Project-Part II: ITC Image2ASCII Art*

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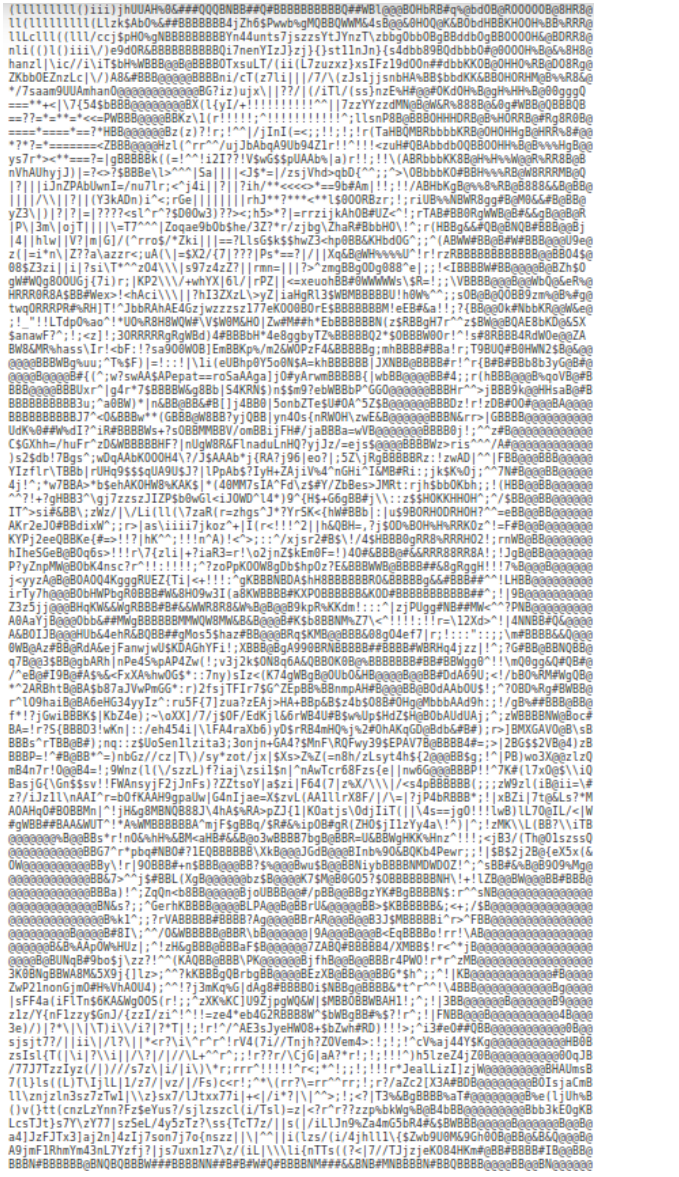
Deadline: December 26, 2016 before 23h30

Attention

- Make sure that you read and understand each and every instruction. If you have any questions or comments you are encouraged to discuss your problems with your colleagues (and instructors) on Piazza.
- Plagiarism is strongly forbidden and will be very strongly punished. If we find that you have copied from someone else or someone else has copied from you (with or without your knowledge) both of you will be punished. You will be awarded (straight zero in the project — which can eventually result in your failure) and appropriate action as recommended by the Disciplinary Committee (DC can even award a straight F in the subject) will be taken.

Input Image



Image's ASCII Representation.

Figure 1: Given left side image your code must produce the right hand side image using ASCII characters.

*Errors and Omissions Expected

Goals: In this part, your goal is to write a simple program that can convert any gray-scale image (gray scale image is an image that has pixels with gray values, *i.e.* without color) an ascii art image (image created using ASCII characters), same as Figure 1.

