

# COMP3317 Computer Vision

## Department of Computer Science

### Assignment 2: *Feature Detection*

**Deadline: 23:59, Mar 6, 2024.**

#### Task

In this assignment, you are going to implement the functions for performing (1) color-to-grayscale image conversion and (2) corner detection. To guide your coding, a partially completed Python program is provided to you, which provides implementations for parsing the program arguments, loading an input image, plotting the corner detection result, and loading/saving the detected corners from/to a file. In completing this assignment, you only need to modify the following functions: `rgb2gray()`, `smooth1D()`, `smooth2D()` and `harris()`. Please refer to the tutorial notes as well as the comments in the source code for details of these functions.

#### Requirements

Your implementation should:

- ☐ Use the formula for the Y-channel of the YIQ model in performing the color-to-grayscale image conversion.
- ☐ Compute  $I_x$  and  $I_y$  correctly by finite differences.
- ☐ Construct images of  $I_x^2$ ,  $I_y^2$ , and  $I_x I_y$  correctly.
- ☐ Compute a proper filter size for a Gaussian filter based on its sigma value.
- ☐ Construct a proper 1D Gaussian filter.
- ☐ Smooth a 2D image by convolving it with two 1D Gaussian filters.
- ☐ Handle the image border using partial filters in smoothing.
- ☐ Construct an image of the cornerness function  $R$  correctly.
- ☐ Identify potential corners at local maxima in the image of the cornerness function  $R$ .
- ☐ Compute the cornerness value and coordinates of the potential corners up to sub-pixel accuracy by quadratic approximation.
- ☐ Use the threshold value to identify strong corners for output.

You can compare your result against the sample output for checking the correctness of your program.

#### Submission

Points to note when submitting your assignment:

- You should include a `readme.txt` file describing the features you have implemented, especially when you have turned in a partially finished implementation.
- Pack your source code `assign2.py` and the `readme.txt` into a zip file and submit it through Moodle.
- No late submission will be accepted.

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