HW5 Report

Computer Vision
Section 02
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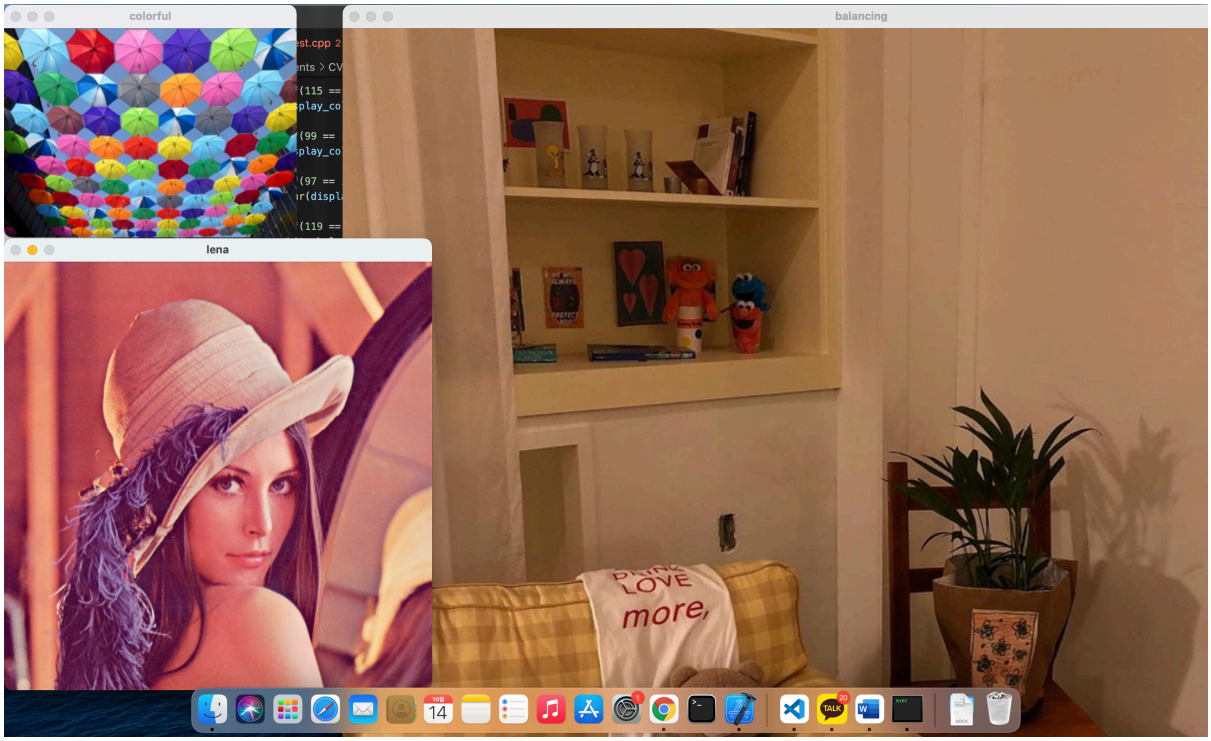
- **HW 5**
  - Purpose

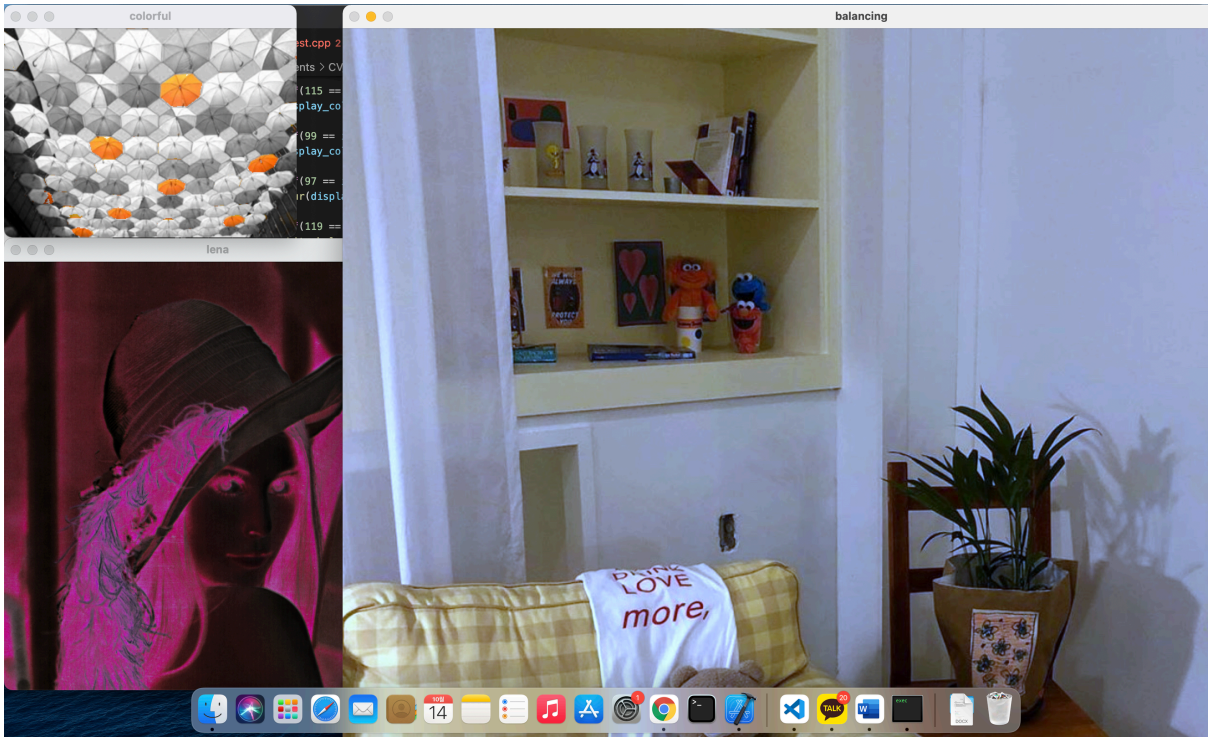
This is a program that read images “lena.png”,”colorful.jpg”,”balancing.jpg” and change the display image depending on the input.

