Project 1 Report

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**Required image 1**

A park with trees and grass

Description automatically generatedA group of trees in a park

Description automatically generated

**Required image 2**

**A group of trees with pink leaves

Description automatically generated**

To generate the grayscale version, I used a color inversion method rather than the typical weighted average of the RGB channels.

For each pixel: Red, Green, and Blue channels are inverted: r = 255 - pixel[2], g = 255 - pixel[1], b = 255 - pixel[0].

Differences from Default Grayscale:

Brightness: The default grayscale preserves brightness, while the inverted method alters brightness, resulting in complementary color contrasts.

Color: Default grayscale converts to shades of gray, whereas the inverted method keeps the complementary colors (e.g., red becomes cyan).

**Required image 3**

A group of trees in a park

Description automatically generated

To ensure the computation uses the original RGB values, the code reads the source pixel values (B, G, R) before any computation, ensuring transformations are based on unmodified values. Each new channel value (newB, newG, newR) is computed independently without relying on intermediate results.

**Implement a 5x5 blur filter**

1. Time per image (1): 0.2296 seconds
2. Time per image (2): 0.1381 seconds

A black background with white numbers

Description automatically generated

Why the 2nd method it’s faster:

I use separable filter 1\*5 and 5\*1 matrix to implement the blurring, so that it can reduce the operations compared with the 5 \*5 Gaussian blurring.

From (25 + 24 + 1) = 50 ops per pixel reduce to (5 + 4 + 1) \* 2 = 20 ops per pixel.

**Required Image 4:** the blurred image

**A close-up of a colorful background

Description automatically generated**

**Required Image 4:** gradient magnitude image from the X and Y Sobel images

**A park with trees and grass

Description automatically generated**

**A group of trees in a park

Description automatically generated**

**Required Image 5: blurs and quantizes a color image**

**A park with trees and grass

Description automatically generated**

**A park with trees and a bench

Description automatically generated**