CSIS0317/COMP3317 Computer Vision
Department of Computer Science

Assignment 2: *Feature Detection*

Deadline: **16:00, 9th Oct, 2015.**

Background

VG3DBuilder is a computer vision based 3D modeling software developed by the Vision Group of the Department of Computer Science at The University of Hong Kong. It provides basic tools for color-to-gray-scale image conversion, corner detection, camera calibration, and image based 3D modeling.

In this assignment, you are going to implement the following two functions of the VG3DBuilder:

- Color-to-gray-scale image conversion
- Corner detection

Task

The core program VG3DBuilder, which implements the graphical user interface and the general program logic, has already been compiled into an executable. This executable will make function calls to two dynamic link libraries (DLL), namely corner.dll and camera.dll. corner.dll accomplishes the tasks of color-to-gray-scale image conversion and corner detection, and camera.dll accomplishes the tasks of camera calibration, projection matrix decomposition and triangulation. Your task in this assignment is to complete the implementation of the functions for color-to-gray-scale image conversion and corner detection in corner.dll.

To guide your coding, a project created under Visual Studio 2010 (32bit) is provided to you. In completing this assignment, you should only modify the file `Assignment2.cpp` which contains the definitions of the following two functions:

- RGBToGrayScale() – this function takes a color image in RGB format as input, and converts it into a gray scale image using the formula for the Y-channel of the YIQ model.
- ObtainCorners() – this function takes a gray scale image as input, and detects corner features using the Harris corner detection algorithm.

Please refer to the tutorial notes as well as comments in the source code for the meanings and usage of the parameters of these two functions.

Requirements

Your implementation should:

- Use the formula for the Y-channel of the YIQ model in performing the color-to-gray-scale image conversion.
- 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.
- Compute I_x and I_y correctly by finite differences.

- 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 results with those produced by the sample program for checking the correctness of your program.

Submission

Points to note when submitting your assignment:

- You should hand in only your modified `Assignment2.cpp` but not the whole project.
- 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 `Assignment2.cpp` and the `readme.txt` into a zip file, and submit it via the course Moodle page.
- No late submission will be accepted.
- Programs that cannot be compiled will not be graded.

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