EECS 22 : ASSIGNMENT 3

(Digital Image Processing)

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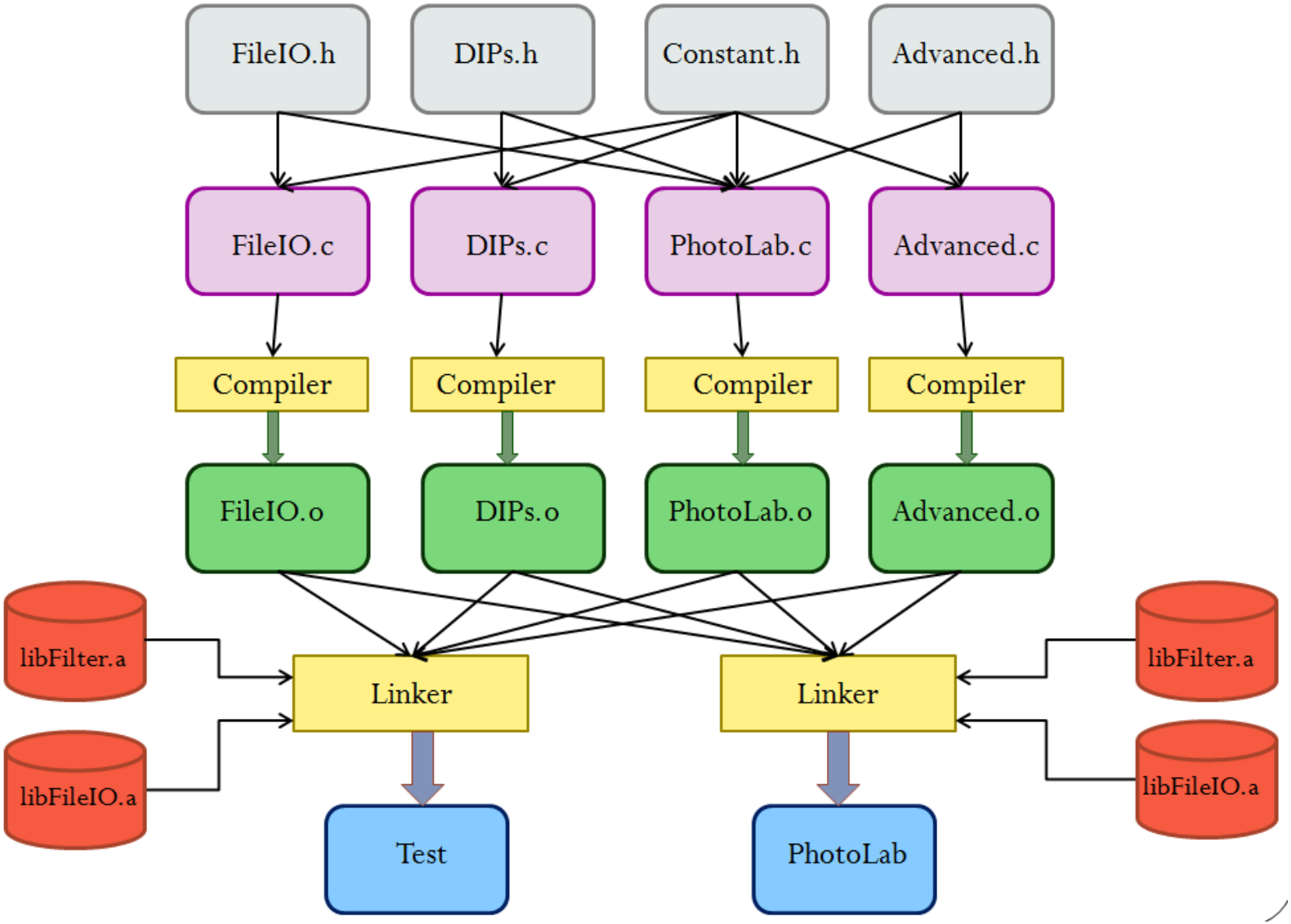
OUTLINE

- Decompose into modules
- Compile using static shared library
- Makefile
- Advanced DIP operations
  - Posterization
  - Fill Light
  - Overlay
  - Bonus: Cut Paste Operation
- DEBUG mode support
- Extend the Makefile

DECOMPOSE INTO MODULES

File	Functions
Photolab.c	Main() , PrintMenu(), AutoTest()
Constants.h	Declare the constants used in code e.g. WIDTH , HEIGHT
FileIO.h FileIO.c	Declaration & definition of ReadImage() and SaveImage()
DIPs.h DIPs.c	Declarations & definitions of BlackNWhite(), VFlip(), HMirror(), ColorFilter(), Edge(), Shuffle()
Advanced.h Advanced.c	Posterize(), FillLight(), Overlay() and CutPaste()

