Design Document

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Project : Image processing

Project overview:

This project covers the processing of grayscale images represented by numerical values recorded in files. The program renders graphics with characters that correlate to brightness levels. The user can select from a menu of options to load a new image, display the currently loaded image, edit the current image, or leave the program. If the user decides to modify the image, they can crop, dim, brighten, or rotate it, with the extra rotation option

Data:

1. Variables:

- **choice**: variable to store the user's menu choice(**int)**
- **filename**: array to store the filename entered by the user(**char)**
- **i**, **j**: variables used as loop counters(**int)**

2. Arrays:

- 2D array (**int**) representing the grayscale image.
- 2D array (**char**) representing characters displayed to screen.
- 2D array (**int** editedField) representing the edited image.

3. File Pointer

- **file**: File pointer used for file handling operations, such as opening and closing image files.

Main Function Algorithm

The main function of the program displays the main menu options using a loop, prompting the user for their choice, and calling the corresponding function based on the user's input. This process repeats until the user chooses to exit the program. It will first display a first menu where the user can choose to load, display, edit the image or exit the program. If the user chooses to edit the image, another menu will be displayed, and the options will be either to crop, dim, brighten or rotate the image.

main()

- **Data:** a variable for user's choice, an array for image field.

- **Functionality:** In a loop, prompt the user to load an image from a file, display, edit it, or exit the program. In another loop, prompt the user to edit the image by cropping, dimming, brightening or rotating it.

LoadImage()

- ***Input Parameters*:** File pointer, Integer rows, Integer columns, 2D array of integers (int field)

- ***Returned Output***: None (void)

- ***Functionality***: This function reads the contents of an image file specified by the user. It takes a file pointer and the dimensions of the image as input parameters. The image data is then loaded into the provided 2D array of integers (int field), which represents the brightness values of the pixels in the image.

DisplayImage()

- ***Input Parameters**:* Integer rows, Integer columns, 2D array of integers (int field), 2D array of characters (char display)

- ***Returned Output**:* None (void)

- **Functionality**: This function traverses through the provided image data structure (int field) and maps the brightness values of each pixel to corresponding characters. These characters are then stored in another 2D array (char) to represent the image on the screen.

EditImage()

- ***Input Parameters**:* Integer rows, Integer columns, 2D array of integers (int field)

- ***Returned Output**:* 2D array of integers (int editedField)

- **Functionality**: This function allows the user to edit the current image by cropping, dimming, brightening, or rotating it. It takes the dimensions of the image and the original image data as input parameters. Depending on the user's choice, it applies the corresponding edit operation and returns the edited image data as a 2D array (int editedField).

CropImage()

- ***Input Parameters:*** Integer rows, Integer columns, Integer startRow, Integer endRow, Integer startColumn, Integer endColumn, 2D array of integers (int field)

- ***Returned Output:*** 2D array of integers (int croppedField)

- ***Functionality:*** This function extracts a specified section of the original image data. It takes the dimensions of the image, the coordinates of the desired section (startRow, endRow, startColumn, endColumn), and the original image data as input parameters. It returns the cropped image data as a 2D array (int croppedField).

DimImage()

- ***Input Parameters:*** Integer rows, Integer columns, 2D array of integers (int field)

- ***Returned Output:*** 2D array of integers (int dimmedField)

- ***Functionality:*** This function decreases the brightness value of each pixel in the image by one step. It takes the dimensions of the image and the original image data as input parameters. It returns the dimmed image data as a 2D array (int dimmedField)

BrightenImage()

- ***Input Parameters****:* Integer rows, Integer columns, 2D array of integers (int field)

- ***Returned Output:*** 2D array of integers (int brightenedField)

- ***Functionality****:* This function increases the brightness value of each pixel in the image by one step. It takes the dimensions of the image and the original image data as input parameters. It returns the brightened image data as a 2D array (int brightenedField).

RotateImage()

- ***Input Parameters****:* Integer rows, Integer columns, 2D array of integers (int field)

- ***Returned Output****:* 2D array of integers (int rotatedField)

- ***Functionality****:* This function rotates the image by 90 degrees clockwise. It takes the dimensions of the image and the original image data as input parameters. It returns the rotated image data as a 2D array (int rotatedField).

SaveImage()

- ***Input Parameters:*** file pointer, Integer rows, Integer columns, 2D array of integers (int editedField), 2D array of characters (char editedField)

- ***Returned Output:*** None (void)

- ***Functionality:*** This function will first prompt the user to save their edited image to a file and then, open a new file with the specified file name for writing, traverse through the 2D array of the edited image structure, convert the brightness values of pixels to their corresponding characters (using the table), write the mapped characters to the file and then, close the file once the image data has been written.