WP3 "INFRASTRUCTURE FOR PAPER EXPERTISE"
Jan C.A. van der Lubbe

Bernstein Meeting, Vienna, February 17, 2009
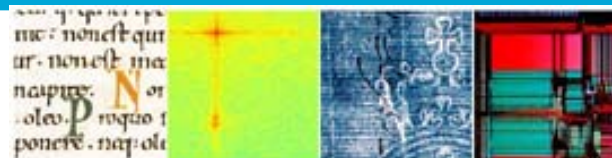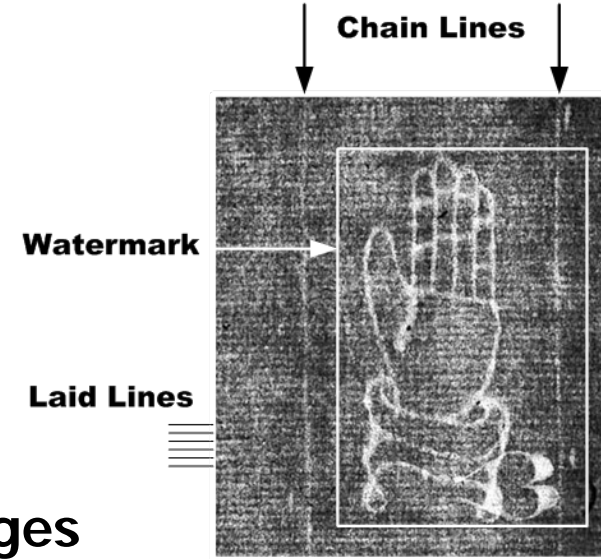
Image Processing Tasks
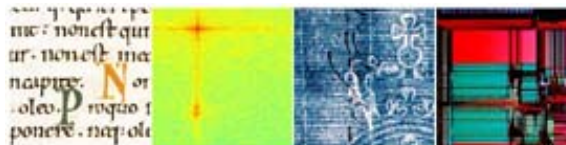## Vienna, January 17, 2007

Chain Lines

Watermark

Laid Lines

- **Sieve Feature Measurements in Binary Images**

- **Sieve Feature Measurements in Grayscale Images**

- **Sieve Feature Segmentation in Grayscale Images**

- **Watermark Imaging by Backlight Subtraction**

- **Identical Watermarks Identification**
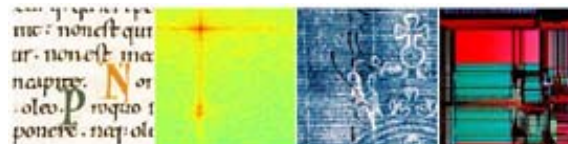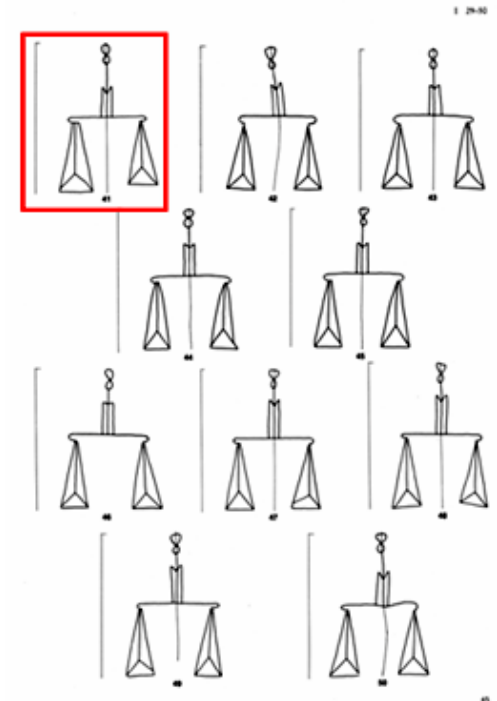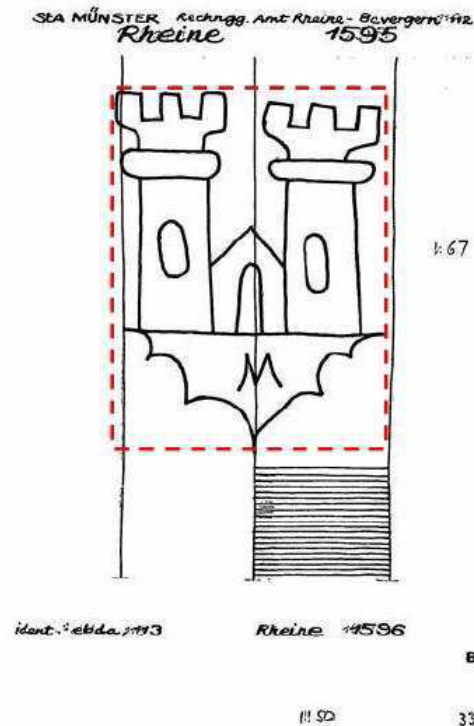
$[I, C)^T$