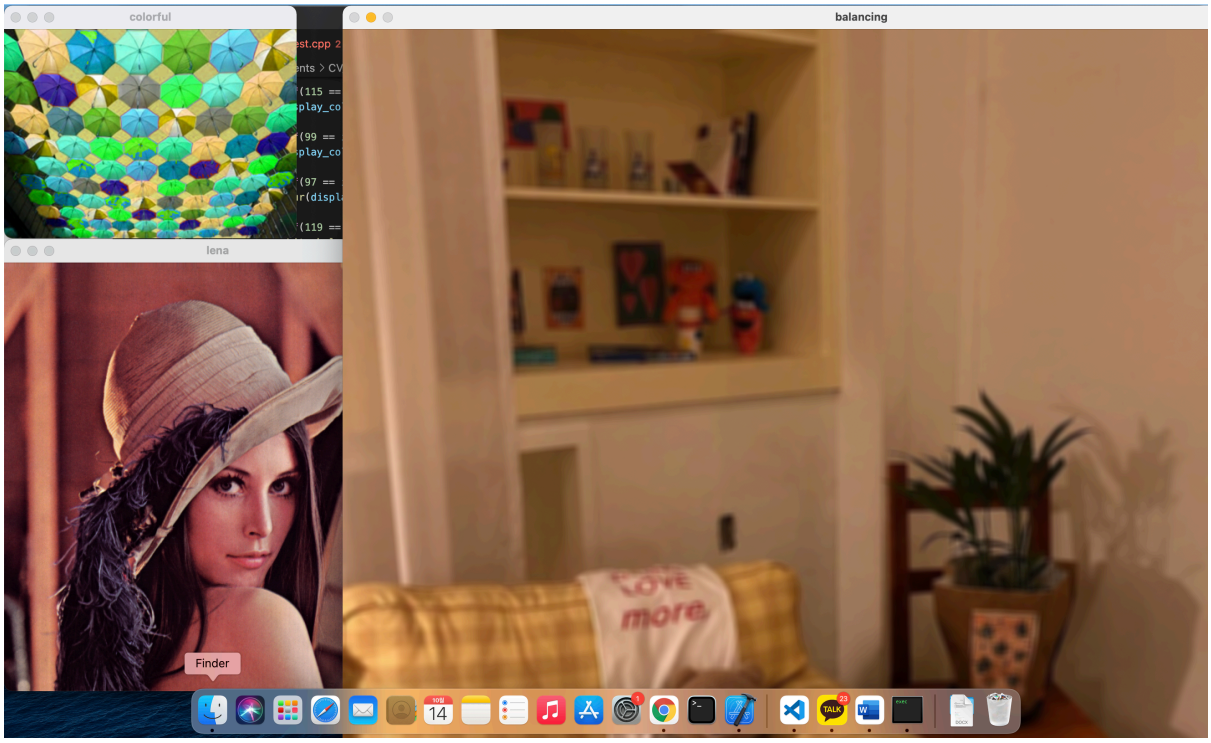
  - Principle

void cv::equalizeHist(InputArray src, OutputArray dst)
Equalizes the histogram of a grayscale image.
void cv::merge(const Mat * mv, size_t count, OutputArray dst)
Creates one multi-channel array out of several single-channel ones.
void cv::split(const Mat & src, Mat * mvbegin)
Divides a multi-channel array into several single-channel arrays.

