PRACTICAL WORK 1
SHADER BASED IMAGE PROCESSING

Prerequires

- “05 - GPGPU with shaders.pdf”
- Computer Vision: Algorithms and Applications, 2nd ed: Chapter 3

Color filtered anaglyph

Color filtered anaglyph is a type of anaglyph image that is created using a color filtering technique. In this technique, the two stereo images are first processed to have different color channels - one image is typically filtered to have only red colors, while the other image is filtered to have only cyan (or sometimes blue/green) colors. The two filtered images are then superimposed, with the red filtered image being placed on top of the cyan (or blue/green) filtered image.

When viewed through the corresponding color filters of the anaglyph glasses, the viewer's brain combines the two images, creating a sense of depth and a 3D effect. This technique is relatively simple to produce and can be applied to a wide range of images, including still images and video content.

However, the color filtered anaglyph technique can also have some limitations. For example, the resulting image can often have a color tint, which can affect the image quality and make it less visually appealing. Additionally, the use of color filters can also limit the range of colors that can be displayed in the final image. Nevertheless, color filtered anaglyph remains a popular and widely used technique for creating 3D stereo images, particularly in the entertainment industry.

The objective of this practical work is to test different types of colored anaglyphs associated with simple image processing methods based on:

- Anaglyph Methods presented here: https://3dtv.at/Knowhow/AnaglyphComparison_en.aspx
- Stereo videos like (with different resolutions):
    - https://www.youtube.com/watch?v=fs_Uw4qL2O8
    - https://www.youtube.com/watch?v=_FgCK6CdR8s

Exercise 1 – 3D Environment

Build with three.js a simple 3D environment that will be used for all the exercises of this practical work.

This environment should have an interface that allows you:

- To pause/start/stop the video.
- To zoom in/out and pan inside:
    - The right image.
    - the processed anaglyph.
- To switch between the different image processing methods that you will implement as well as to modify the parameters of these methods.

Exercise 2 – Anaglyph color methods

Implement all the anaglyph methods presented here:
https://3dtv.at/Knowhow/AnaglyphComparison_en.aspx

Exercise 3 – Image processing methods

Implement the following color image processing methods on the stereoscopic videos before the anaglyph processing:

1 - Convolution

- Gaussian filter
    - **Parameters**: kernel size, sigma

- Laplacian filter (where the result can be a color or the norm of this color)

2 - Separable filter

- Gaussian filter
    - **Parameters**: kernel size, sigma

3 - Denoising

- Median filtering
    - **Parameters**: kernel size

4 – Gaussian filter + Laplacian filter

Combine the gaussian filter and the Laplacian filter (with the norm of the resulting color).

- **Parameters**: kernel size, sigma, factor associated with the Laplacian values.

5 – How to correctly process the pixels on the edges of the images?