

### Side Scan Image Processing, Texture Mapping and Classification

#### Description

GeoTexture is a unique software package from GeoAcoustics for the analysis of side scan sonar data. It has a powerful suite of tools for normalising the side scan sonar image texture across the swath, which significantly improves the quality of the side scan mosaics for human and machine interpretation. It can also be trained to remember and recognise multiple textures across and between images, and produce classified maps. This makes GeoTexture an invaluable tool for interpreting sonar images of the seabed environment for applications ranging from civil engineering site survey to biological habitat mapping.

As well as standard side scan and image data formats, GeoTexture can also read the side-scan output files from the GeoAcoustics GeoSwath Plus shallow water wide swath bathymetric sonar, offering significant benefits to existing GeoSwath Plus users in Side Scan normalisation, image creation, and texture mapping.

#### Processing Steps

##### Side Scan Sonar Image

##### Processing

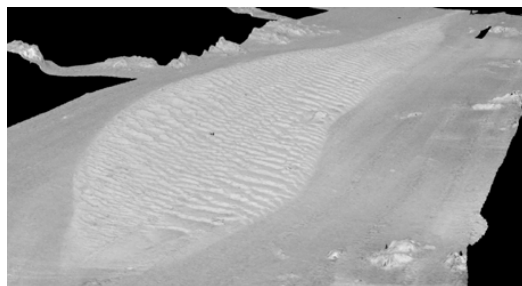
- Trace Sampling
- Seabed Locate for water column removal
- Filter Bathymetry
- Trace Normalisation
- Slant Range Correction

##### Trace Normalisation

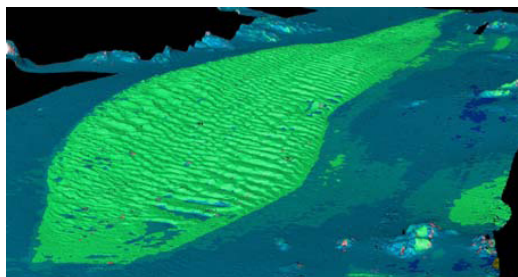
- Removes the effects of things other than seabed material from image texture
- Improves the interpretability of the image
- Allows amplitude based classification



Side Scan Mosaic



Normalised Side Scan Mosaic



Classified Image

#### Features

- Side scan processing
- Side Scan mosaicing and normalisation
- Image classification
- Wide range of data input formats
- close GeoSwath Plus data support

#### Mosaic Generation

A mosaic image may be created or an existing one loaded. Geo-referenced images displayed in GeoTexture Swath Mode may be drawn into a mosaic at any stage during the processing of the image. In Mosaic Mode, multiple side-scan sonar image files (.swp or .xtf formats) may be loaded for bulk processing and subjected to the same

processes available in Swath Mode before being drawn into the mosaic.

#### Feature Extraction and Image Classification

The texture mapping software extracts a feature vector around each image pixel and decides the best match with a characterised texture defined in supervised training. The colour code for that texture is used to set the pixel colour in the classified

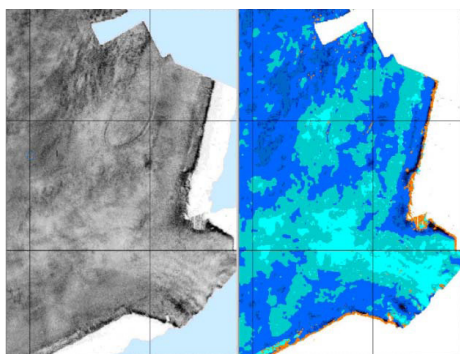
image.

- Supports user supervised image texture characterisation
- Classifies mosaic images or swaths
- Georeferenced classified image can be saved with a world file for GIS
- Multiple user-defined training areas
- Automated feature vector extraction
- Adjustable decision threshold

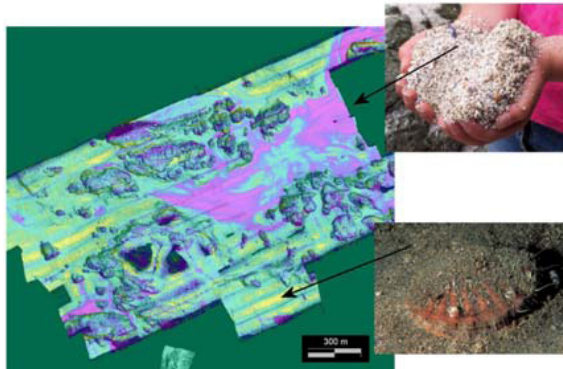
### GeoSwath Plus Interface

GeoTexture is designed to easily integrate with the GeoSwath Plus wide swath bathymetric sonar. The GeoSwath collects co-registered Bathymetry and true geo-referenced digital side scan data, from a well characterised bathymetric sonar system and motion sensor.

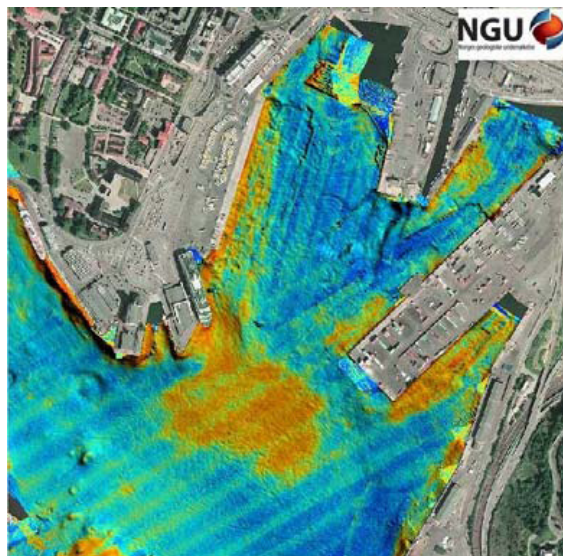
- Allows correction for beam pattern and beam pointing direction
- Side-scan roll and heave artefacts reduced
- Bathymetry data can be used for seafloor slope correction
- Classified images can be output as GeoSwath mosaic data.



Normalised and classified images of a harbour.



Classified mosaic from the Norwegian Geological Survey (NGU), with ground truth samples



Classified image of a ferry berth showing extent of sediment disturbance (NGU)

### Specifications

- Operating System: Windows XP PC.
- Resolution: User definable (both for loaded side scan data and mosaic generation).
- Side Scan processing: Bottom detect, bathymetry filter, beam pattern extraction, normalisation, slant range correction, 1D and 2D filters, mosaic generation.
- Normalisation methods: Range, grazing angle, beam pattern, transducer motion, seafloor slope.
- Classification method: Image based with user defined box sizes for supervised training.
- Input data formats: .jpeg, .bmp, .tif, .png, .tga, .pcx, .psd, .xtf, .mod, .mof, and GeoSwath .swp.
- Output data formats: Data image, classified image and characterised textures as .jpeg,

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GeoAcoustics Ltd is engaged in continuous development of its products, and reserves the right to alter the specifications without further notice

### GeoAcoustics Limited

Shuttleworth Close  
Gapton Hall Industrial Estate  
Great Yarmouth NR31 0NQ  
United Kingdom

Telephone +44 1493 600666  
www.geoacoustics.com  
sales@geoacoustics.com

**GeoAcoustics**  
A KONGSBERG COMPANY