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Programming Assignment 3 Report

Implementation Overview:

I broke my implementation of the assignment into the following steps.

C Program:

1. Read pattern into custom Matrix struct that holds #rows, #columns, and a 2D array.
2. Loop through the given image directory.
3. If the current file is .img, read the image into Matrix and compare with the pattern.
4. Holding information for a match within a custom PatternMatchInfo struct that holds the #numberOfTimesPatternWasFoundInImage, and the rows and column values for each match.
5. Write pattern match info to output file.

Bash Script:

1. Run input sanitization on file paths to ensure they end in ‘/’.
2. Create a temp directory to hold copies of pattern files.
3. Create an empty copy of all pattern files within the temp directory.
4. Loop through line by line of each pattern file, printing to it’s temp file counterpart the same line with ‘\r’ replaced with ‘\n’.
5. Repeat steps 2,3,4 for Image directory.
6. Copy all files from temporary directories into original pattern and image directories, replacing the original files with windows line endings .

7. Delete temporary directories .
8. Create an output directory if it doesn't exist.
9. Compile C program with given exec name.
10. Run instances of the program concurrently for each pattern file with the images directory.

Finding Pattern Matches

- To find the pattern matches in images, I used an algorithm that would iterate row by row of the image using ststr() to look for the first row of the pattern. If a match was found, then I used character by character checking to check the 2 rows under the match of the first row I found.
- I hard coded the checking of the bottom two rows because the image was 3x3, if I had time to do the extra credit I would of instead check the #rowInPattern - 1 following rows after finding a match of the first row. Making sure that I did not loop out of bounds.

Difficulties:

- I found the most "difficult" part reading the images or patterns into a matrix. For hours I tried implementations using fgets, reading each line as a buffer but to no avail, eventually I read the documentation on fscanf and that turned out to be exactly what I needed.

Limitations Of C Program / Script

- Because there was no data validation fragment to this assignment I didn't do too much of that. The validation I do have is making sure the program works with paths ending in / and those that don't, and making sure in the bash script to create the output directory if it doesn't already exist.

- If that had been a part of the assignment and If I had more time I would add more validation such as,
    - Ensuring the given image and pattern directories exist before searching through them
    - Ensuring images and patterns are properly formatted
- Other than that I believe that my program works with valid input, the only caveat to this is that I am using static allocation for my array holding the number of pairs of row and columns values for placesFound[10000] in my PatternMatchInfo struct. This would mean undefined behavior that for a very large with more than 10 thousand pattern matches. For this assignment I felt this was okay because the image is guaranteed to be small, if that was not a given, I would dynamically allocate the size of that array, re-allocating more memory if it became close to getting full.