PSI Tools v.1.2

for Microsoft-Windows95

Please follow the instructions in the Help-File, chapter "Ubungsbeispiele" (demo-examples).

Attention: the software is poor and far away to be user friendly.
It was developed for interference experiments only.
It is not sure, that it works on different operating systems.
So it seems, it works only with short directory- and filenames under WindowsXP.

Create a directory near c:, for example c:\temp\psitools

Extract PSI.ZIP using 'save as'.

Start for example with

1) File/load INI-file/ demo1.ini

2) File/load bitmap as virtual generator/ G.BMP

3) Actions/ Picture->Channel

4) Actions/ Channel->Interference integral

you get an time-inverted interference reconstruction of the 'G'.

Next, try:

5) Actions/ Channel->Channel
(be shure, the reverse-time option in the Parameter/ Channel filter-menue has been set)

4) Actions/ Channel->Interference integral

now you get the time-correct projection.

Short Overview

Lot of engineering knowledge is based on integral transformations (FFT, DFT, LT, Wavelets, Convolution, ...). All them can be seen as results of interference between two time functions. The question 1993 was, to ask for the set of restrictions and parameters for the interference of lots of time functions. For example, any pyramidal neuron deals with some thousend synapses and time functions. This created the terms 'Interference network' and 'waves on wires'.

The possibility to get simple analytic solutions for such interference nets is not the best. Thus we developed PSI-Tools, a numerical tool to analyse *simplest* interference circuits, consisting of a *generator* field, some channels (axons) and a *detector* field. PSI-Tools uses only time functions that appears delayed between some points defined by a field velocity.

Because of industrial orientation PSI-Tools was developed for interference *reconstruction* in the form f(t+T) only. That means, **it *back*propagates the timefunctions of generated channels into the detector space**. Thus, if generator- and detector spaces are identical, the

resulting image should approximate the source map of the generator field. After the simulation worked using a genarator field, we replaced the generator by a microphone array. This was the birth date of acoustic photo- and cinematography.

To produce interference *projections* (beamforming, f(t-T)) one know from optical lens systems, it is possible to invert the time functions before reconstruction. In this way it is possible to inspect relations between *mirroring projection systems* and *non-mirroring reconstruction* systems.

In the INI-file one can define channel coordinates, velocity and other properties of the generator field (load bitmap) and the detector field ('save detector as bitmap'). We suppose, generator and detector field have physical coordinates in 3D-space. To make the things simpler to understand, we suppose, the generator and detector space are homogeneous (free wave expansion).

It is possible to define wave sources using pixels with *black* color in the generator field. Define the time function in the INI-file, don`t forget to load the INI-file.

You can place a number of axons (channels) between detector and generator by their co-ordinates. Each channel has start- and end- coordinates at the generator and at the detector field. The axonal delay can be changed in the offset-field, it is by default zero between detector and generator location.

Define velocities for wave movement in the generator and detector spaces. PSI calculates the distances of all interesting points, shifts the time functions with delays and produces the interference images - the wave space, and interference integrals - in optics called "photographs".

For more, read the Help-File PSI.HLP first.
Or have a look to http://www.gfai.de/~heinz

PSI-Tools got a historical dimension.
It was the tool, that allowed the very first (static) acoustic images and films mankind could observe between 1994 and 1996: "Sehen ist Hoeren". In 1997 the term 'Acoustic Photo- and Cinematography' was introduced using PSI-Tools. In the same year a reporter invented the term 'Acoustic Camera' for the worlds first device (before we called it 'acoustic interference measurement place'). And it was the first tool, using a interference reconstruction - resulting in orthogonal, non-distorted images.

Have some fun.

Dr. G. Heinz
GFaI Berlin
Albert-Einstein-Str. 16
D-12489 Berlin
Germany
Tel. +49 30 6392-1652
Fax. -1602
heinz@gfai.de
http://www.gfai.de/~heinz
http://www.acoustic-camera.com