

EECS 10: COMP METHODS IN ECE

Discussion 9

Guantao Liu
guantaol@uci.edu

07/21/2015

Assignment Discussion

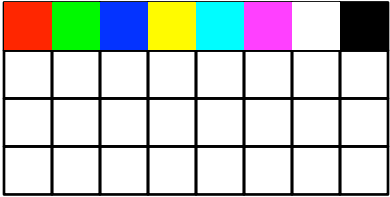
- Assignment 5

– A menu-driven digital image processing program

- | | |
|--|----------|
| 1. Load a PPM image | Provided |
| 2. Save an image in PPM and JPEG format | |
| 3. Change a color image to black and white | Tuesday |
| 4. Make a negative of an image | |
| 5. Flip an image horizontally | |
| 6. Flip an image vertically | Thursday |
| 7. Aging an image | |
| 8. Add noise to an image | |
| 9. Zoom in (Bonus) | |
| 10. Mirror an image vertically (Bonus) | |
| 11. Test all functions | |
| 12. Exit | |

Image Representation

- A digital image can be represented by a two-dimensional array of pixels in C.
- The color of each pixel is composed of three primary colors.
 - Red: 0 - 255
 - Green: 0 - 255
 - Blue: 0 - 255
- Color examples:
 - Red (255, 0, 0), Green (0, 255, 0), Blue (0, 0, 255)
 - Yellow (255, 255, 0), Cyan (0, 255, 255), Magenta (255, 0, 255)
 - White (255, 255, 255), Black (0, 0, 0)



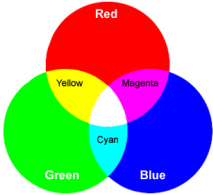
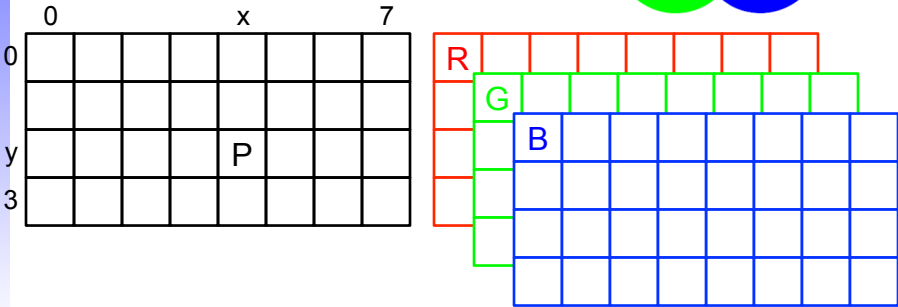
EECS 10 Discussion 9, July, 2015 (c) 2015 Guantao Liu 3

Image Representation

- Use three two-dimensional arrays to store an image.

```

unsigned char R[8][4];
unsigned char G[8][4];
unsigned char B[8][4];
    
```

EECS 10 Discussion 9, July, 2015 (c) 2015 Guantao Liu 4

Image Processing

- To access each pixel of an image, you can use two for-loops.

```
unsigned int x, y;
for (x = 0; x < 8; x ++) {
    for (y = 0; y < 4; y ++) {
        ...R[x][y]...
        ...G[x][y]...
        ...B[x][y]...
    }
}
```

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

5

Assignment Setup

- Copy these files ONCE before working on the assignment.

```
mkdir hw5
cd hw5
cp ~eecs10/hw5/PhotoLab.c ./
cp ~eecs10/hw5/Anteater.ppm ./
cp ~eecs10/hw5/index.html ~/public_html/
```



EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

6

Assignment Setup

- Input: PPM images
 - P6 **Image Type**
 - 540 490 **Width & Height**
 - 255 **Maximum Intensity**
 - R G B** **R G B** **R G B** ...
- Output: PPM images and JPEG images
- Provided functions:
 - Complete: ReadImage(), SaveImage(), Border()
 - Partially complete: AutoTest()
 - Function declarations and global constants

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

7

Program Interface

-
1. Load a PPM image
 2. Save an image in PPM and JPEG format
 3. Change a color image to black and white
 4. Make a negative of an image
 5. Flip an image horizontally
 6. Flip an image vertically
 7. Aging an image
 8. Add noise to an image
 9. Zoom in (Bonus)
 10. Mirror an image vertically (Bonus)
 11. Test all functions
 12. Exit
- Please make your choice:

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

8

Black & White



- Assign the average value of $R[x][y]$, $G[x][y]$ and $B[x][y]$ to each channel.
- $R = (R+G+B)/3$; $G = R$; $B = R$;

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

9

Negative



- Subtract $R[x][y]$, $G[x][y]$ and $B[x][y]$ from 255, and set the new value back.
- $R = 255-R$; $G = 255-G$; $B = 255-B$;

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

10

Flip Horizontally



- Swap Pixel (x, y) and Pixel $(\text{WIDTH}-1-x, y)$.
- `swap(R[x][y], R[WIDTH-1-x][y]);`
`swap(G[x][y], G[WIDTH-1-x][y]);`
`swap(B[x][y], B[WIDTH-1-x][y]);`

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

11

Flip Vertically



- Swap Pixel (x, y) and Pixel $(x, \text{HEIGHT}-1-y)$.
- `swap(R[x][y], R[x][HEIGHT-1-y]);`
`swap(G[x][y], G[x][HEIGHT-1-y]);`
`swap(B[x][y], B[x][HEIGHT-1-y]);`

EECS 10 Discussion 9, July, 2015

(c) 2015 Guantao Liu

12

Assignment Discussion

- Test all functions
 - Call previous digital image processing functions one by one.
 - Read Anteater.ppm
 - Save the processed image (ppm and jpg)
 - bw, negative, hflip, vflip,...
- View the images
 - 'eog' (enable X windows)
 - <http://newport.eecs.uci.edu/~youruserid>
- Submission
 - Name your files as **PhotoLab.c**, **PhotoLab.txt** and **PhotoLab.script**.