

# MULTISCALE MODULUS FILTER BANKS

## METHOD AND APPARATUS FOR PATTERN DETECTION, CLUSTERING AND CLASSIFICATION

### Context

This invention solves pattern detection, clustering, classification and matching problems. It can be applied to images such as digits, faces, textures or any type of objects and structures that undergo deformations, but also for pattern recognition in one-dimensional signals such as audio or medical signals and three dimensional signals such as videos.

A major difficulty for pattern recognition and signal matching is to identify and compensate complex multiscale deformations. The method improves results obtained by state of the art processes.

### Technical description

The invention is a signal processing process which transforms one dimensional signals or images or videos into an invariant spectrum whose modulus are locally invariant to signal deformations and whose phase characterize the deformation. The system is implemented with a filter bank process with complex quadrature band-pass filters, which incorporates complex modulus non-linear processes. The deformation descriptors output by this process are used to measure deformations between signals, which applies to signal registration, optical flow measurements in videos, stereo matching for depth measurements and medical image processing.

### Assets:

Simple, fast and efficient algorithm.

### Maturity level:

The system is ready and implemented.

### Potential markets:

Automatic classification is a widespread problem due to the increase of automatic data acquisition. The potential applications are numerous in all « big data » and « data science » fields.

### KEYWORDS:

Pattern matching detection  
Clustering  
Classification  
Filter-banks

### INTELLECTUAL PROPERTY:

This method is patent protected.

- EP patent application, publication number : EP2577564
- US granted patent, publication number : US8953875

### DESIRED PARTNERSHIP:

Licensing  
Industrial partnership

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