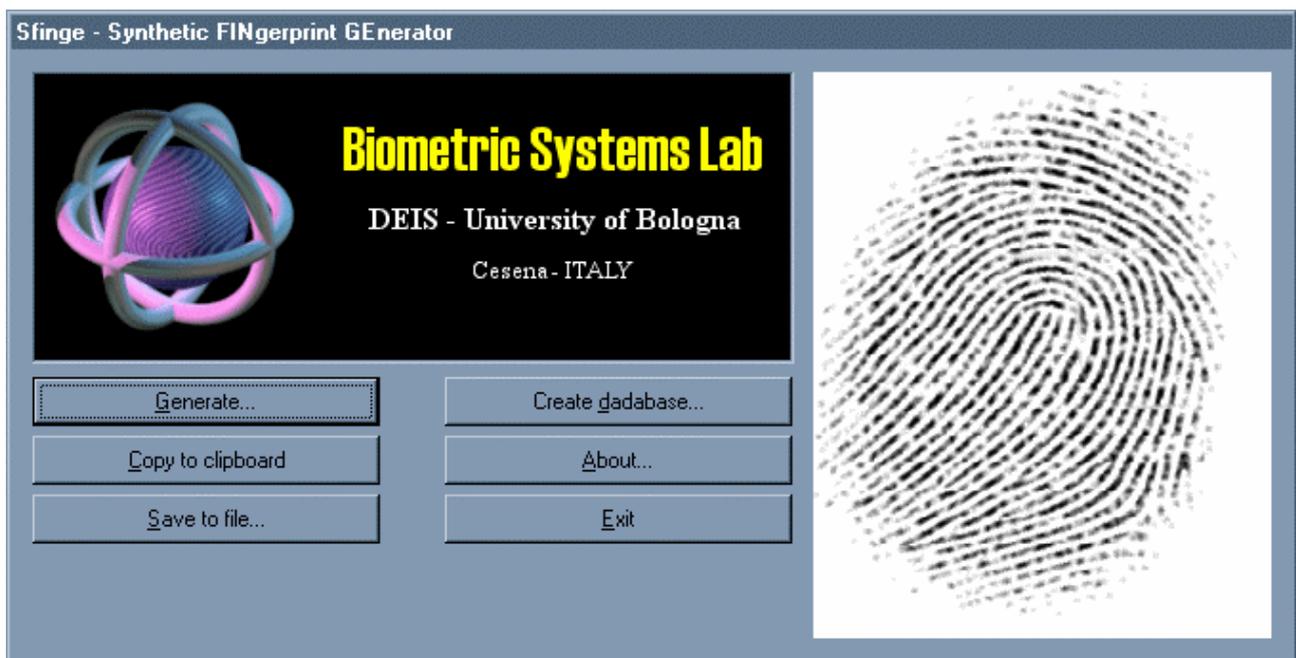


SFinGE v2.0

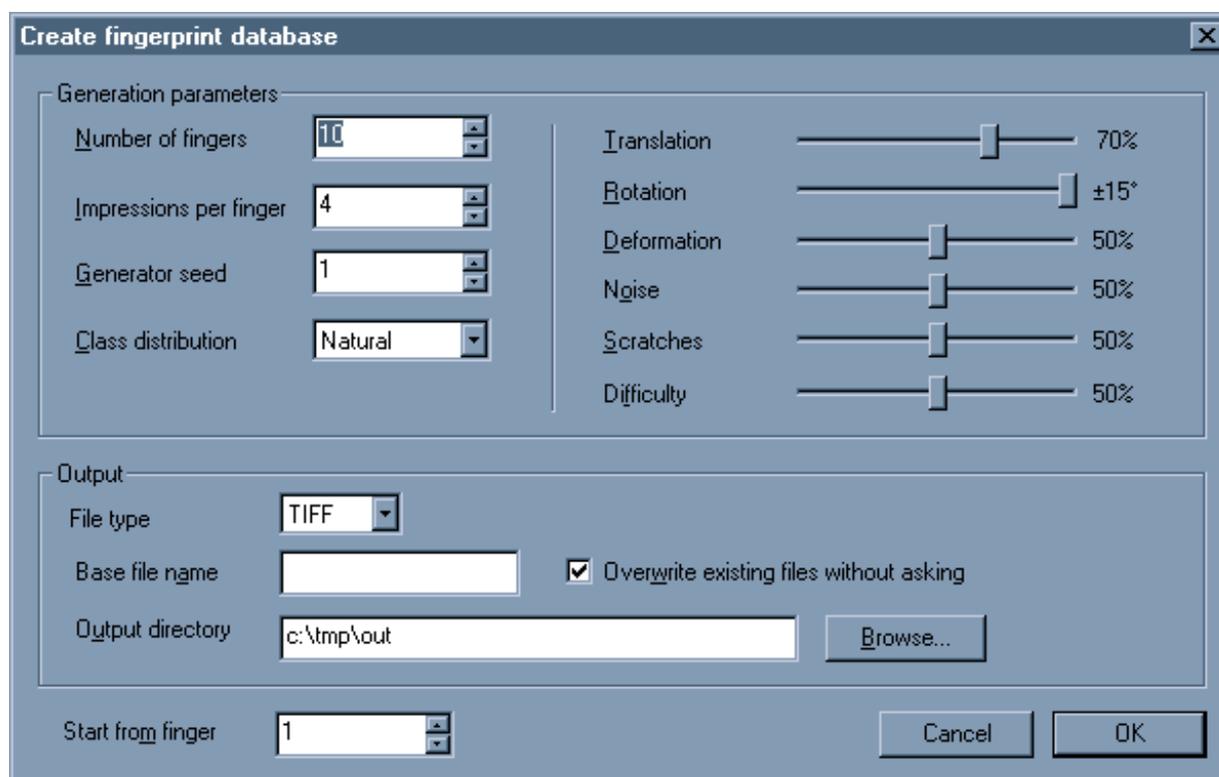
Synthetic Fingerprint Generator



Some notes on the “Fingerprint database generation” module

Create fingerprint database dialog box

This dialog enables you to create a database of synthetic fingerprint images.



Generation parameters options

Number of fingers – The number of “fingers” (1..100000) that will be generated by SFinGe.

Impressions per finger – The number of samples (1..100) of the same finger that will be generated; the total number of generated fingerprints is **Number of fingers**×**Impressions per finger**.

Generator seed – This parameter let you to specify the initial seed for the random selection of a set of fingerprint seeds. In fact, a different seed is chosen by SFinGe for each fingerprint to be generated within a single database. Different fingerprint databases are generated for different values of this parameter.

Class distribution – Specifies if the fingerprints will be generated according to a *uniform* distribution of the five classes (Arch, Tented arch, Left loop, Right loop and Whorl) or according to a *natural* distribution (A=3.7%, T=2.9%, L=33.8%, R=31.7%, W=27.9%).

Translation – The maximum amount of translation of the generated fingerprints: the parameter is expressed as a percentage value between zero and the maximum translation allowed by SFinGe.

Rotation – The maximum amount of rotation of the generated fingerprints.

Deformation – The maximum amount of fingerprint distortion: the parameter is expressed as a percentage value between zero and the maximum distortion allowed by SFinGe.

Noise – The maximum amount of noise in the generated fingerprints: the parameter is expressed as a percentage value between zero and the maximum noise allowed by SFinGe.

Scratches – The maximum amount of “scratches” in the generated fingerprints: the parameter is expressed as a percentage value between zero and the maximum value allowed by SFinGe.

Difficulty – This parameter controls the overall level of “diversity” that can be introduced among impressions of the same finger, that is the intra-class variability among impressions of the same finger.

Output options

File type – Specifies the output file format (Windows bitmap or Tiff).

Base file name – The file name of the generated fingerprint images will be: <Base file name>*n_m*.tif[bmp], where *n* is the fingerprint number and *m* the number of samples of the same finger.

