

Image Resizing Using Nearest Neighbor Interpolation

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Input path e.g.

C:\\Users\\Mohammad\\Desktop\\A1.jpg

Just like this and nothing more.

And for factor just number.

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Overview

This document describes the implementation and functionality of a Python program that resizes a grayscale image using the **nearest neighbor interpolation** technique. The tool allows users to input an image file path and a scaling factor to resize the image accordingly. It is intended for simple image manipulation tasks where speed is prioritized over precision.

Requirements

The script requires the following Python libraries:

- **Pillow (PIL):** Used for image loading, conversion, and display.
- **NumPy:** Used for efficient manipulation of image pixel data as arrays.

These can be installed using the following commands:

```
pip install pillow numpy
```

Description of Functionality

1. Image Loading and Conversion

The image is loaded from the provided file path and converted into a

grayscale format. This simplifies processing by reducing the image to a single intensity channel.

2. Dimension Extraction

The script reads the original image dimensions (width and height) to calculate new dimensions based on the given scaling factor.

3. Resizing Logic with Nearest Neighbor

The nearest neighbor interpolation method is used to resize the image. Each pixel in the resized image is mapped to the nearest corresponding pixel in the original image using inverse scaling. This technique is computationally efficient and simple to implement but may lead to jagged or pixelated results when enlarging images.

4. Pixel Mapping

A new blank image is created using the calculated new dimensions. Each pixel value in this new image is assigned by referencing the closest pixel in the original image based on the nearest neighbor approach.

5. Image Display

The script displays both the original and resized images to visually confirm the transformation.

How Nearest Neighbor Works

Nearest neighbor interpolation is a straightforward algorithm where, for each pixel in the new image, the closest pixel value from the original image is copied directly. There is no averaging or smoothing, making it very fast but less accurate than more advanced techniques like bilinear or bicubic interpolation.

User Interaction

When executed, the script prompts the user to:

- Enter the **file path** to the image.
 - Enter the **scaling factor** (e.g., 2 to double the size, or 0.5 to reduce it by half).
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Limitations

- This method does not handle color images (it converts all input images to grayscale).
- It does not perform any interpolation beyond selecting the closest pixel.
- Enlarged images may look blocky or pixelated due to the nature of nearest neighbor interpolation.