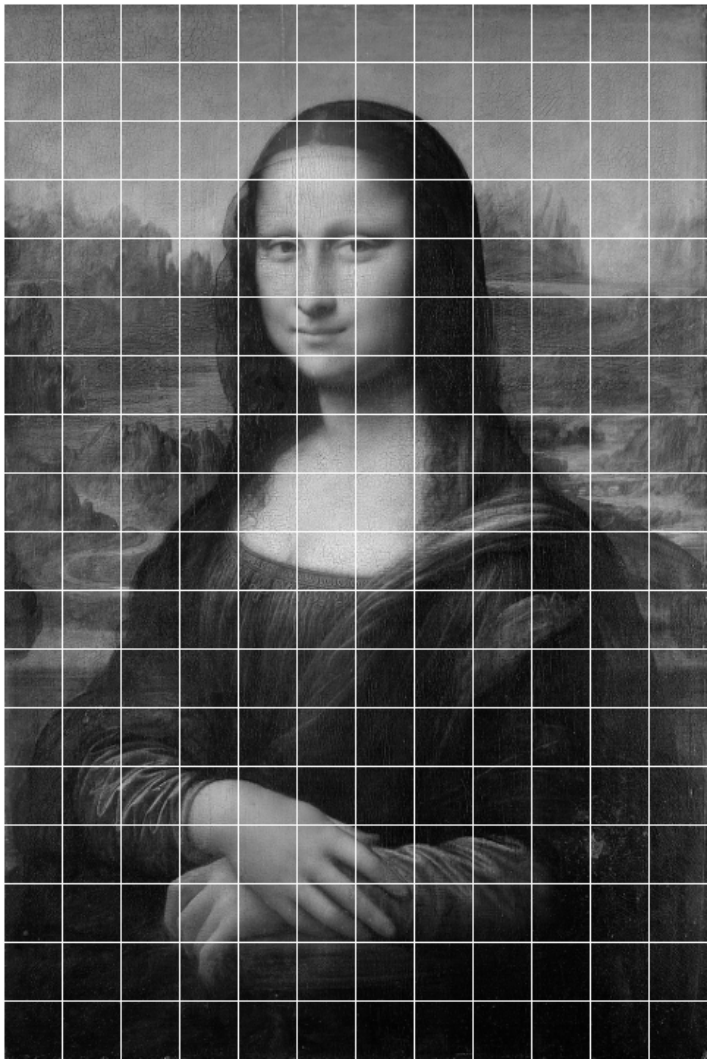


Figure 2: Division of Image into equal size grid.

Character Intensity Calculation You are provided an image of all 95 printable ASCII characters. Characters with ASCII code from 32 to 127 are all printable characters. Here in this image (*c.f.* Figure 3) each character covers an area of 25×23 pixels. First character is space which covers first 25×23.

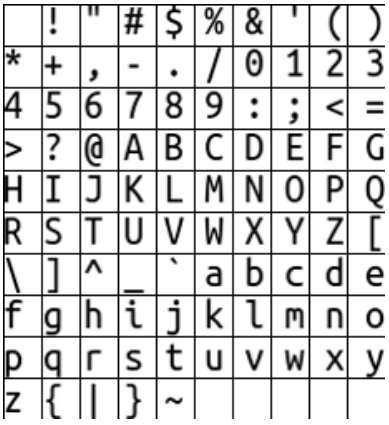


Figure 3: Division of ASCII characters image into 25×23 pixels size grid.

You have already been provided with a function that can read any image.

```cpp
/*
 * Function reads a gray-scale image of ascii characters
 * and store the pixel values in 250x230 2-dimensional
 * array of integer type.
 * Pixel Value = 0 implies black color
 * Pixel Value = 128 implies gray color
 * Pixel Value = 255 implies white color
 * Here each character pixel occupies 25 x 30 sub-matrix
 * in the complete matrix.
 * */
void ReadAsciiCharactersImage(int array[250][230]) {
        CImg<unsigned char> img("./ascii-char-set-25_23-95-grid.png");
        int k = 0;
        for (int i = 0; i < 250; ++i)
                for (int j = 0; j < 230; ++j)
                        array[i][j] = img[k++];
}
/*
 * Function reads a gray-scale image (imname) and
 * store the pixel values in 720x480 2-dimensional
 * array of integer type.
 * Pixel Value = 0 implies black color
 * Pixel Value = 128 implies gray color
 * Pixel Value = 255 implies white color
 * */
void ReadImage(string imgname, int imgArray[720][480]) {
        CImg<unsigned char> img(imgname.c_str());
        int k = 0;
        for (int i = 0; i < img.height(); ++i)
                for (int j = 0; j < img.width(); ++j)
                        imgArray[i][j] = img[k++];
}
```

Algorithm for converting image to Ascii Art The algorithm for converting image to ascii is very simple. Here are the complete steps required to solve the problem:

1. You will split the image into small non-overlapping regions $w \times w$ pixels (see Figure 2).
2. For each region you have to calculate the mean intensity i.e average of the specified region.
3. For each Ascii character, you have to calculate the mean intensity as well.
4. Once the intensity of all the Ascii characters has been calculated, then you have to scale each intensity as per the following formula:

$$newIntensity = \frac{intensity[i] - minintensityofImage}{maxintensityofImage - minintensityofImage}$$

5. The main task is to replace the intensity of a region with a ASCII character. So you matches the intensity of particular region of image with the intensities of the Ascii. The one that closely matches will replace the image intensity with the corresponding ASCII character.

This is a bonus part of the project. So anyone who will submit this part will be awarded with bonus marks. This is an opportunity to compensate the marks that you have lost.

Good Luck :)