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Homework 1

1 – Auxiliary

1 – Language:

*Python3

2 – Libraries:

*cv2

*numpy

*scipy

*glob

*os

2 – Methods

1.1 – read_all_image_files:

This method reads all file inside of "images" folder under working directory. It returns file list.

1.2 – generate_output_image_file_path:

This method generates output file name for a image file name. It returns output file name as string.

1.3 – get_grayscale_image:

This method takes image file path as a parameter. It reads the image from file. It returns image as converted to grayscale.

1.4 – convolve:

This method takes two parameters: image and kernel. It applies kernel to image by considering convolution operation. It returns convolved image.

1.5 – blur_image:

This method takes image as a parameter. It defines 3*3 Gaussian kernel for blur operation. It returns the image convolved with Gaussian kernel.

1.5 – sobel_filter:

This method takes image as a parameter. Also, it takes another boolean parameter to get which sober filter will be applied. 0 means vertical, 1 means horizontal. It returns the image convolved with decided 3*3 Sobel kernel.

1.6 – get_gradients:

This method takes image as a parameter. It applies both horizontal and vertical sobel filters to image. It returns a matrix which includes gradient value for each pixel.

1.7 – get_orientation:

This method takes image as a parameter. It applies both horizontal and vertical sobel filters to image. It returns a matrix which includes orientation value for each pixel.

1.8 – non_max_suppression:

This method takes two parameters: gradient matrix and orientation matrix. It decides non-suppressed pixel by checking orientation values of pixels and checking related neighbor.

1.9– apply_threshold:

This method takes five parameters. One is mandatory, it is image. The others is optional, they have default values. These are optional parameters: low_ratio is coefficient to calculate low threshold, high ratio is coefficient to calculate high threshold, w is weak pixel value and s is strong pixel value. It applies two-threshold to image and assigns weak and strong pixels to new zero matrix. It returns the matrix and a tuple list including strong pixel coordinates.

1.10 – hys:

This method takes four parameters: two of them is mandatory, two of them is optional. Mandatory parameters are image and strong pixel coordinates. Optional parameters are weak and strong pixel values. This method assigns strong value to weak values that connected with strong pixels. If weak values does not have connection with strong values, 0 assigns to this pixels. Depth-First Search is used for following weak values having strong connections. Return a matrix, final image.

1.11 – apply_canny_edge_detector:

This method takes image as a parameter. Firstly, image is blurred. After blurring, gradient and orientation calculated. Non-max suppression applied and two-threshold applied. After the hysteresis operation it returns the final image.

3 – How to run the code

1 – os, glob:

Unix system has to have os, glob libraries as default. You don't need to install this libraries.

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2 – cv2:

In order to install cv2, the below command can be used.

- pip install opencv-python

If you don't have pip, you can install like this.

- sudo apt install python-pip

3 – scipy:

In order to install scipy, the below command can be used.

- pip install scipy

4 – numpy:

In order to install numpy, the below command can be used.

- pip install numpy

5 – Run the project:

Important note: You have to have *images* folder in the current working directory. All images to will be applied edge detector should be inside this folder. Also there should not be any other files in this folder

To run the project:

python hmw1.py

4 – Result

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