VISUAL COMPUTING

ASSIGNMENT 2

Antonio J. Rodríguez-Sánchez, Dennis Barnes, 21-Oct-2025

Deadline: 23:59 3-Nov-2025

<u>Important note: Should be done in groups of 2-3 people</u>

1. (2 points) Implement a perspective transformation. Show at least one example of a transformation that is not possible with the affine transformation. Explain how you can see in the image that there is a perspective and not an affine transformation.

2. (2 points) Take an outdoor scene picture and resize it as to be 448x336 pixels and do the following:
   A. Implement a Gaussian Pyramid. Show the results using the same picture. Comment on the results. What are the low frequencies?
   Hint:You can use the sampled version of the Gauss filter: [1 4 6 4 1]/16. To reduce the image size, get every two rows and two columns

   B. Create a Laplacian Pyramid. Show the pyramid for your picture. Comment on the results.
   Hint: Remember the Laplacian can be obtained from the Gaussian filte.

3. (4 points) Apply a Gabor filter at 4 orientations. Combine (use the maximum value for each pixel) the four orientations into one filtered image and show the result. Play with the parameters of the filter and show how the filter works with 3 different parameter set values.

4. (4 points) For the Canny Edge detector, set the thresholds using Otsu's algorithm. Show the results and compare them to the edge-detecting methods from the PS. Use two images for the comparison, and rank the algorithms from worst to best.

5. (3 points) Implement the AKAZE and BRISK feature-detector descriptors. Apply different transformations to an image and compare the results. How many good feature matches can each algorithm find? Is the performance the same for all types of transformations? Also compare the results to the SURF algorithm from the PS.

Deliverable: PDF document with code snippets and results.