EECS22 LAB WEEK2

10/8/12

Weiwei Chen

Assignment 2

- A manual driven digital image processing (DIP) program.
- Using function calls for image inputing / outputing, image processing, and testing.
  - Function declaration, function definition, function call
  - Function parameters, argument.
  - Scope of the variables.
- Two-week assignment. Plan the schedule of your work. Start it early!
  - Week1: Setup the working environment. Design the user menu. Build up the frame of the operation functions. Try 1~2 operations on the image?
  - Week2: Complete the operations. Test your program?
- Use the web browser to view your image.

Images (Pictures) in the computer

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- How to represent a picture in computer:
  - A picture is composed of pixels
  - One color for each pixel

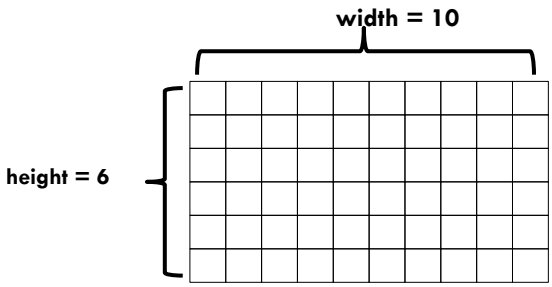

Image with pixels

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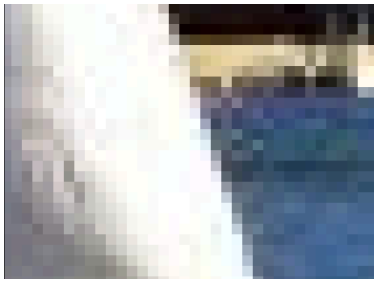

RGB Color Model

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- Three components for one color
- 3-tuple (R, G, B)
  - R: intensity of red
  - G: intensity of green
  - B: intensity of blue
  - Basically, the range of the intensity is [0, 255], use **unsigned char** to for each intensity
- 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)**

How to operate a picture

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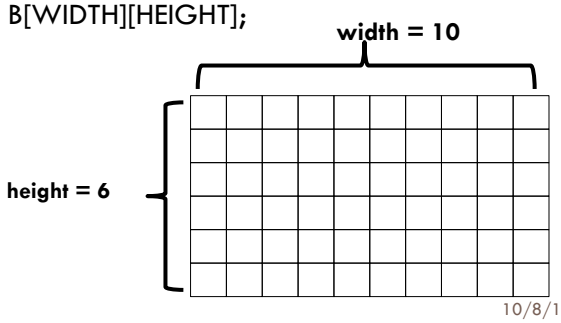
- The data structure to represent a picture in computer
  - Two-dimensional arrays for the intensities of each pixel
    - unsigned char R[WIDTH][HEIGHT];
    - unsigned char G[WIDTH][HEIGHT];
    - unsigned char B[WIDTH][HEIGHT];



How to operate a picture

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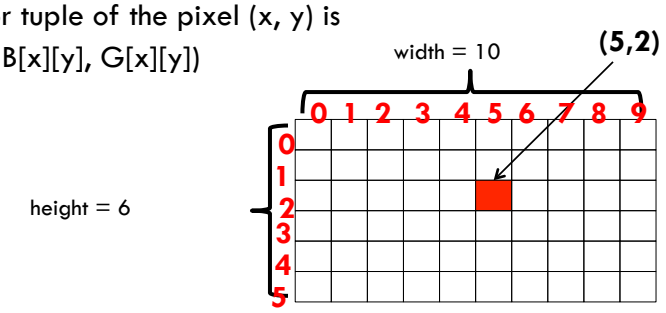
- How to access every pixels in a picture
  - Coordinate of a pixel (x, y),
    - **x** is the number of the column
    - **y** is the number of the row
  - The color tuple of the pixel (x, y) is (R[x][y], B[x][y], G[x][y])



How to operate a picture

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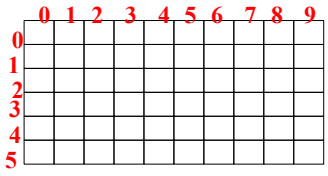
- How to access every pixels in a picture in C
  - List all the possible coordinates of a pixel
    - (0,0), (1,0), (2,0), …, (9,0)
    - (0,1), (1,1), (2,1), …, (9,1)
    - …
    - (0,5), (1,5), (2,5), …, (9,5)



How to operate a picture

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- Use two for-loops to scan all the pixels in a picture
  - Inner loop: fix the number of the column, iterate the pixels in the same column with different row numbers
  - Outer loop: iterate all the columns.

```
int x, y;
for (x= 0; x < WIDTH; x ++){
      for(y=0; y<HEIGHT; y++){
            operations for pixel(x,y);
      }
}
```


DIP Operations

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- Black & White
  - Get the average value of the three color channels for each pixel (x,y).
  - Set R[x][y], B[x][y] and G[x][y] to be the average value.
- Negative
  - Substract R[x][y], B[x][y] and G[x][y] from 255 and set the new value back.
- Flip horizontally
  - Swap pixel (x,y) and pixel (width-1-x, y)
  - Scan half of the picture

DIP Operations

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- Mirror horizontally
  - Copy pixel (x, y) to pixel (width-1-x,y)
  - Scan half of the picture.
- Flip Vertically, Mirror Vertically

Assignment 2 Tips

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- Test your program
  - AutoTest() function
  - Call all the other operation functions together in the program.
  - Be careful with the arguments for each functions.
  - Sample function calls are listed in the assignment.
- Global constants
- Scope of the variables
- Pass by reference when using array parameters.
- Function prototypes mentioned in the assignment are very helpful hints.