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Sieve Feature Measurements in Binary Images

Software to isolate watermarks from the Piccard Online database and the printed Piccard collection
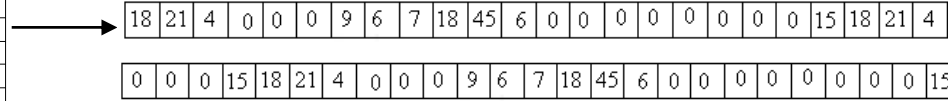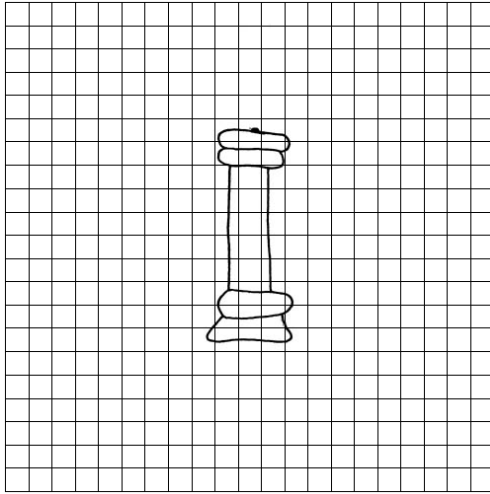
Performance 80% resp. 85%

Images will be used to automatically measure watermarks height and width.

They will also be used to identify identical watermarks within both collections.

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Identical Watermarks Identification 1
Printed Piccard vs. Piccard Online

| 18 | 21 | 4 | 0 | 0 | 0 | 9 | 6 | 7 | 18 | 45 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 18 | 21 | 4 |

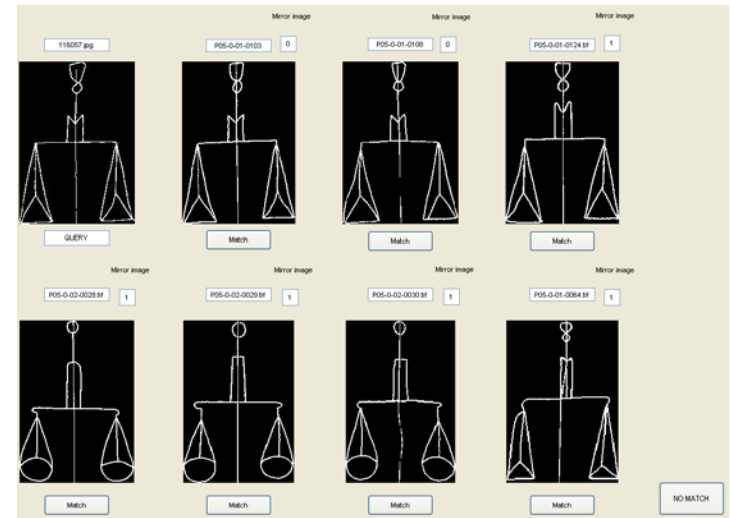| 0 | 0 | 0 | 15 | 18 | 21 | 4 | 0 | 0 | 0 | 9 | 6 | 7 | 18 | 45 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |

Compute vector

Compute Euclidean distance with the vectors of the database

Output: the first seven most similar watermarks to the query.

Performance: 90%.

In the 62% of the cases the identical watermark occupies the first place.
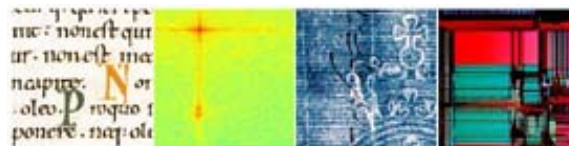
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Sieve Feature Segmentation and Measurements in Grayscale Images 1

