⬤ Middle East Technical University
Department of Computer Engineering

CENG 466
FUNDAMENTAL IMAGE PROCESSING
TECHNIQUES
Spring 2004
Homework 2

General Rules

- Due date is 26 November 2004, Friday, 17:00.
- In case of cheating, all parts involved (source(s) and receiver(s)) get zero.
- You will submit your homework electronically through Ceng Homework Submission System (https://submit.ceng.metu.edu.tr/) as usual. Additionally, you should submit a hard copy report to my office A-401. Your electronic submission must include only your implementation (hw2.c), you don't need to electronically submit input-output images or soft copy of your report.
- For each group, only one of the students should submit the homework electronically through CENG Homework Submission System.

Homework

1. Write a C program that performs histogram specification on a given color image for a desired pdf defined on the I channel of HSI color space.

   Apply your program to the following images with reasonable desired pdf's that you create.

   In the report,

   - Show input images and your specified pdf's together with the output images,
   - Discuss on your results, compare between the original's and specified image's histograms.
   - Discuss on the effect of the histogram specification in general.

2. Write your own algorithm to segment a given color based on split-and-merge method.

   Apply your algorithm to the following images:

   In the report,

   - Explain your algorithm,
   - Show input images together with their output,
   - Discuss on your results,

3. Write a C program to extract closed boundaries in a given image.

   Apply your program to the following images:

   In the report,

   - Explain your algorithm,
   - Show input images together with their output,
   - Discuss on your results,

Specifications

For each of the questions in this homework, there is a set of common specifications which are listed below:

1. Input and output image file format is binary encoded Portable Pixel Map (**PPM**).

2. All of the questions should necessarily be combined into a single program. The usage of the program for each question should be as follows:

   hw2 Q1 <input image> <output image> *<pdf>*

      <pdf> set consists of two strings: **pdf1**, and **pdf2** representing the specified pdf's
                                            - **pdf1**: desired pdf for 1.ppm,
                                            - **pdf2**: desired pdf for 2.ppm,

   hw2 Q2 <input image> <output image>

   hw2 Q3 <input image> <output image>

3. Your programs will be compiled and run automatically.

4. Use the following function templates in your homework:

```
//----------------------------------------------------------------------
void question1(char *image_filename, char *output_filename,
               char *pdf_type)
{
        type_imageCO input_image;
        type_imageCO output_image;

        // read the input image
        read_image(image_filename, &input_image);

        // INSERT your functions here, to perform histogram specification
        // according to the desired pdf stated by the variable pdf_type
        // ...

        // write the output image
        write_image(output_filename, &output_image);
}

//----------------------------------------------------------------------
void question2(char *image_filename, char *output_filename)
{
        type_imageCO input_image;
        type_imageCO output_image;

        // read the input image
        read_image(image_filename, &input_image);

        // INSERT your functions here, to solve the question
        // ..

        // write the output image
        write_image(output_filename, &output_image);
}
```

```
//----------------------------------------------------------------------
void question3(char *image_filename, char *output_filename)
{
        type_imageCO input_image;
        type_imageCO output_image;

        // read the input image
        read_image(image_filename, &input_image);

        // INSERT your functions here, to solve the question
        // ..

        // write the output image
        write_image(output_filename, &output_image);
}
```