Computer Graphics — Task 2
Dithering and Colour Quantization

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1   Assignment

Create a program with a graphical user interface that allows 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.

Assignment will consist of two of the following dithering algorithms:

- random dithering,

- average dithering,

- ordered dithering,

- error diffusion,

and two of the following colour quantization algorithms:

- uniform quantization,

- popularity algorithm,

- octree colour quantization,

- k-means colour quantization,

- median cut colour quantization.

They should be implemented as specified during the lecture.

2 Requirements

2.1 Dithering

User should be able to:

1. Load an image from a file.

2. Select desired number of grey levels k in the output. Program should support at least $k \in \{2, 4, 8, 16\}$.

3. Select other parameters of the algorithm:

   - for ordered dithering — select the size n of dither matrix. Program should support at least $n \in \{2, 3, 4, 6\}$,
   - for error diffusion — select error diffusion matrix. Program should support the following filters:
     - Floyd & Steinberg,
     - Burkes,
     - Stucky,
     - Sierra,
     - Atkinson.

4. Apply selected dithering to the image.

In response the program should:

1. Convert the loaded image to greyscale.

2. Process the image using the selected dithering algorithm with provided parameters.

3. Display in the program window greyscale image and dithering result side-by-side in their original resolution.

2.2 Colour Quantization

User should be able to :

1. Load an image from a file.

2. Select algorithm parameters:

   - for uniform quantization — number of subdivisions k_r, k_g, k_b along each of RGB axes,
   - for popularity, k-means and median cut color quantization — size k of the colour palette,

- for octree colour quantization — maximum size k_{max} of the colour palette.

3. Apply selected colour quantization algorithm to the image.

In response the program should:

1. Process the image using the selected colour quantization algorithm with provided parameters.

2. Display in the program window the image and quantization result side-by-side in their <u>original resolution</u>.