Manual Watermarking program

This interactive program demonstrates some basic aspects of watermarking technology, such as:

- Add a watermark to a picture and check the influence on the visual perception
- Experiment with various parameters that specify a watermark
- Check whether a picture contains a watermark or not
- Manipulate the image content and check how long the watermark 'survives' this treatment

Getting started

Click on the program link to download the program. You need a .bmp image file as starting picture. Choose your own or take the provided image (filename: lenna.bmp).

Start the watermark program by running the executable file. Click Open in the File menu to open a .bmp starting image.

Watermarking options (general)

You can experiment with various watermarking options via the Operations menu. Several options generate new images which are displayed in separate window. Make sure the right window is active when you try next options.

Adding a watermark to an image

Make sure the original picture window is active. Choose Add from the Operations menu to embed a watermark into the starting image.

Specify the watermarking parameters:

- Choose a starting seed (basic pattern of the watermark): 0-8

- Choose the watermarking method:
  - PRL method: a homogeneous watermark that has the same strength throughout the image
  - PRL variable depth: the strength of the watermark is varied over the picture. The watermark is stronger in areas where the picture shows strong local variation, while in more homogeneous areas (where an added watermark is easier perceptible) the embedding depth is smaller.
  - Pitas method: an alternative homogeneous scheme

- For PRL method: choose embedding depth (or: watermark strength): 0-25

- For PRL variable depth method: choose blocksize (an adaptive parameter): 1-9999 (recommended value: 32)

- For PRL variable depth method: choose maximum embedding depth (maximum deviation per pixel): 1-9999

By clicking OK a new picture is generated with the watermark according to the selected specification. A dialog box pops up showing the total energy of the watermark. For both PRL methods the total energy is given, for the Pitas method the average energy per pixel. In the PRL variable depth method, the energy value will be larger in a picture with much content variation than in a more homogeneous image.

Display the generated watermark

Make the original picture (without watermark) window active. Choose Show from the Operations menu to display the watermark pattern belonging to selected specifications.

- Choose the option ‘as black and white image…’ and specify the watermark parameters as described above.

- The option ‘within original picture’ generates a watermark with a homogeneous pattern of which the embedding strength increasing in six steps from top to bottom (vertical) or from left to right (horizontal)

Check the presence of a watermark in an image

Make the right image window active. Choose Check from the Operations menu to detects whether a watermark is present in the image or not.

- For the PRL method and the PRL variable depth method (see Add a watermark to an image (see above)) the area used to search for the watermark must be inserted (value: 1-3). This value is indicative of the search effort of the watermark detection algorithm when synchronization with the embedded watermark is lost. Synchronization loss can for example occur after cropping an image.

- Indicate the false alarm probability (i.e. the chance that a watermark is report while it was not embedded. A higher false alarm probability corresponds to a lower threshold value of the correlation value that is calculated in the detection procedure).

The program returns a list indicating whether each of the 9 watermark patterns (see Add a watermark to an image (see above)) is present or not.

Content manipulation

These options show that watermarks are robust enough to ‘survive’ even strong and multiple signal processing steps.

- To experiment with this, first create an image with a watermark (see Add watermark to an image (see above))

- Next, manipulate the image with one or several of the manipulation tools from the Operations menu: Add Noise, Filter, JPEG compression, Suppress bits, Brightness and Greyscales

- Then check the presence of the watermark again (see Check the presence of a watermark in an image (see above))

- Rotate, Scale and Mirror are manipulation tools which disable watermark detection. More advanced watermarking algorithms than the one presented in this demo are resistant to this kind of attacks. Upon request, the authors of this demonstration program will gladly explain these details.