

Lab 1 Report: What is an Image?

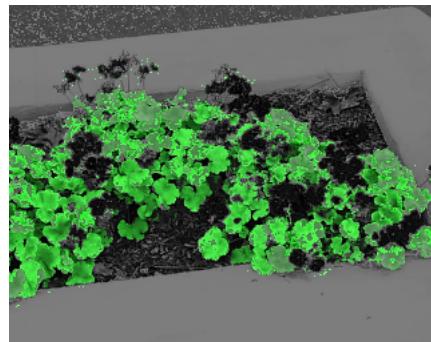
Summary

The purpose of this assignment was to familiarize myself with C programming, and the mechanics of creating, manipulating, and writing images. The tasks involved setting up a directory structure, compiling a library for image processing, and performing various operations on images such as turning an image green, implementing green/blue screen compositing, and merging images with a mask and offsets. Additionally, I explored extensions to enhance the functionality of the program.

Required Images

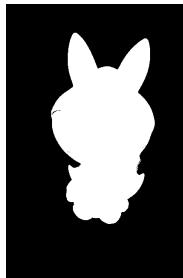
1. Modified Image

Description: For the first task, I modified the image to highlight all the very green pixels and turn the rest greyscale. This involved reading the image data, iterating through each pixel, and calculating whether it was “very green”. Pixels that met the threshold were highlighted while those that were not “green enough” were converted to grayscale. This transformation highlights the pixel manipulation capabilities in C.



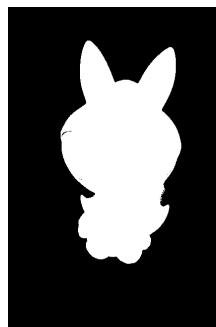
2. Mask Creation

Description: The second task involved creating a mask from a green/blue screen image. I generated a mask image by identifying green or blue pixels and setting them to 0 (black) while setting all other pixels to 255 (white). This mask helps in distinguishing the foreground from the background.



3. Composed Image

Description: The third task was to composite two images using the mask as an alpha mask. I wrote a compositing function to blend the foreground image onto the background image based on the mask values, with specified offsets for positioning. In this specific example, I used a value of 500 for dx and 200 for dy . One interesting thing I noticed was that my mask caused the powerpuff girl to bring some of the background from the greenscreen into the composited image because the shadow from the doll changed the shade of green enough to be identified as foreground. I was able to use a green background image (forest) to mitigate how noticeable the green background was.



Extensions

1. Mirroring

Description: My first extension was to flip the image horizontally. I accomplished this by reversing the pixel order in each row of my input image (powerpuff girl).



2. Fog/Explosion Overlay

Description: My other extension was to apply fog/explosion effect to an image. I implemented this by providing a foreground image (explosion), which I turned into a semi-transparent layer with random transparency values between 30 and 50 before laying it over my background image (actor Shia LaBeouf) and producing a composite image using alpha blending.



Portfolio Images

1. Mask Creation and Composited Image

Description: I used programs I wrote for this lab to create a mask of actor Shia LaBeouf standing in front of a green screen, then applied that to produce a composite image of the actor standing in a forest.



2. Mirroring + Fog/Explosion Overlay

Description: I used my two extensions to mirror an image of Mount Rushmore, then overlay an image of the sky to make the output image slightly blue and add clouds.



Reflection

This project helped me gain a deeper understanding of image processing in C, and the importance of efficient memory management. I also learned about alpha blending and various techniques to manipulate and enhance images. The mask creation problem taught me that thresholds can control how much of a base image can be passed into the foreground of a mask, and that a well-selected background can be used to hide these artifacts in a composite image.

Acknowledgements

I would like to thank my peers (Jiafeng Du) for their valuable insights and online resources such as [W3schools](#) which helped me better understand C programming. The coding style guide and makefile tutorial provided by Professor Maxwell were particularly helpful in organizing my project and ensuring proper coding practices. I consulted the lecture notes and recordings to understand the techniques for solving these problems.