Software to segment chain and laid lines from X-ray and backlight images.
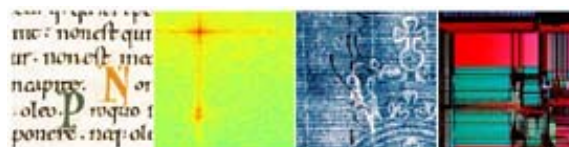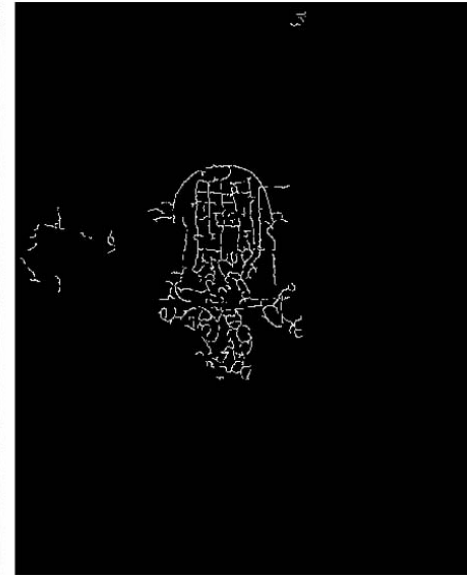
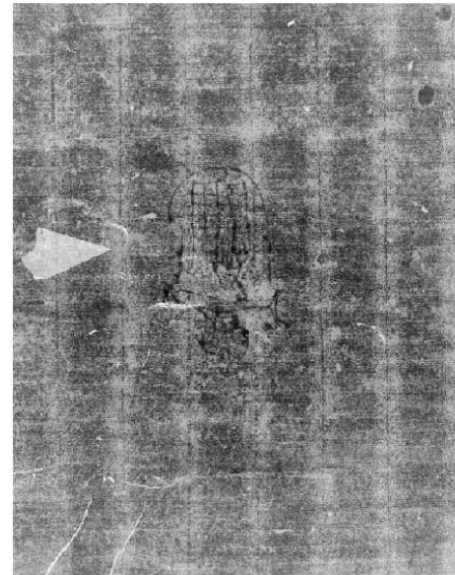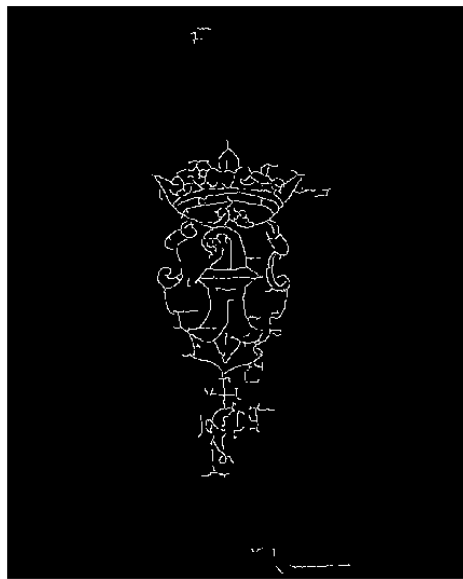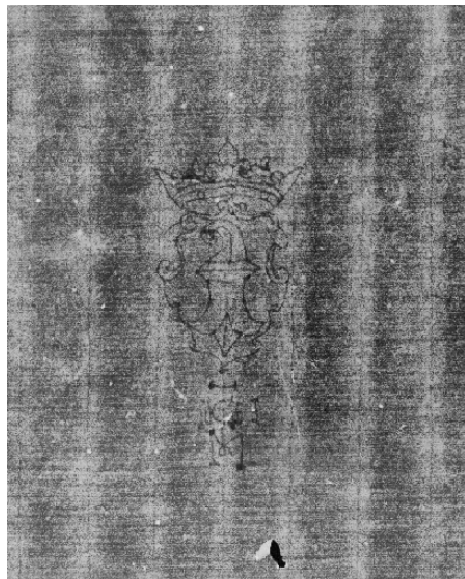Measurements: laid lines density, chain lines distances

