SPP-ICS

KryPict

A software environment for copyrighting, authenticating, archiving and retrieving pictorial documents in multimedia databases

J. O'Ruanaidh, C. Rauber, J.-F. Buisson,
T. Pun (project leader), Univ. of Geneva

A. Herrigel, A. Perrig, D. Som, r^3 Security Eng.

P. Tschudin, R. Gschwind, Basler Papiermuseum

October 1997

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1. KryPict: Project goals

Context: distribution of documents over Internet.

Goal: development of copyright enforcement and authentication methods for image databases, based on image watermarking methods.

Tasks:

- 1) database: image and text collection of historical documents (UniGe, Paper Museum);
- 2) digital watermarks: invisible signatures resistant to image modification (UniGe, r^3);
- 3) secure copyright protection environ.: registration of legal ownership proof (r^3, UniGe).

End-users:

- Basel Paper Museum;
- information providers;
- content providers: digital libraries, publishers, news agencies, etc.;
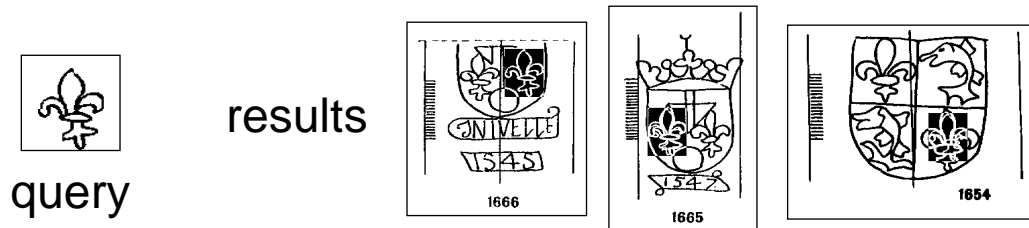- copyright offices and intellectual property agencies.

Objectives and milestones were met.

Proposed continuation, tasks 2) and 3): KryPict2.

2. Summary of achievements

2.1 Pictorial database

Content-based image retrieval system of fragile historical documents (ancient watermarks):

query   results

Current status:

- client-server architecture;
- client access through WWW interface;
- server:
    - Illustra database (over 4'000 documents);
    - retrieval engines;
- retrieval:
    - textual queries;
    - global features;
    - shape characteristics;
- end-user evaluation.

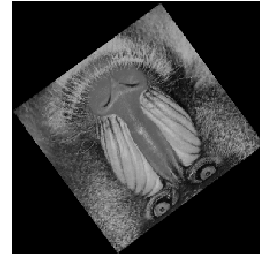Possible continuation as an independant European project.

2.2 Digital watermarks

Insertion of hidden signatures in images (grey-level, color), resistant to various types of processing:
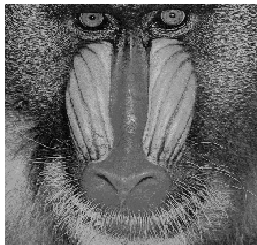
original

rotated,
scaled,
marked

Principles:

- information hiding: perceptually adaptive spread spectrum;
- resistance to distortion: Fourier space, log-polar mapping.

Current status:

- watermark perceptually invisible;
- watermark resistant to e.g.:
    - photometric transformations, scanning;
    - geometric transformations: cropping, translation, rotation, scaling;
    - JPEG compression (5%);
- public and private watermak;
- oblivious watermarking;
- European patent application.

Proposed continuation: KryPict 2.

2.3   Security architecture

Secure copyright protection environment, allowing to obtain and securely register watermarks over Internet (legal binding of copyrights).

