Kriging Extension

DRAMATICALLY REDUCES IMAGE NOISE
USING A POWERFUL KRIGING METHOD

The Kriging Extension is a highly effective tool for the removal of random acquisition noise from digital images. Its processing is based on Kriging analysis used in geostatistics. It was developed for imaging applications in a collaboration between the GeoSciences Research Group, an R&D laboratory at the Paris School of Mines in France, and imaging software developer ADCIS SA.

Kriging methods, widely used in the field of oil exploration, are now successfully used in the field of imaging technology to enhance the quality of digital images. The Kriging noise removal method proceeds in three steps. First, an image variogram is generated. Next, a fitting model (function) is automatically computed by the software and is displayed graphically. The user can then interactively adjust the fitting model to better approximate the variogram. These adjustments are made with a linear combination of functions selected from a list provided in the Kriging Extension software. Slider bars enable the user to fine-tune the selected functions to improve

the model match to the computed variogram. Lastly, the Kriging process uses the fitting model to generate the noise-filtered image.

Application Domains

Kriging Extension supports models for both isotropic and anisotropic variables, as well as single and multiple variables. For multivariate analysis, the selected model can be adjusted simultaneously to both the variograms and the covariograms. In the field of materials science, the Kriging Extension can be used on each image corresponding to one trace element (i.e., stain, chrome, molybdenum, etc.). Use of this extension enabled the successful detection and quantization of trace elements on a stainless steel sample acquired with an electronic microprobe. It may also be used to filter another component of an image different from the background noise. When installed, the Kriging Extension is fully integrated in the Aphelion Dev software product.
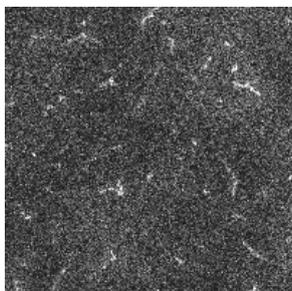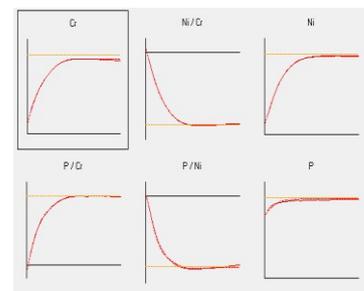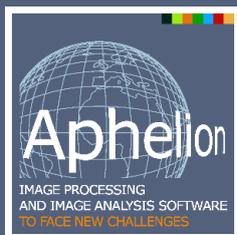

Original image
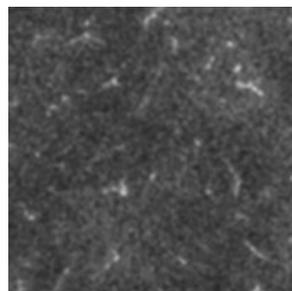
Results after typical filtering
(5x5 Gaussian)
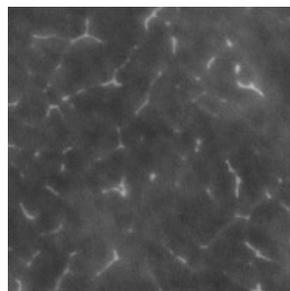
Results after multivariate
Kriging filtering

Covariograms in orange and model
fitting in red dashed lines

Main benefits of the Kriging Extension:

- Effectively removes acquisition noise from digital images
- Standard models are provided (e.g., Gaussian, nugget effect, etc.)
- Automatic generation of models to help the user
- User tools for refining model parameters to enhance fitting to actual data
- Mono and multivariate analysis, with multiple directions

Rev: 1.0