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Assignment 5

Clustering and Region Growing for Image Segmentation

Submission Deadline: 21.06.2023, 11 pm

Task 1 – K-Means Clustering

a) Read the exemplary color image `inputEx4_1.jpg` and setup a three-dimensional RGB feature space (`reshape`).

b) Implement a simple *k-means* clustering approach (usage of built-in function not allowed) with random initialization (see lecture notes) to group the color features.

c) Select an appropriate number of clusters *k*, apply the algorithm and visualize the detected groups in feature and image space (e.g. with color coding: `colormap`).

d) Execute your clustering algorithm once more, this time using `inputEx4_2.jpg` as an input image. Visualize the detected clusters in feature and image space.

Task 2 – Watershed Segmentation

a) Load the provided image `inputEx4_2.jpg`, convert it to gray and compute the gradient magnitude (`imgradient`).

b) The starting or *seed points* for the regions to be grown can be determined automatically or manually. Plot the seeds you are using. You can use e.g. these manually selected seed points:

x	40	140	5	130	70	100
y	110	90	60	20	30	130

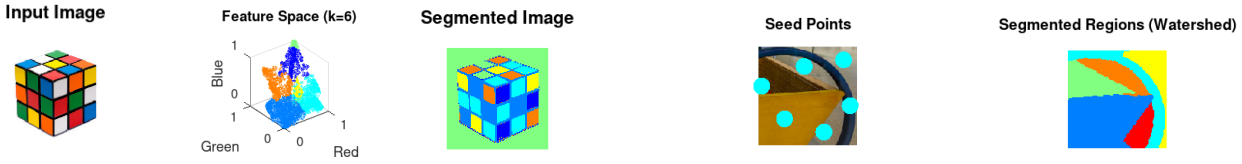
c) Implement the watershed method by yourself. You can use the provided seeds as starting points for region growing. It is recommended to use a *4-neighborhood*.

d) Visualize the final result as well as at least two intermediate steps during the region growing procedure. Use a proper colormap (`colormap`).

e) Shortly describe the benefits and drawbacks of the watershed method for the given example.

Submit your source code, the resulting images, and a `.pdf` (or `.ipynb`) file containing your answers.

Sample Results:



K-Means Clustering Watershed Segmentation