



EECS 22: Advanced C Programming

Week 6

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Agenda

1. General Information
2. Makefile
3. Advanced DIP operations
4. Submission

Assignment 3

- A menu driven digital image processing program [100 pts]
- Deadline: 2017/11/08, Wednesday, 6:00 pm
- Goal
 - Decomposing the PhotoLab in multiple source and header files
 - Adding new DIP operations
 - Sharpening
 - Posterization
 - Motion Blur

Advanced DIP Operations

New Operations

- Sharpening
- Posterize
- Motion Blur

The menu looks like:

-
- 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: Color filter an image
 - 6: Sketch the edge of an image
 - 7: Shuffle an image
 - 8: Flip an image vertically
 - 9: Mirror an image vertically
 - 10: Add border to the image
 - 11: Add noise to an image
 - 12: Sharpen an image
 - 13: Posterize an image
 - 14: Motion Blur
 - 15: Test all functions
 - 16: Exit
- please make your choice:

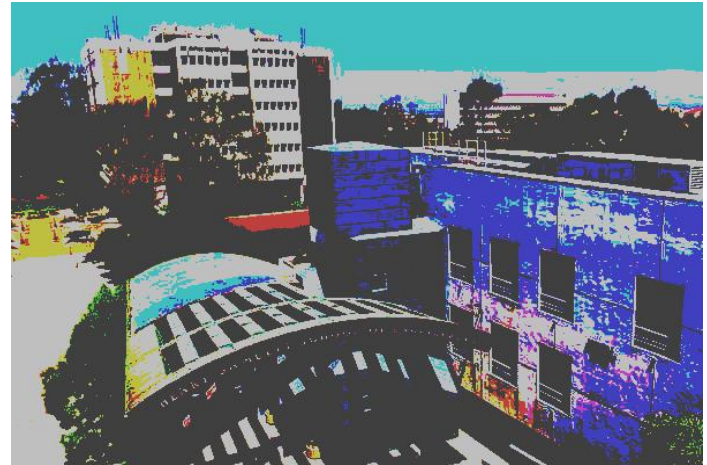
Sharpening



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

It is like adding the picture to the its edge!

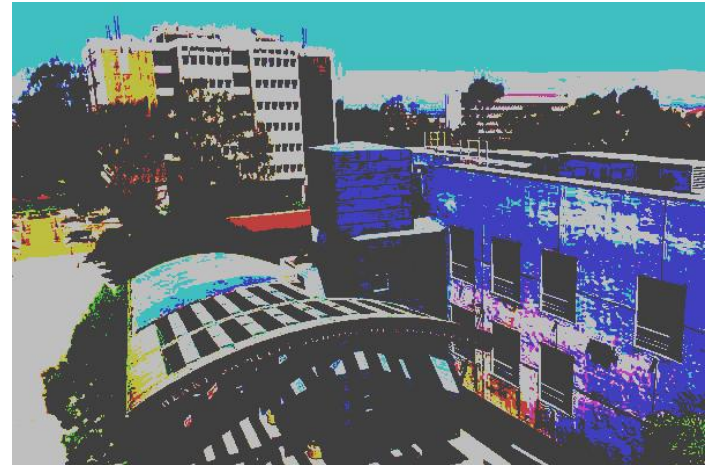
Posterize



```
void Posterize(  
    unsigned char R[WIDTH][HEIGHT],  
    unsigned char G[WIDTH][HEIGHT],  
    unsigned char B[WIDTH][HEIGHT]  
    int rbits, int gbits, int bbits);
```

- You need to use the bitwise operators

Posterize



Function call Posterize(R, G, B, 6, 5, 4);

Posterize red with 6 bits

| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |



| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |

Posterize green with 5bits

| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |



| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |

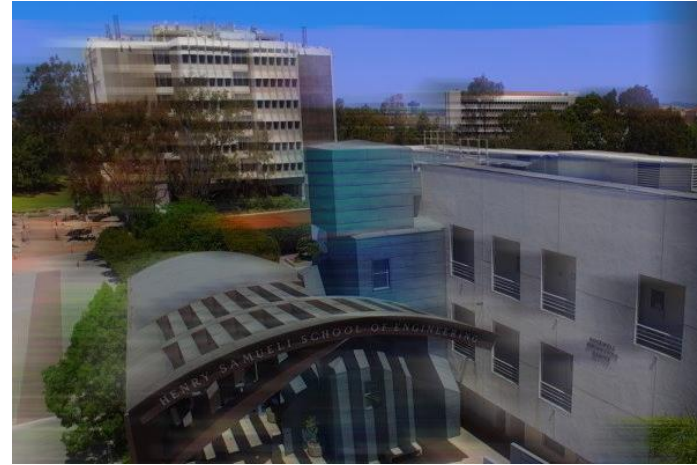
Posterize blue with 4 bits

| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |



| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |

Motion Blur: Bonus



```
/* Make a blurred image*/  
void MotionBlur(int BlurAmount,  
unsigned char R[WIDTH][HEIGHT],  
unsigned char G[WIDTH][HEIGHT],  
unsigned char B[WIDTH][HEIGHT]);
```

BlurAmount specifies the percentage of blur in the image.

Extend the Makefile

- For the Makefile
 - extend it properly with the targets for your program with the new module: `Advanced.c`.
 - generate two executable programs
 - PhotoLab with the user interactive menu and the DEBUG mode off
 - PhotoLabTest without the user menu, but with only the `AutoTest()` function for testing, and turn the DEBUG mode on

Note: we can thus use the same source files to generate two different programs.

Submission

The submission should include these files

- PhotoLab.c
- PhotoLab.script
- PhotoLab.txt
- FileIO.c
- FileIO.h
- Constants.h
- DIPs.c
- DIPs.h
- Advanced.c
- Advanced.h
- Makefile