

L03. Image analysis in chemometrics

S. Kucheryavskiy

Aalborg University Esbjerg, Denmark

Digital image processing is a powerful research tool that is employed for discovering both the properties and state of different objects by analyzing of their structure and appearance. In spite of the fact that basic methods and algorithms have been developed in 70-80th of previous century, the area is still open for the researchers. Moreover, even the meaning of 'digital image' term has undergone a very thorough revision since that time, as now the term includes multispectral, hyperspectral, etc images. Such area expansion stimulates researchers to new findings in processing, analysis and classification of images in science and engineering.

The presentation gives an overview of image processing and analysis methods, used in chemometrics. These methods are divided on several parts, depending on the type of investigated image. Thus, for the ordinary images, in which every pixel is represented by one (intensity) or three (basic colors) values, it is very important first to extract useful information for a posterior analysis. In this case, the transform based methods: wavelet analysis (that transforms image from a spatial to the frequency-spatial domain) and Angle Measure Technique (that transforms image to the scale domain) are efficient. Several examples of using these methods for features extraction will be shown.

In the multi- and hypespectral images each pixel contains enough information (from tens up to hundreds corresponding values) to become an independent object of analysis. A huge amount of data (e.g., the 512x512 pixel image with 100 channels gives a data matrix with 262144 objects and 100 variables) does not allow applying the traditional methods for analysis. In such case it is very helpful.to use a score space instead of a variable space. Two methods that implement this idea, namely Multivariate Image Analysis (MIA) and Multivariate Image Regression (MIR) are overviewed.