Computer Gr phics

Project 2

M rch 21, 2022

Subject: Dithering nd Colour Qu ntiz tion

Extend the program from the previous task to allow the user to apply selected dithering and colour quantization algorithms to an image. During the laboratories you will be assigned dithering and colour quantization algorithms that should be implemented in your application.

Requirements

- using the application from previous project,
- all the previously implemented functions should still work,
- loading of a selected image and displaying it in the application **in its original resolution**,
- implementation of one dithering algorithm and one colour quantization algorithm (both assigned by the teacher in the USOS grade section),
- applying selected algorithm to the loaded image and displaying result beside or in place of the original image (displaying both images is not required, but recommended),
- option to convert loaded image to a greyscale,
- dithering algorithms correctly working for both colour images (applying dithering function to each color channel independently), and for greyscale images (using only the grey channel),
- changing parameters of the implemented algorithms in the graphical user interface,
- saving result image to a file,
- returning filtered image back to its original state without reloading the file (optional, but recommended),

Remarks

Image file loading and displaying may be handled by an external library, but implementation of the required algorithms must be done using only operations on single pixels.

Interaction with the application may be handled mainly by the graphical user interface. ll actions performed with keyboard shortcuts should be possible to do using application GUI.

Dithering lgorithms

For all the dithering algorithms user can select number of colour values per channel (eg. number of shades of grey for the greyscale images).

- **Random dithering (5 points)**
- **verage dithering (5 points)**
- **Ordered dithering (10 points)**
  - selecting the size of the threshold map. Size can be limited to values 2, 3, 4, 6.
- **Error diffusion (10 points)**
  - implementation of all 5 error diffusion kernels from the lectures,
  - selecting one of implemented kernels to be used in the algorithm.

Colour qu ntiz tion lgorithms

- **Uniform quantization (5 points)**
  - selecting a number of division along each of the color axes (R, G and B).
- **Popularity algorithm (5 points)**
  - selecting a number of colours in the result image.
- **K-Means (10 points)**
  - selecting a number of colours in the result image.
- **Median cut (10 points)**
  - selecting a number of colours in the result image.
- **Octree colour quantization (10 points)**
  - selecting maximum number of colours in the result image.