COMPILE USING STATIC SHARED LIBRARY



COMPILATION COMMANDS

I. Generate the object files for each module, e.g.

```
% gcc -c FileIO.c -o FileIO.o -ansi -Wall
% gcc -c DIPs.c -o DIPs.o -ansi -Wall
% gcc -c Advanced.c -o Advanced.o -ansi -Wall
% gcc -c PhotoLab.c -o PhotoLab.o -ansi –Wall
```

II. Create libraries

```
% ar rc libFileIO.a FileIO.o
% ranlib libFileIO.a
% ar rc libFilter.a DIPs.o Advanced.o
% ranlib libFilter.a
```

III. Linking with the library

```
% gcc PhotoLab.c -lFileIO -lFilter -L. -o PhotoLab
```

IV. Execute the program

```
% ./PhotoLab
```

MAKEFILE

- Refer Lecture 8

- Required targets :

  make all

  make clean

ADVANCED DIP OPERATIONS

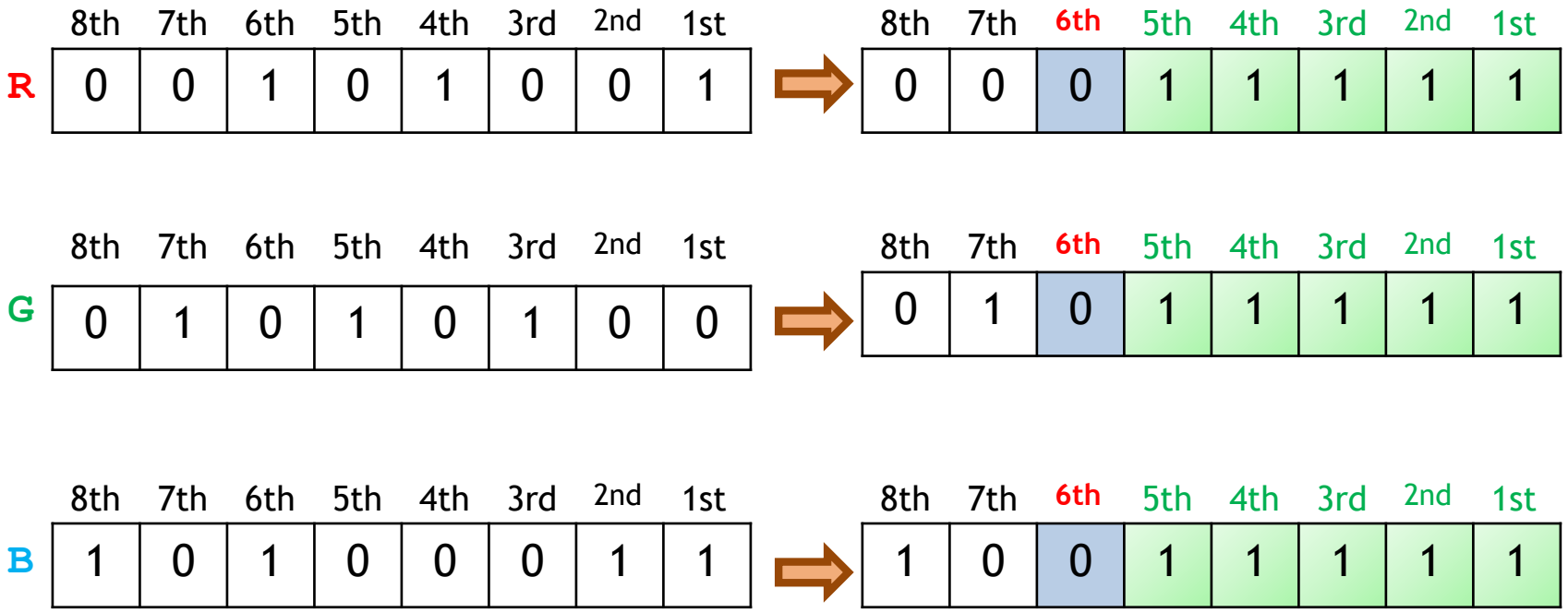
- Posterize the image
- Fill Light in the image
- Overlay a second image on RingMall.ppm
- Bonus: Cut Paste Operation

POSTERIZE THE IMAGE

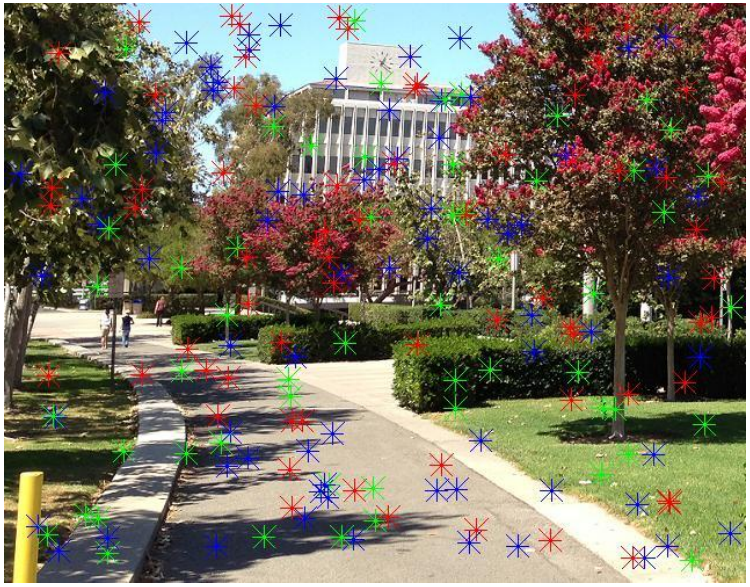
```
void Posterize( unsigned char R[WIDTH][HEIGHT],
                unsigned char G[WIDTH][HEIGHT],
                unsigned char B[WIDTH][HEIGHT],
                unsigned int  pbits)
```

