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# Laboratory – Fourier Descriptors

## 1 Fourier Descriptors

Implement fourier descriptors based on the set of points obtained from the boundary following algorithm such that you can change the sample rate of the boundary points (every 2nd point, every 3rd point, etc.) and the magnitude of the first K descriptors (spectral components).

### 1.1 Basic properties

- The square image set (square.zip) provides images of an ideal square (sq1.tif), a slightly rotated version (1 degree, sq11.tif), a shifted version (sq2.tif), a scaled version (sq3.tif) and a rotated version (sq4.tif). Compare and discuss the results obtained from invariant fourier descriptors of these objects. Why do you get different results for some oft the images? Does scaling work properly?
- As above, but use different sample rates for the set of boundary points. How much can the sample rate be reduced such that no major effects are visible?
- Propose and implement an idea to solve the scaling problem. Is your method applicable to any mix of different shapes?
- Now take the image set from shapes.zip. Compute the fourier descriptors for these images. Is there still the scaling problem?

### 1.2 Characterization of different shapes

The shape image set (leaves.zip) provides a set of different shapes, similar to real world plant leaves.

- Compute invariant fourier descriptors for the set of shapes and try to find a minimal set of descriptors (number of relevant spectral components) that allows for precise discrimination of the leaves. Hint: how could fourier descriptors from different shapes be compared (fourier descriptors from an image constitute a vector entity)?
- How much can the sample rate of the border points be reduced such that the shapes still are well distinguishable?