

EECS 10: COMP METHODS IN ECE

Discussion 10

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Assignment Discussion

- Assignment 5
 - A menu-driven digital image processing program
 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

Today

AutoTest Function

```
void AutoTest(unsigned char R[WIDTH][HEIGHT],
              unsigned char G[WIDTH][HEIGHT], unsigned char
              B[WIDTH][HEIGHT])
{
    char fname[SLEN] = "Anteater";
    char sname[SLEN];

    ReadImage(fname, R, G, B);
    Border(R, G, B);
    strcpy(sname, "border");
    SaveImage(sname, R, G, B);
    printf("Border tested!\n\n");
}
```

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Border Function



- void Border(unsigned char R[WIDTH][HEIGHT], unsigned char G[WIDTH][HEIGHT], unsigned char B[WIDTH][HEIGHT]);
- Add black borders to an image

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Border Function

```

void Border(unsigned char R[WIDTH][HEIGHT], unsigned char
G[WIDTH][HEIGHT], unsigned char B[WIDTH][HEIGHT])
{
    int x, y;
    unsigned int thick = 5;

    for (x = 0; x < WIDTH; x ++)
        for (y = 0; y < thick; y ++)
        {
            R[x][y] = 0;
            G[x][y] = 0;
            B[x][y] = 0;

            R[x][HEIGHT-1-y] = 0;
            G[x][HEIGHT-1-y] = 0;
            B[x][HEIGHT-1-y] = 0;
        }
    ...
}

```

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Copy an Image

- Original image: R1[WIDTH][HEIGHT], G1[WIDTH][HEIGHT], B1[WIDTH][HEIGHT]
- Copied image: R2[WIDTH][HEIGHT], G2[WIDTH][HEIGHT], B2[WIDTH][HEIGHT]

```

for (int x = 0; x < WIDTH; x ++)
    for (int y = 0; y < HEIGHT; y ++)
    {
        R2[x][y] = R1[x][y];
        G2[x][y] = G1[x][y];
        B2[x][y] = B1[x][y];
    }

```

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Aging an Image



- Convert the image into gray first, and then add yellow color to each channel.
- $B = (R+G+B) / 5;$
 $R = B * 1.6;$ $G = B * 1.6;$

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Add Noise to an Image



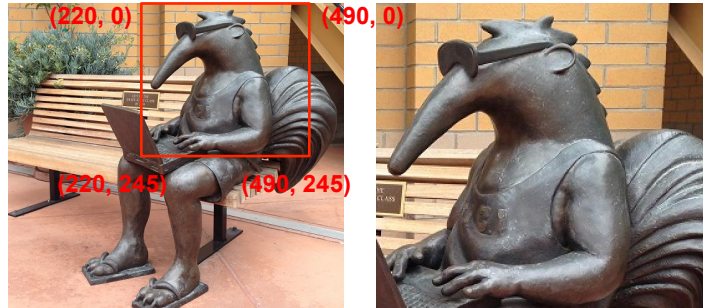
- A noise pixel is either black or white.
- Noise percentage: $n = 20$
- Number of noise pixels: $n * \text{WIDTH} * \text{HEIGHT} / 100$
- Use random number generators to generate coordinates.

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Zoom In an Image



1	5	4	10
4	2	6	11
3	8	7	14
2	9	2	12

5	5	4	4
5	5	4	4
2	2	6	6
2	2	6	6

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Mirror Vertically



- Copy Pixel (x, y) to Pixel $(x, \text{HEIGHT}-1-y)$.
- $R[x][\text{HEIGHT}-1-y] = R[x][y];$
 $G[x][\text{HEIGHT}-1-y] = G[x][y];$
 $B[x][\text{HEIGHT}-1-y] = B[x][y];$

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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:



Assignment Discussion

- Hints: to save the target image information

- Use local variables and copy back

```
void DIP_function_name(...)
{
    unsigned char RT[WIDTH][HEIGHT];
    unsigned char GT[WIDTH][HEIGHT];
    unsigned char BT[WIDTH][HEIGHT];
}
```

- In place manipulation

```
void DIP_function_name(unsigned char R[WIDTH][HEIGHT],
    unsigned char G [WIDTH][HEIGHT], unsigned char
    B[WIDTH][HEIGHT]);
```

- Submission

- Name your files as **PhotoLab.c**, **PhotoLab.txt** and **PhotoLab.script**.