

Evaluation of the section: color image segmentation and unsupervised classification

UV FDAA

January, 22th, 2025 (10h-11h)

1 Preamble

In this exercise, we will first try to extract the sky from three fisheye images on the dataset <https://dataverse.isae-superaero.fr/dataset.xhtml?persistentId=doi:10.34849/LP3YVF> acquired with a camera mounted on the roof of a vehicle and pointed at the sky: urban.bmp and canyon.bmp. Secondly, we will segment these images using region growing to highlight the different areas of interest. To do this, you will chain together several existing operators from the PANDORE library. You have the choice of using the ARIANE datastream visual programming environment or writing a shell script to chain the operators.

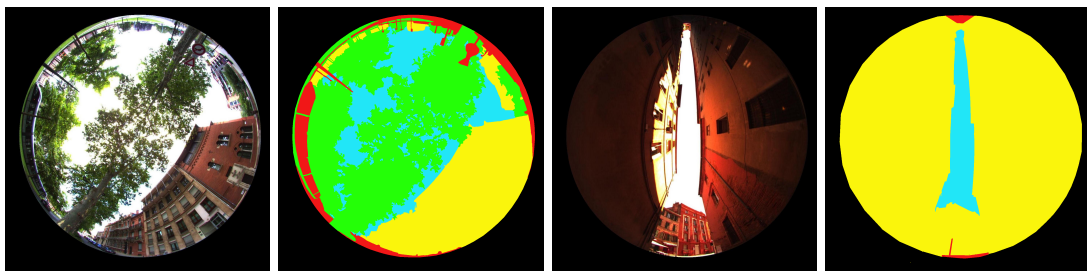


Figure 1: Two images (urban and canyon) to treat and their corresponding ground-truth:

2 Report and source code sending for evaluation

Between 10.45 am and 11.00 am, you must send an archive NOM.zip to the two email addresses: cyril.meurie@univ-eiffel.fr and cyril.meurie@ext.imt-nord-europe.fr. It will contain your .sh script or your ARIANE project, a report (.txt or .doc) explaining your strategy, and a summary analysis of your results. Please note that every minute you are late will deduct one point from your total score.

3 Questions

To guide you in the strategy to follow, here are a number of steps you should carry out. It's up to you to summarise each point, e.g. the benefits (or otherwise) of the extra step, the colour component that gives the best results, the most appropriate colour space, the number of classes used, etc., all backed up by quantitative results.

1. Perform multi-thresholding on urban.bmp by partitioning the histogram of grayscale levels to extract the sky in the image.
2. Change the color space to improve (or not) the results.

3. Apply a pre-processing (filtering) and post-processing (using simple mathematical morphology operators) to improve the quality of the sky extraction (e.g. by eliminating small regions of no interest , overexposed areas, windows, etc.).
4. Recolorize the classified image obtained in the previous step by assigning the color black to sky pixels and the color present in the original image to non-sky pixels. You can use an existing operator from the library or program your own operator.
5. Segment the image canyon.bmp using region growing, and justify how you obtained the images that will be used as input. Explain if so, what additional processing is applied to them to improve the segmentation results.
6. Evaluate the quality of the segmentation and classifications obtained using two evaluation methods with/without reference: MSE and a method that provides recall and precision metrics using the reference ref-urban.jpeg and ref-canyon.jpeg that you previously processed to retain only two classes (sky and not-sky).