L02 Image Processing Fundamentals

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Technical Understanding

What was the most surprising discovery about how images are represented?

The most surprising aspect about how the images were presented was the way computers process images. Computers don't "see" the way we do; the way the human vision works is not a simple process, it involves many elements, it is a combination of biological components, context, and experiences.

How do the mathematical operations we implemented relate to visual effects?

Computers have a different vision system, the system consists of image processing, image interpretation, image analysis, and image understanding. The mathematical operations we implemented are related to visual effects because computers store and process image information in a numerical way. Computers see a matrix of pixel values, each pixel is a grayscale is represented by a single number that range from 0 to 255 (zero represents pure black, and 255 *represents pure white).*

Which technique was most challenging to understand and why?

For me, the technique that was most challenging to understand was the geometrical transformation. The four main types of transformations are translation (same distance and same direction), rotation (turn around a fixed point), reflection (mirror image), and dilation (changes the size up or down). The lab helped me visualize the transformations and have a better understanding.

Connections and Applications
How do today's lab activities connect to the Nano Banana demonstration from class?

Nano Banana is an AI image model editor and generator. This tool is not the same as traditional image processing, but without the basics, how would the current AI technology work? This may be a silly example, but when kids are little, they first start to crawl before they learn how to walk. It's the same with Nano Banana, of course, it's faster, more flexible, easier to use, and uses ML and neural networks, but without the principles and techniques of traditional processing, it wouldn't be possible.

What real-world applications can you envision for the techniques you learned?
The real-world applications that I can envision for the techniques I learned in this lab are facial and fingerprint recognition, medical imaging, and autonomous vehicles.

How might you combine traditional and AI approaches in a future project?
I would combine traditional techniques with modern AI tools in a project where I would use traditional methods to clean and standardize images, and after that, I could use the standardized images to feed the AI tools for more complex tasks. An example of this would be medical image analysis, where I can use traditional techniques for histograms and noise reduction, and AI tools for segmentation and classification.

Personal Reflection

What aspect of image processing interests you most for further exploration?
The aspect of image processing that interested me the most for future exploration is image restoration.

How has this lab changed your understanding of digital photography and image editing?
One of my favorite hobbies is photography, and this lab helped me understand more about how images are processed. I think most of the time, we don't really think about the whole process behind the curtains. It was great to understand this subject better.

What questions do you still have about image processing?
I would like to understand more about RGB channels.