Identify identical pieces of paper based on chain and laid lines information. Demo version at:
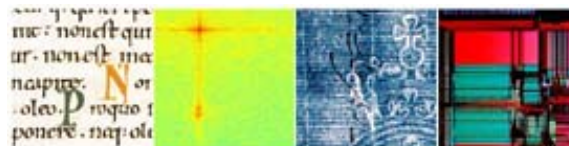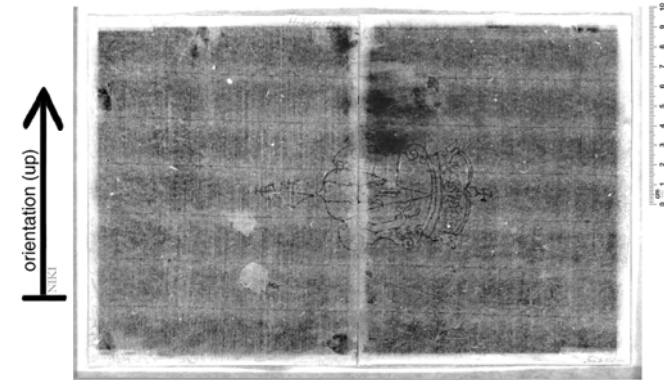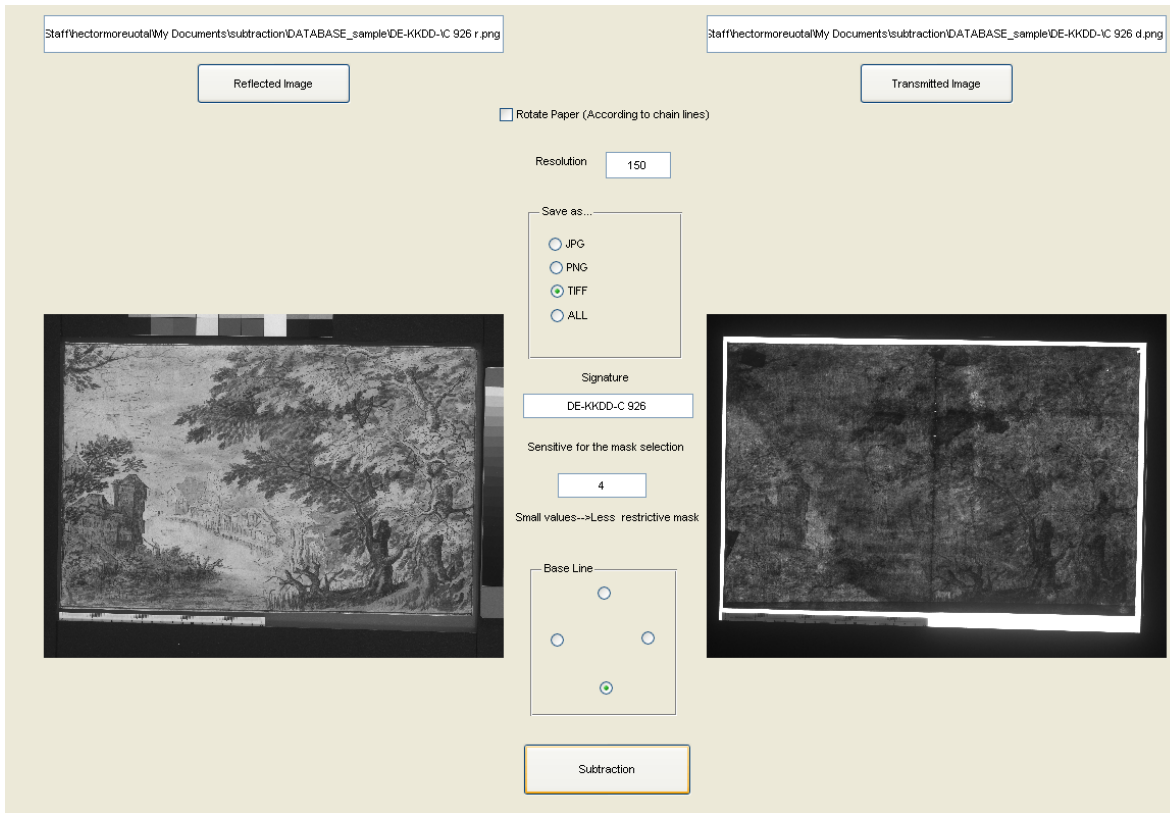http://rembrandt.ewi.tudelft.nl/

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Sieve Feature Segmentation
and Measurements in Grayscale Images 2

Software to extract watermarks (semi)automatically

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Watermark Imaging by Backlight Subtraction

Software for subtraction of back- and frontlight imagery.


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present and near-future work

- **improvement of automatic watermark detection in binary images**

- <u>**semi-automatic watermark detection in grayscale images**</u>

- **advanced matching techniques**

Bernstein Meeting, Stuttgart, July 1-2, 2008

- **position of watermarks wrt chain lines**

- **detection of chain lines in watermarks in order to separate them from the watermark**