Output directory – The absolute path of the directory where the fingerprint images will be saved.

Browse... – You can use this button to select the **Output directory**.

Overwrite existing files without asking – If checked, SFinGe will overwrite any file with the same pathname of the generated fingerprint images.

Other options

Start from finger – Allows to generate the fingerprint database starting from any finger number; this option may be useful to resume a previously interrupted database generation, or to extend an existing database, without regenerating it from scratch.

Log files

SFinGe creates a log file (<Output directory>\<Base file name>_ LOG.txt) which contains many details of the generated database. In the first part of the log file all the parameter values selected in the *Create fingerprint database* dialog box are reported.

```
10/26/00 12:13:17 --> SFINGE DB Generation -- Engine Version 2.0
  WORK_BMP: 384x504
  DIRMAT: 32x42 (grid: 12,12)
  SENSOR: 240x320
-->Database Generation Parameters<--
  Num fingers: 1000
  Num impressions: 4
  Generator seed: 1
  Class distribution: Natural
  Translation: 70
  Rotation: 15
  Deformation: 50
  Noise: 50
  Scratches: 50
  Difficulty: 50
```

In the rest of the log file, for each generated fingerprint, the corresponding random seed and all the intermediate parameters selected by the algorithm are reported.

```
Finger 1 - FingerSeed 3671432
  Class R
  Mask 133,96,210,116
  RidgeWidth 7.56545 ProbSeedPoints 0.00010
  PermScratches 19
  SkinTrasl (-17..17,-7..7)
  Pressure (-3..-2)
  Deform (Rot: -5..5, Tr: -6..6,-9..9, k= 1.60000)
  ProbNoise ( 0.10945.. 0.14192) Scratches (11..20)
  NumSmooth 1 SmoothType 0
  Trasl (-9..9,-9..9) Rot (-15..15)
  AdjContr (124..138)
```

Execution times

As to the execution times, the synthetic fingerprint generation procedure can be divided into two steps:

1. Creation of the “master” fingerprint image
2. Generation of each “sample” (or “impression”) from the master fingerprint

The average time taken by the above operations on an Intel Celeron™ 400Mhz PC is:

1. 11.5 seconds for the creation of the “master” fingerprint image
2. 4.9 seconds for the generation of each fingerprint “sample”

This means that, for instance, the time needed for the generation of a 1000x8 database (1000 fingers wide and 8 impressions per finger deep), is $11.5 \times 1000 + 4.9 \times 8000 = 50700$ seconds \cong 14 hours.