Identified parties:
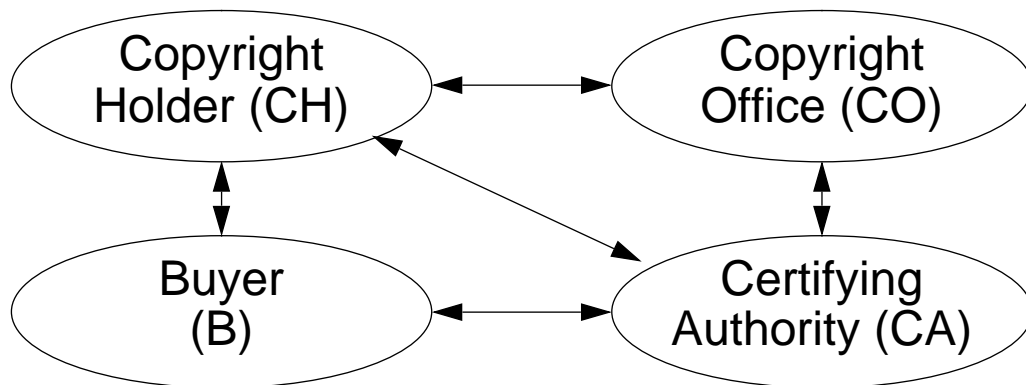
Status:

- comprehensive threat analysis;
- registration by cryptographic techniques;
- secure copyright transmission protocols btw. Copyright Holder and Copyright Office;
- persistent copyright registration and storage at the Copyright Office;
- Java-based prototype, integrating the watermarking engine.

Proposed continuation: KryPict 2.

3. <u>Technology transfer</u>

Academic:

- articles;
- courses;
- diploma (eg. with EPFL, Prof. A. Schipper).

European patent.

Demonstrator.

Commercial:

- business plan;
- market analysis:
    - content providers: digital libraries, pu-
      blishers, museums, news agencies;
    - copyright & intellectual property agencies;
    - Internet providers;
- direct contacts with potential end-users.

4. KryPict 2

4.1 Goals of the project continuation

Goals:

- digital document watermarking algorithms:
    - invariant perceptually adaptive spread spectrum watermarking;
    - distance-based document authentication;
    - binary images watermarking;
- copyright protection environment:
    - different public key schemes;
    - X500 distributed database for CH, CO, B;
    - Web crawler to detect copyright violations;
    - secure payment protocols.

Deliverables:

- basic algorithms;
- complete security architecture for legal binding of copyrights.

Remarks:

- fast moving technology;
- hard scientific research;
- pursue R&D to remain competitive.

Need to move fast $\rightarrow$ (slight) budget increase.

4.2 Subtasks and calendar

(A) Document watermarking algorithms (UniGe):

(A.1) Invariant watermarking and authentication
(A.2) Multi-dim. spread-spectrum techniques
(A.3) Watermarking of binary documents
(A.4) Evaluation
(A.5) Audio and video
(A.6) MPEG-7
(A.7) Integration

(B) Copyright protection environment (r^3):

(B.1) X500 distributed DB with Web gateway
(B.2) Security architecture
(B.3) Transactional, persistent, fault tolerant CO
(B.4) Extensions: Web crawler, payment
(B.5) Integration

Planning (task (A), 42 MM; task (B), 21 MM):

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Subtask      Month (1..21)
             1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21
--------------------------------|---------------------------------------
(A): responsible: G;            |
(A.1)        G  G  G  G  G  G  G  G  G
(A.2)                                 G  G  G  G  G  G
(A.3)        g  g  g  g  g  g  g  g  g  g  g  g  g  g  g  g  g  g  g
(A.4)                          Gg Gg                          Gg Gg
(A.5)                                          G  G  G  G  G  G
(A.6)                                          GR GR GR GR GR GR
(A.7)                                                      g  g  g
   "                                                      m  m  m  m  m
--------------------------------|---------------------------------------
(B): responsible: R;            |
(B.1)        R  R  R  R  R  R  R  R
(B.2)                              R  R  R  R  R  R
(B.3)                                       R  R  R  R
(B.4)                                             R  R  R  R
(B.5)                                             GR GR GR
   "                                              m  m  m  m  m
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5. References

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Patent application:

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