OpenGL Engine Modifications for Image Filters

Overview

This project involved modifying the OpenGL engine to implement four image filters: Grayscale, Canny Edge Detection, Halftone, and Floyd-Steinberg Dithering. These filters were applied to the "Lenna" image, and the implementation was structured to be modular and reusable. Below are the changes made to the engine.

Changes to the Engine

1. Created a New File: graphicsFilters.c

- All filter implementations are located in this file.
- **Filters Implemented:**
    - Grayscale: ConvertToGrayscale, ConvertToGrayAveragescale
    - Gaussian Filters: ApplyGaussianFilter3x3, ApplyGaussianFilter5x5
    - Canny Edge Detection: GradientCalculation, NonMaxSuppression, HysteresisThresholding
    - Halftone: Halftone
    - Floyd-Steinberg Dithering: floydSteinbergDither
- **Utility Functions:**
    - LoadImageToArray for loading images.
    - SaveImage for saving processed images.

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2. Created a New Header File: graphicsFilters.h

- Contains declarations for all implemented functions.
- Includes libraries: stb_image.h and stb_image_write.h.

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3. Updated the main.cpp File

- **Menu Integration:** Added a console menu for selecting filters:
    1. Grayscale
    2. Canny Edge Detection
    3. Halftone
    4. Floyd-Steinberg Dither
    5. Exit
- **Image Reloading:** Reloads the original image after each filter is applied to ensure correct results.

Files Modified

1. **graphicsFilters.c:** Contains all filter implementations.
2. **graphicsFilters.h:** Header file with function declarations and dependencies.
3. **main.cpp:** Updated to integrate the filters with a menu-driven interface.

Usage Instructions

1. **Filters Menu:**
    - Users can choose a filter by entering its number.
    - Processed images are saved in the output directory: C:\Users\aseel\OneDrive\Desktop\BasicOpenGL-main (new)\output_images\. (you should change the path..)
2. **Filepaths:**
    - Input image: Lenna.png.
    - Output image names are based on the selected filter (e.g., grayscale.png, halftone.png).

GitHub Repository: https://github.com/Aseel205/computerGraphics