  - Result







- Code

```
#include "opencv2/opencv.hpp"
#include <iostream>

using namespace std;
using namespace cv;
Mat negative(Mat img);
Mat gamma(Mat img);
```

```
Mat hist(Mat img);
void white_balancing_g(Mat img);
Mat conversion(Mat img);
Mat color_slicing(Mat img);

int main () {
    Mat lena,colorful,balancing; //r
    Mat colorful_slicing, colorful_conversion; //s c
    Mat display_lena, display_colorful,display_balancing;

    lena = imread("lena.png");
    colorful = imread("colorful.jpg");
    balancing = imread("balancing.jpg");

    display_lena = lena.clone();
    display_colorful = colorful.clone();
    display_balancing = balancing.clone();

    int input;
    while(true){
        imshow("lena",display_lena);
        imshow("colorful",display_colorful);
        imshow("balancing",display_balancing);
        input = waitKey(30000);
        if(27 == input || -1 == input) break; //ESC
        else if(114 == input){ //r
            display_lena = lena.clone();
            display_colorful = colorful.clone();
            display_balancing = balancing.clone();
        }
        else if(110 == input){ //n
            display_lena = negative(display_lena);
        }
        else if(103 == input){ //g
            display_lena = gamma(display_lena);
        }
        else if(104 == input){ //h
             display_lena = hist(display_lena);
        }
        else if(115 == input){ //s
            display_colorful = color_slicing(display_colorful);
        }
        else if(99 == input){ //c
            display_colorful = conversion(display_colorful);
        }
        else if(97 == input){ //a
            blur(display_balancing,display_balancing,Size(9,9));
        }
        else if(119 == input){ //w
            white_balancing_g(display_balancing);
        }
```

```
    }
}

Mat negative(Mat img){
    cvtColor(img, img, CV_BGR2HSV);
    for(int i = 0;i <img.rows;i++)
        for(int j = 0; j<img.cols;j++)
            img.at<Vec3b>(i,j)[2] = 255 - img.at<Vec3b>(i,j)[2];
    cvtColor(img, img, CV_HSV2BGR);
    return img;
}

Mat gamma(Mat img){
    float gamma = 2.5;
    cvtColor(img, img, CV_BGR2HSV);
    for(int i = 0;i <img.rows;i++)
        for(int j = 0; j<img.cols;j++)
            img.at<Vec3b>(i,j)[2] =
pow((float)(img.at<Vec3b>(i,j)[2]/255.0),gamma)*255.0f;
    convertScaleAbs(img,img,1,0);
    cvtColor(img, img, CV_HSV2BGR);
    return img;
}

Mat hist(Mat img){
    vector<Mat> HSV_channel;
    cvtColor(img, img, CV_BGR2HSV);
    split(img,HSV_channel);
    equalizeHist(HSV_channel[2], HSV_channel[2]);
    merge(HSV_channel,img);
    cvtColor(img, img, CV_HSV2BGR);
    return img;
}

void white_balancing_g(Mat img) {
    Mat bgr_channels[3];
    int sum_b = 0 , sum_g = 0,sum_r = 0;
    int avg_b, avg_g,avg_r;
    split(img, bgr_channels);
    for(int i =0;i<img.rows;i++){
        for (int j = 0; j < img.cols; j++) {
            sum_b += bgr_channels[0].at<uchar>(i, j);
            sum_g += bgr_channels[1].at<uchar>(i, j);
            sum_r += bgr_channels[2].at<uchar>(i, j);
        }
    }
    avg_b = sum_b / (img.rows * img.cols);
    avg_g = sum_g / (img.rows * img.cols);
    avg_r = sum_r / (img.rows * img.cols);
    for(int i =0;i<img.rows;i++){
        for (int j = 0; j < img.cols; j++) {
```

```
            int b = (128*bgr_channels[0].at<uchar>(i, j)/avg_b);
            if(b > 255) bgr_channels[0].at<uchar>(i, j) = 255;
            else bgr_channels[0].at<uchar>(i, j) = b;
            int g = (128*bgr_channels[1].at<uchar>(i, j)/avg_g);
            if(g > 255) bgr_channels[1].at<uchar>(i, j) = 255;
            else bgr_channels[1].at<uchar>(i, j) = g;
            int r = (128*bgr_channels[2].at<uchar>(i, j)/avg_r);
            if(r > 255) bgr_channels[2].at<uchar>(i, j) = 255;
            else bgr_channels[2].at<uchar>(i, j) = r;
        }
    }
    merge(bgr_channels, 3, img);
}

Mat conversion(Mat img){
    cvtColor(img, img, CV_BGR2HSV);
    for(int i =0;i<img.rows;i++){
        for (int j = 0; j < img.cols; j++) {
            img.at<Vec3b>(i,j)[0]+=50;
            if(img.at<Vec3b>(i,j)[0] > 129) img.at<Vec3b>(i,j)[0] -=129;
        }
    }
    cvtColor(img, img, CV_HSV2BGR);
    return img;
}
Mat color_slicing(Mat img){
    cvtColor(img, img, CV_BGR2HSV);
    for(int i =0;i<img.rows;i++){
        for (int j = 0; j < img.cols; j++) {
            if(img.at<Vec3b>(i,j)[0]>9 && img.at<Vec3b>(i,j)[0]<23)
img.at<Vec3b>(i,j)[1] = img.at<Vec3b>(i,j)[1];
            else img.at<Vec3b>(i,j)[1] = 0;
        }
    }
    cvtColor(img, img, CV_HSV2BGR);
    return img;
}
```

- Video

https://youtu.be/RyTGB9lIx-I

- References

https://docs.opencv.org/master/