MULTIMEDIA CLASS 2016 TA CLASS

SLIDE 3:

INTRODUCTION TO IMAGE PROCESSING USING MATLAB

A FEW TIPS ABOUT MATLAB

- First, MATLAB is realllly 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?
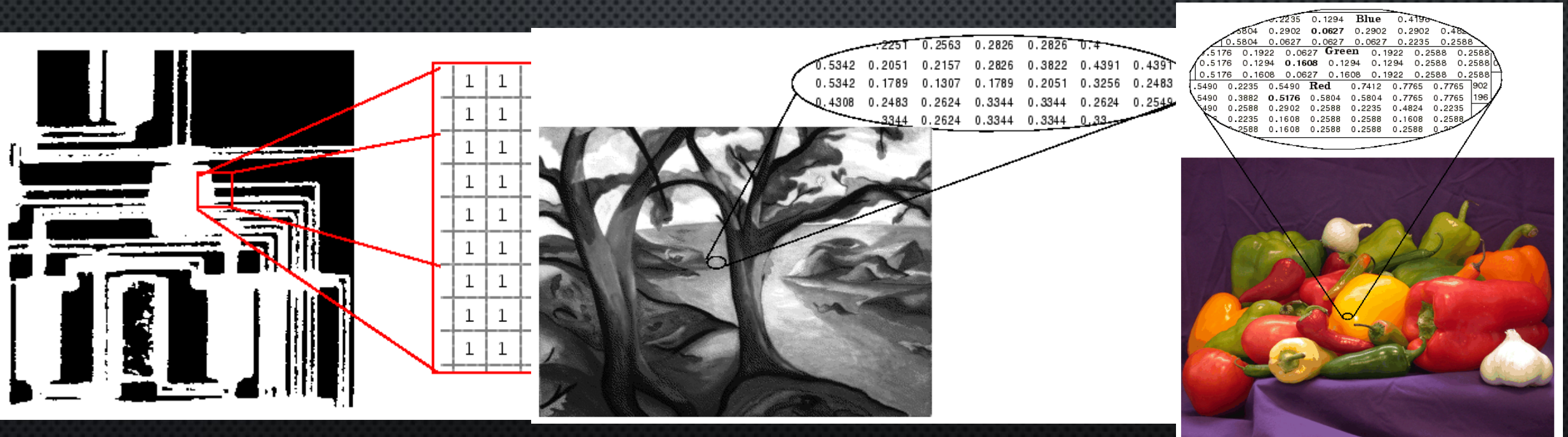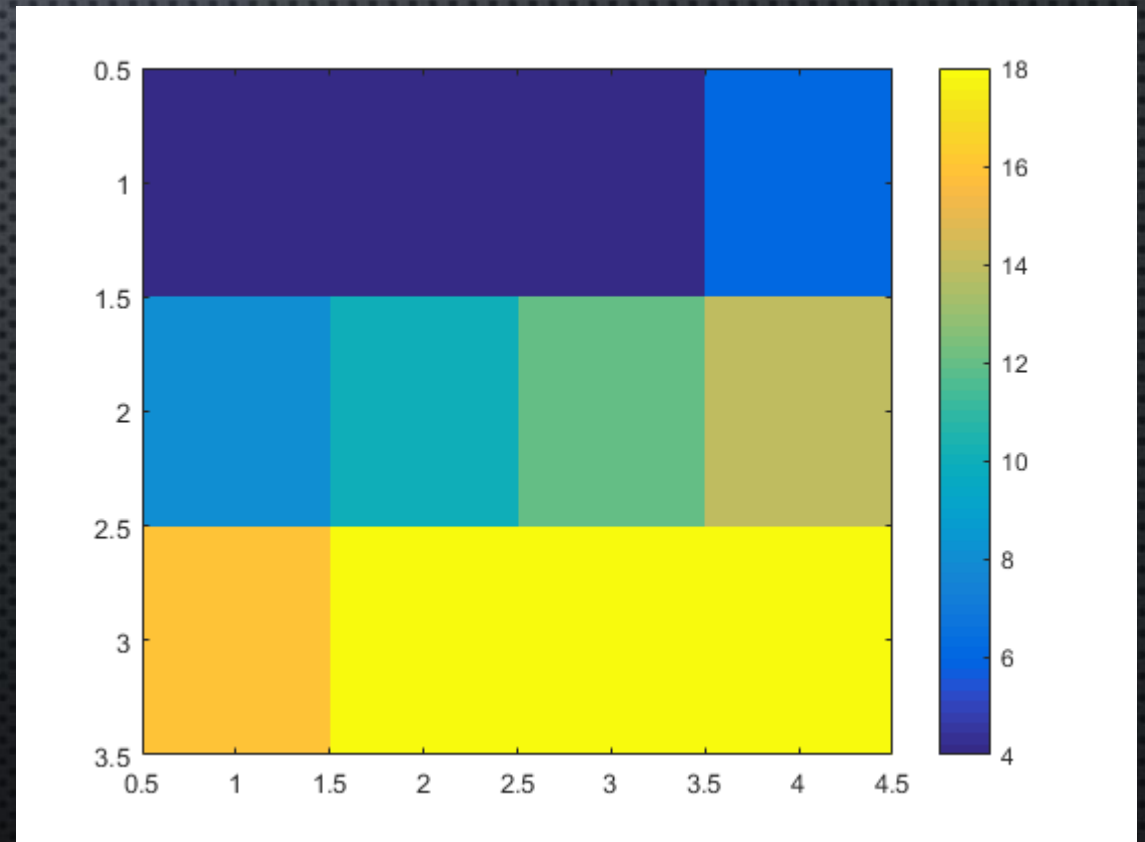
HOW DO I READ AND WRITE THEM?

```
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
- GUESS WHAT? QUIZ FOR OUR NEXT SESSION!