

Image Processing Using Scilab

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Introduction to Digital Images

- Images can be Grayscale or Color (RGB)
- Specified as a matrix of size $M \times N \times 3$ ($M \times N$ for grayscale)

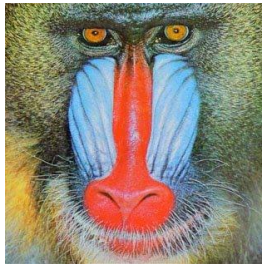
Image Processing in Scilab

- Toolboxes - SIP (Scilab Image Processing) , SIVP (Scilab Image & Video Processing), IPD (Image Processing Design Toolbox)
- We focus on SIVP Toolbox
- Installation in Ubuntu Linux - SIVP and IPD through atoms (5.3 onwards)
- Installation in Windows - SIVP and IPD through atoms (5.3 onwards)

Grayscale and Color Images



(a) Gray Scale Image



(b) Color Image

Image Read/Write/Show

1. Read Image - `lena = imread('lenagray.jpg')`
2. Show Image - `figure; imshow(lena)`
3. Write Image - `imwrite(lena, 'lena.png')`

Image Datatype Conversions

- `im2int8`
- `im2int16`
- `im2int32`
- `im2uint8`
- `im2uint16`
- `im2double`

Image Conversions

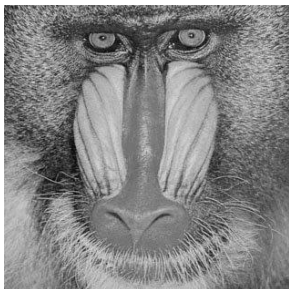
- ```
-- > babbon = imread('bab.png');
```
- RGB to Gray scale - `rgb2gray`  

```
-- > babgray = rgb2gray(babbon);
```
  - RGB to Binary - `im2bw`  

```
-- > lenabw = im2bw(lena, 0.5);
```

```
-- > imwrite(lenabw, 'lenabw.png');
```
  - RGB to HSV format - `rgb2hsv`
  - HSV to RGB format - `hsv2rgb`
  - RGB to YCbCr - `rgb2ycbcr`
  - YCbCr to RGB - `ycbcr2rgb`

# Image Conversions - Results



(a) `rgb2gray(babbon);`



(b) `im2bw(lena, 0.5);`



# Basic Operations

- Crop -  
-- > *lenacrop = imcrop(lena, [200, 200, 200, 200]);*
- Complement - -- > *lenacomp = imcomplement(lena);*
- Resize - -- > *lenaresize = imresize(lena, 2, 'bicubic');*
  - The last term can be 'nearest', 'bilinear', 'bicubic' or 'area'

# Basic Operations - Complement



(a) Original

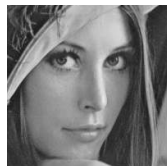


(b) Complement

# Basic Operations - Crop

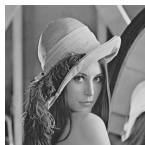


(a) Original



(b) Cropped

# Basic Operations - Resize



(a) Original



(b) Resize by 2

# Add Noise

```
-- > lenaNgaussian = imnoise(lena,'gaussian');
```

The noise can be one of these:

1. salt & Pepper - white/black noise (default probability  $d=0.05$ )
2. speckle - multiplicative noise (uniform with mean 0 and variance  $v=0.04$ )
3. gaussian - additive noise (with mean 0 and variance  $v=0.01$ )

# Add Noise - Results



(a) Original



(b) Salt & Pepper



(c) Speckle



(d) Gaussian

# Advanced Topics - To be Explored

- FFT
- Wavelets
- Radon Transform
- Hough Transform

# Thank You!!



# Thank You!!

- Thank You!