IMAGE PROCESSING WORKSHOP

FEB 2018

SLIDE 2:

INTRODUCTION TO IMAGE PROCESSING USING MATLAB

A FEW TIPS ABOUT MATLAB

- First, MATLAB is reallllly slow on loops (10-20 times slower than C++)
- Don't be mad, it is doing "A LOT", cut it some slack
- So here's our policy when using MATLAB for image processing tasks (working on huge arrays like images): NEVER USE FOR LOOPS
- There are a few tricks to use faster loop: Mex, parfor,…
- Then again, MATLAB is REALLLLY fast on array manipulations
- Do everything on arrays

So, how do I use it?

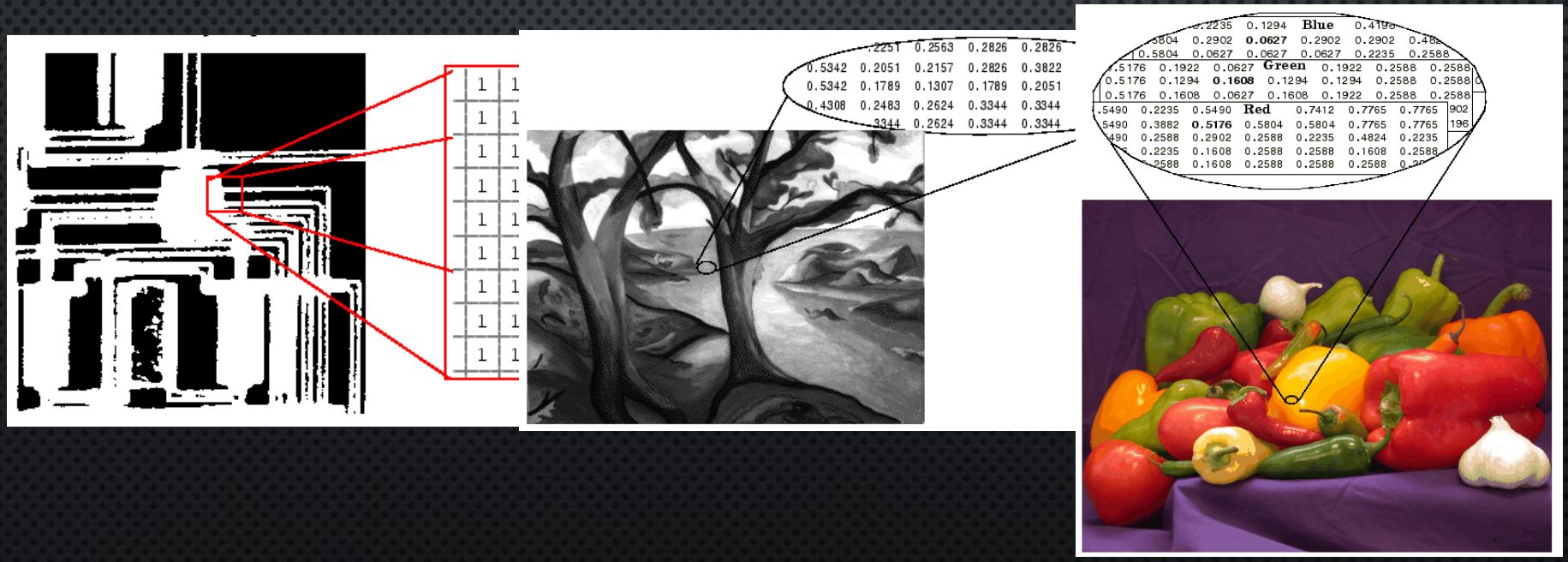
- Well, read the "fast-matlab-code.pdf" in this folder, it is a great tutorial for performing really fast data crunching in MATLAB (trust me, I'm an engineer☺)
- Well, that's it, I will show you some examples, but mainly after you read that you can do anything
- So why do we need to make it fast?
- Check the code + Video

OK, WHAT IS IMAGE PROCESSING TOOLBOX?

- The Image Processing Toolbox is a collection of functions that extend the capabilities of the MATLAB's numeric computing environment. The toolbox supports a wide range of image processing operations, including:
  - Geometric operations
  - Neighborhood and block operations
  - Linear filtering and filter design
  - Transforms
  - Image analysis and enhancement
  - Binary image operations
  - Region of interest operations

WHAT ARE IMAGES IN MATLAB?

- BINARY IMAGES : {0,1}
- INTENSITY IMAGES : [0,1] DOUBLE OR UINT8
- RGB IMAGES : M × N × 3
- MULTIDIMENSIONAL IMAGES: M × N × P (P IS THE NUMBER OF LAYERS) -> WHERE?

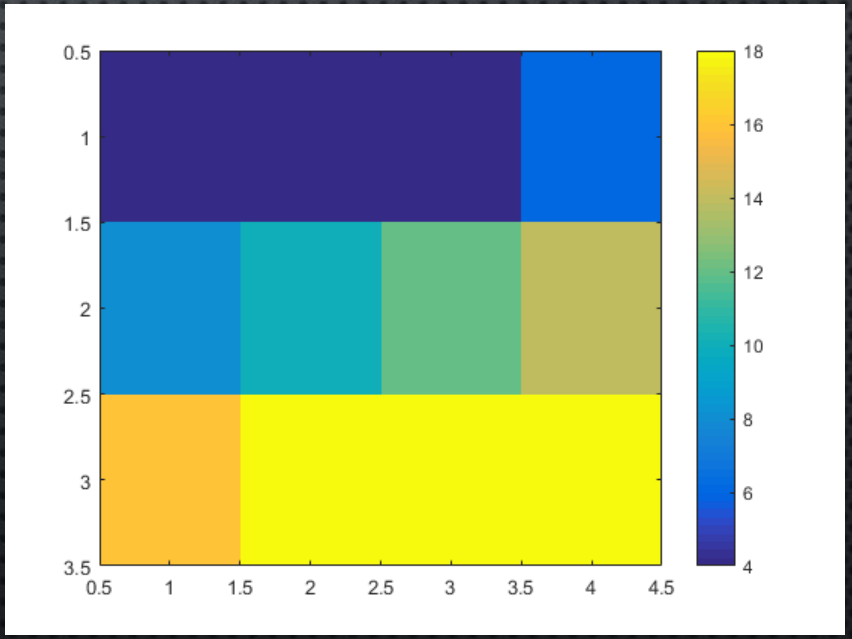


HOW DO I READ AND WRITE THEM?

```
img = imread('apple.jpg');
dim = size(img);
figure;
imshow(img);
imwrite(img, 'output.bmp', 'bmp');
```

How can I show an image?

- imagesc(I)
  - Display an image using scaled colors
  - Read MATLAB help
- imtool(I)
  - You can view a patch
  - Good for debugging the code
- image(I)
  - Extermely simple
- Imshow -> you have seen it -> Simple



How can I convert between image types?

- gray2ind – intensity image to index image
- im2bw – image to binary
- im2double – image to double precision
- im2uint8 – image to 8-bit unsigned integers
- im2uint16 – image to 16-bit unsigned integers
- ind2gray – indexed image to intensity image
- mat2gray – matrix to intensity image
- rgb2gray – RGB image to grayscale
- rgb2ind – RGB image to indexed image

What is an indexed image?

- Indices instead of color values
- Very handy for image compression
- Not very useful in image processing

What's next?

- Simple example of vectorized implementation
- Check out the MATLAB code