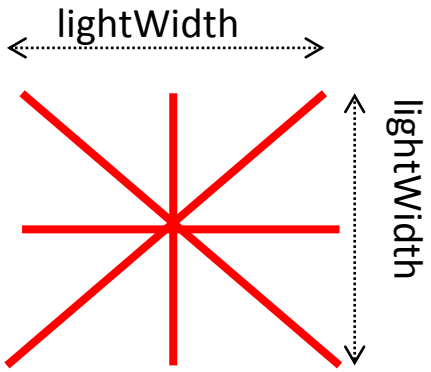
POSTERIZATION OF PIXELS

```
R[0][0] = 41          00101001
G[0][0] = 84          01010100          ;       Pbits = 6
B[0][0] = 163         10100011
```



FILL CHRISTMAS LIGHTS





- Place lights at random positions
- Beware of Segmentation Faults (assign centre position appropriately)

```
void FillLight(  int number    , int lightWidth,
                 unsigned char R[WIDTH][HEIGHT],
                 unsigned char G[WIDTH][HEIGHT],
                 unsigned char B[WIDTH][HEIGHT])
```

OVERLAY

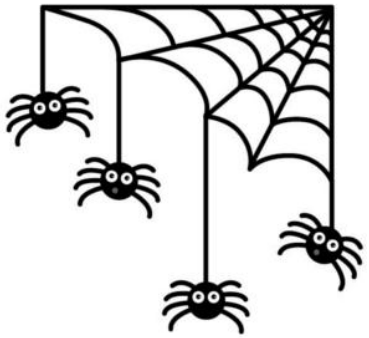
Peter.ppm (640x500)

Overlay with (0, 0) offset

```
void Overlay( char fname[SLEN],
              unsigned char R[WIDTH][HEIGHT],
              unsigned char G[WIDTH][HEIGHT],
              unsigned char B[WIDTH][HEIGHT],
              int x_offset, int y_offset)
```

Note: The background white colored pixels in Peter.ppm does not appear upon overlaying

OVERLAY

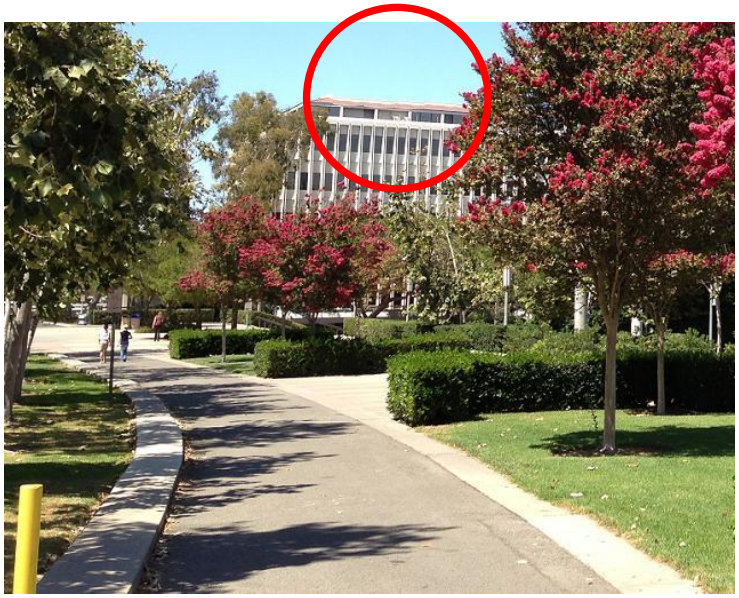


Spider.ppm (640x500)

Overlay with (90, -10) offset

Note: There are just 3 Halloween spiders visible after overlaying

CUT PASTE OPERATION (BONUS)



- Take a block of pixels from the original image (start_x , start_y , x_width , y_width)
- Input number of Paste locations (pasteNumber)
- Once the function starts executing, take the positions of paste locations

```
void CutPaste( unsigned char R[WIDTH][HEIGHT],
               unsigned char G[WIDTH][HEIGHT],
               unsigned char B[WIDTH][HEIGHT],
               unsigned int start_x, unsigned int start_y,
               unsigned int x_width, unsigned int y_width,
               unsigned int pasteNumber);
```

DEBUG MODE

- Support for the DEBUG mode (Refer to Lecture 9)
- Extend the Makefile Refer to (Lecture 8)