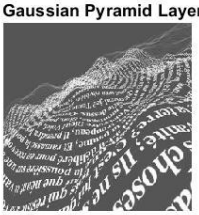
Polarcities Gaussian Pyramid Layer = 6

Polarcities Gaussian Pyramid Layer = 7

Polarcities Gaussian Pyramid Layer = 8

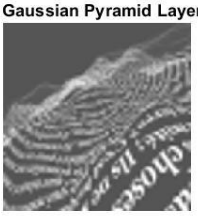
- Text

Text Gaussian Pyramid Layer = 0

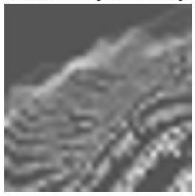


Text Gaussian Pyramid Layer = 1

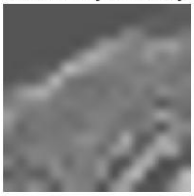
Text Gaussian Pyramid Layer = 2



Text Gaussian Pyramid Layer = 3

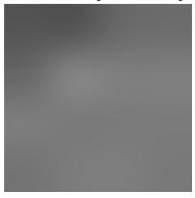


Text Gaussian Pyramid Layer = 4



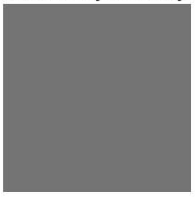
Text Gaussian Pyramid Layer = 5

Text Gaussian Pyramid Layer = 6



Text Gaussian Pyramid Layer = 7

Text Gaussian Pyramid Layer = 8



Part 2: Laplacian Pyramid

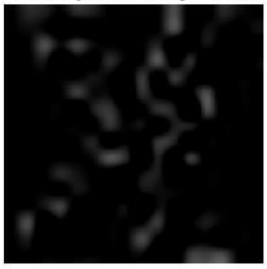
- Write a program to generate the Laplacian pyramid by subtracting the consecutive levels of the Gaussian pyramid. Create the Laplacian pyramid for all the images in the gallery and put the results in the PDF format.
- Cartoon

CARTOON Laplacian Pyramid Layer 1

CARTOON Laplacian Pyramid Layer 2

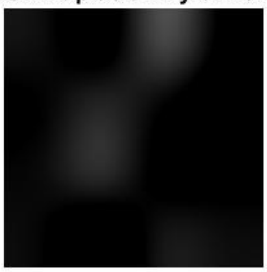
CARTOON Laplacian Pyramid Layer 3

CARTOON Laplacian Pyramid Layer 4



CARTOON Laplacian Pyramid Layer 5

CARTOON Laplacian Pyramid Layer 6

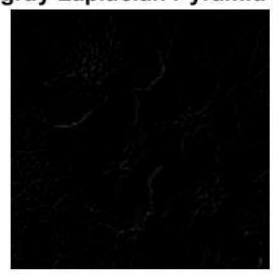


CARTOON Laplacian Pyramid Layer 7

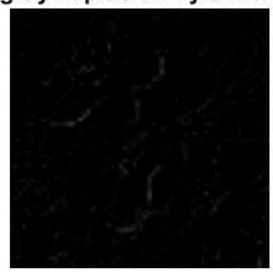
CARTOON Laplacian Pyramid Layer 8

- Flower

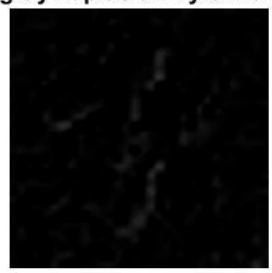
Flowergray Laplacian Pyramid Layer 1



Flowergray Laplacian Pyramid Layer 2

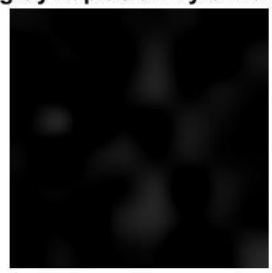


Flowergray Laplacian Pyramid Layer 3

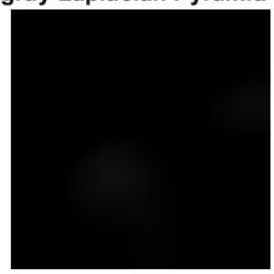


Flowergray Laplacian Pyramid Layer 4

Flowergray Laplacian Pyramid Layer 5



Flowergray Laplacian Pyramid Layer 6



Flowergray Laplacian Pyramid Layer 7

Flowergray Laplacian Pyramid Layer 8

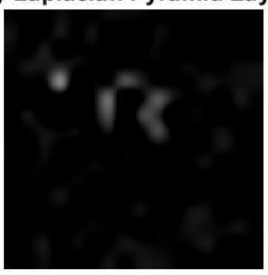
-
- Kitty

Kitty Laplacian Pyramid Layer 1

Kitty Laplacian Pyramid Layer 2

Kitty Laplacian Pyramid Layer 3

Kitty Laplacian Pyramid Layer 4



Kitty Laplacian Pyramid Layer 5

Kitty Laplacian Pyramid Layer 6

Kitty Laplacian Pyramid Layer 7

Kitty Laplacian Pyramid Layer 8

- Polarcities

Polarcities Laplacian Pyramid Layer 1

Polarcities Laplacian Pyramid Layer 2

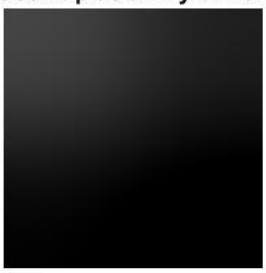
Polarcities Laplacian Pyramid Layer 3

Polarcities Laplacian Pyramid Layer 4

Polarcities Laplacian Pyramid Layer 5

Polarcities Laplacian Pyramid Layer 6

Polarcities Laplacian Pyramid Layer 7



Polarcities Laplacian Pyramid Layer 8

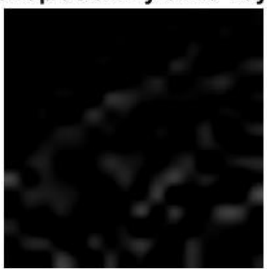
- Text

Text Laplacian Pyramid Layer 1

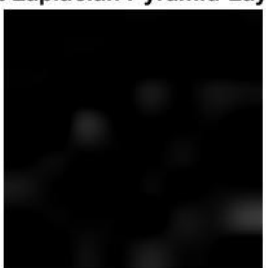
Text Laplacian Pyramid Layer 2

Text Laplacian Pyramid Layer 3

Text Laplacian Pyramid Layer 4



Text Laplacian Pyramid Layer 5



Text Laplacian Pyramid Layer 6

Text Laplacian Pyramid Layer 7

Text Laplacian Pyramid Layer 8

Multi-Scale Edge Detection

Multi-Resolution Spline

-
-
- Choose 3 pairs of images from the gallery. Show the original images, your mask and the final result in your PDF file

Mask Filter

Splined CARTOON and kitty

Splined flowergray and CARTOON

Splined CARTOON and text