

Solved Problems

Why another fingerprint classifier

Poisoned waterholes

- OCR
- Postal address
- Signature verification
- Speech recognition

Solved Problems

- Fingerprint recognition
- Iris recognition
- ATR target recognition
- Search
- Machine Translation
- Simple Natural Language
- Compilers for modern language features

Iris Recognition

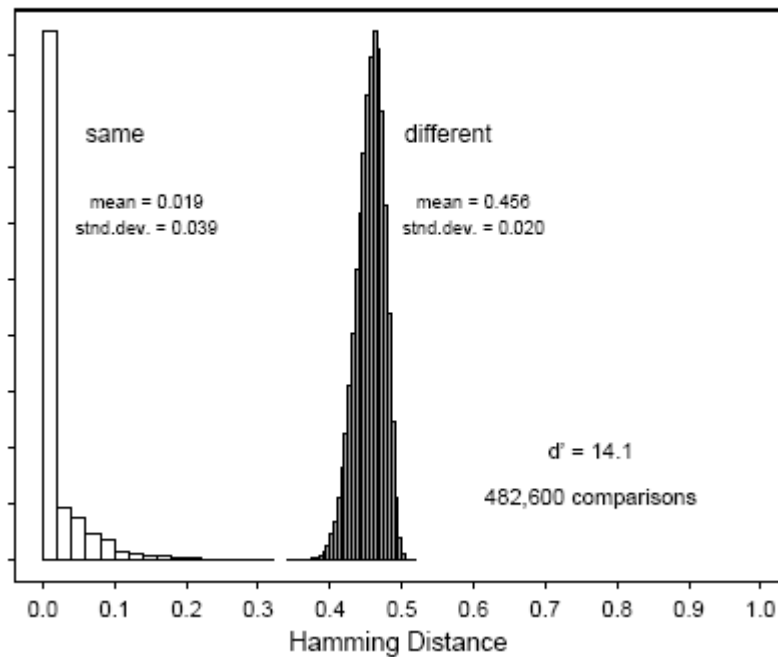
- Pupil and Iris not necessarily concentric
- Wavelet phase-quadrant multiscale coding
- 2048 bits, 256 bytes; 2048 bits masking
- Only phase is used, not amplitude;
- AND mask1 mask2
- XOR instance template

Iris Recognition

- Test of independence;
- If match, test fails;
- ~ 244 binomial
- Fractional Hamming Distance
- 32 bit chunks, 100,000 irises per sec
- All rotations; prob of no match
- 0 FAR; 0 FRR;

Iris Recognition

Decision Environment for Iris Recognition: Ideal Imaging



Solved Problem

There is a popular misconception in the pattern recognition academic community that automatic fingerprint recognition is a fully solved problem.

Evaluation

- Feasibility
- Operation
user acceptance, durability, ease of data acquisition, stability of data,
- Verification
- Identification

Fundamentals

- Experts show error rate .8%
- Individuality established
- Twins only slightly less discriminable;

Information Available

- Minutae
- Ridge orientation, local, global
- Singularities
- Multispectral, subsurface features
- Palm prints: lines, wrinkles
- Hand and finger geometry
lengths, widths, ratios

Variation

- Orientation, deformation, smudging;
- Dry or wet contact;
- Mapping 3d surface onto 2d;
- Age, dry skin, skin damage;
- Altered prints
- Non-cooperative subjects; partial prints

Attacks

- 2d images
- 3d molds, gummy finger
- Latent images;
breathing on reader can reactive last latent
pressing on latent image;
- Iris: photo with hole cut for pupil

Strange

- FCV2004 best EER 2.07 averaged over 4 databases.
- FAR<1%, half systems FRR<10%;
- Strange: correlation among best performing algorithms is very low; they tend to make different errors; combining at score level dropped EER for DB3 from 1.18 to .28

Signature Verification

- Behavioral: changes over time;
- Updating is natural;
- Many attacks;

Signature Verification

- FCV2004 online
15 teams; 6 identified; no companies
9 chose anonymous
'skilled forgeries'
- best team EER 2.84 task 1;
EER 2.89 task 2

Signature Recognition

- Another evaluation shows little difference between online and offline

Signature Recognition

- Human Performance

Expert .5% FAR, 7% FRR

Non-expert 6.5% FAR, 26% FRR;

OCR, ICR, handwriting

- Digit strings: about 4% reject, .5% error rate on strings length 5
- Captiva
 - handprint numeric only 94%-96%
 - handprint alpha only 78%-88%
 - handprint alpha-numeric 65%-75%
- USPS 03: 80% handwritten letters finalized

OCR

- the character accuracy of unique non-stopwords for first and second-generation copies, is between 99.44% and 99.27%.
ISRI DOE evaluations;

Read-Ink

- Multi-lingual,
- OCR, handprint, unconstrained handwriting
- Online, offline
- Multiwriter

Read-Ink

- Current performance: online system approx 5% error handwriting, a few writers w/o lexicon
- Goal: 1% error, 99% two nines; w/o lexicon offline