SPP-ICS

KryPict

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

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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- 1) database: image and text collection of historical documents (UniGe, Paper Museum);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, r³);
- 3) secure copyright protection environ.: registration of legal ownership proof (r³, 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Content-based image retrieval system of fragile historical documents (ancient watermarks):

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:

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 watermark;
• 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. **Technology transfer**

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

European patent.

**Demonstrator.**

**Commercial:**
- business plan;
- market analysis:
  - content providers: digital libraries, publishers, 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 → (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 (r³):
(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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5. References

Articles, reports, diploma work:


Patent application: