Publications

by

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Category (*)	Scientific papers
GeoScience and climate	**Ultra-shallow seismic and GPR methods applied on sand-covered limestone in northern Jutland, Denmark.** F. Barlach, Near Surface Geophysics, Vol 13, No. 1, February 2015 pp. 83 - 92.
Mathematics, applied mathematics and statistics	**A linear classifier design approach.** F. Barlach, Pattern Recognition, 1991, v:24, n:9, pp:871-877.
Mathematics, applied mathematics and statistics	**Payphone coin validation using pattern recognition.** F. Barlach, Pattern Recognition, 1990, v:23, n:3-4, pp:379-384.

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Abstract: Ultra-shallow seismic and GPR methods applied on sand-covered limestone in northern Jutland, Denmark.

This report gives an analysis and a geophysical interpretation of an ultra-shallow highresolution seismic profile recorded on sand-covered limestone. The interpretations include velocity and structural elements characterising the limestone surface. The seismic profile consists of short-offset gathers with a very limited number of traces and with a shot-point distance along the profile giving presumed equidistant reflection points on the subsurface interfaces. By subsequent band-pass filtering and NMO-correction this field set-up is found to be sufficient to create a detailed image of the immediate subsurface down to 20 m depth on the investigation site. This recording procedure facilitates a considerable increase in profiling speed compared to the denser shot-point recordings normally required to obtain CDP gathers. A small number of additional larger gathers is recorded in order to verify that target reflectors are within the data window and source generated noise is outside. Interval velocities are inferred from a subset of the shot gathers by means of normalised semblance analyses demonstrating that critically refracted signals are not present in the gathers. Two major reflecting interfaces are detected, one in the sand above the limestone and the other the top of the limestone, and a fault in the limestone. In addition, a small depression and possible cracks/karst formations in the limestone surface are visible. Anomalies in the amplitude of a reflector in the sands along the profile can be linked with the cracks/karst formations. Multiples are formed in the sand layers above the limestone, but they can be attenuated by predictive deconvolution. The seismic velocity field indicates progressively higher water content in

the sand layers above the limestone along the profile. Georadar facies descriptions provide additional insight into the more recent geological development on the investigation site. A georadar profile recorded near the limestone fault has penetration depth and resolution high enough to yield a facies model supporting geological interpretations which include the identification of aeolian sands on top of marine beach sand deposits. Furthermore, beach foreland and buried remains of sand dunes can be identified by their structural facets as derived from the georadar interpretations. The top of the marine beach sand is identified on the seismic and the georadar profiles and may be associated with the Littorina Sea bottom in the sand layers above the limestone.

Abstract: A linear classifier design approach.

In this paper we discuss a linear classifier design approach based on an exhaustive search procedure. The pattern classes are projected onto subspaces of the pattern space and bounded by hyperplanes with fixed orientation. A set of such linear discriminators is then submitted to an optimization procedure which displaces the discriminators systematically. The optimization procedure is characterized as a linear exhaustive search which performs an ordering of the set of all possible positions of the discriminators. From this ordered sequence of solutions any particular solution can be chosen. A cost minimization procedure, in terms of classifier complexity, is introduced. The result of the minimization is the necessary and sufficient set of discriminators having the same discriminatory performance as the optimized solution. For multimodal pattern sets, we give a brief discussion of a simple set partition approach. In two examples we show the results of this design approach on synthetic data.

Abstract: Payphone coin validation using pattern recognition.

In this paper we give a classifier design approach, which yields classifiers of high computational efficiency and low memory requirements. The method is based on subdivision of the pattern space by a minimum number of optimized linear inequalities, i.e. the discriminators, into regions containing the pattern classes. The discrimination vectors are selected from the principal axes of each pattern class covariance matrix. We present an optimization procedure for sets of discrete parameter bounds. We briefly discuss the problem of multimodal pattern classes, and the possibility of using suboptimum solutions. The main objective is to design a group of optimum classifiers for payphone coin classification. In two examples we compare our classifier performance with the classification performance derived from fitting normal probability densities to the pattern classes.