- <u>**comparison of watermarks, similarity measurements**</u>
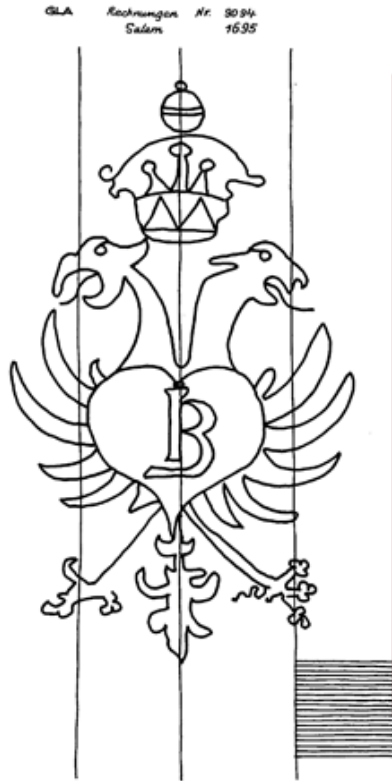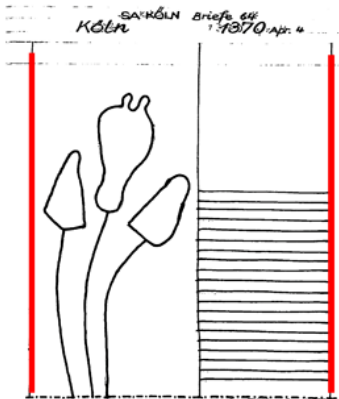
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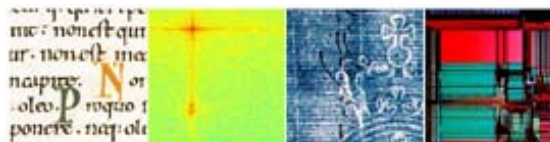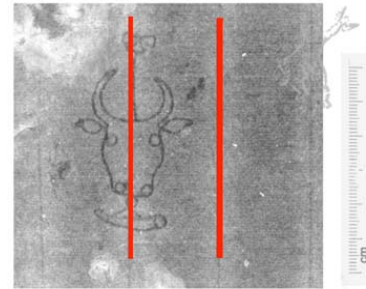
chain line distance measurements 1
1st Bernstein usability report by NIKI, November 2008

WZMA

NIKI

WILC

POL
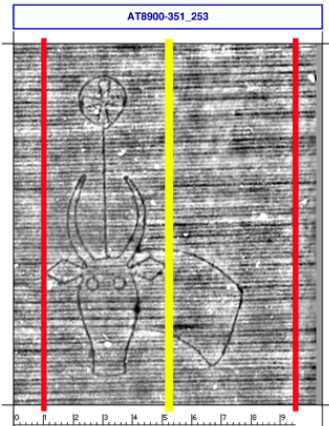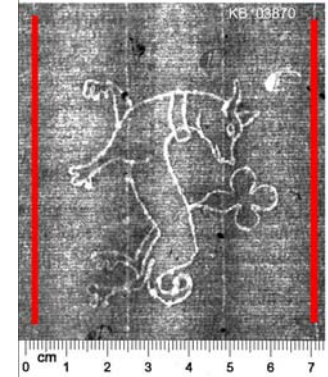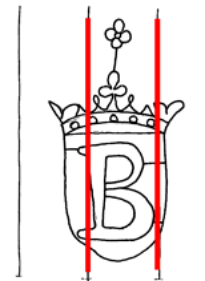
At least 4 different methods….

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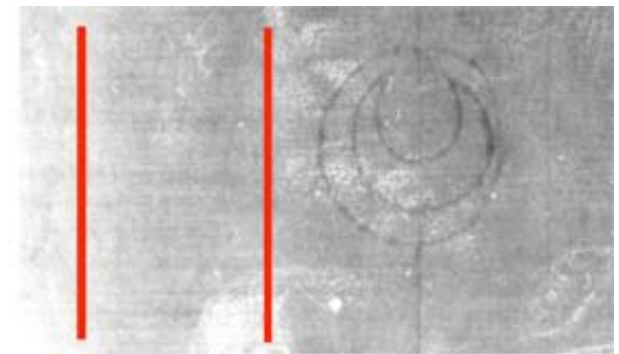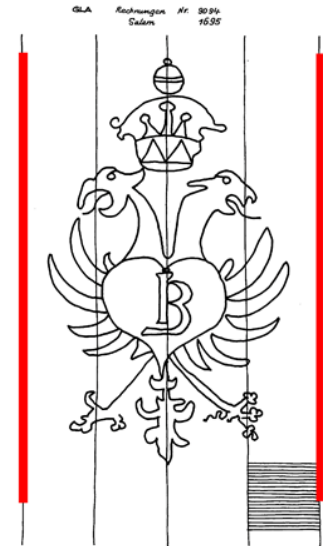
Software for automatic re-measurement?

Which measurements:

- enclosing chain lines?

- average chain line distance?

- chain lines through watermark

- ….?

Unambiguous, uniform description

is required!

IT-GDSU 522 E

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Software (MatIab)

- Picard Online isolation tool
- Printed Picard isolation tool
- Watermark identification within Printed Picard and Picard Online
- Chain line distances and Laid line density measurement tool
- Automatic watermark detection software
- Manual watermark detection tool
- Backlight subtraction tool
- Paper identification based on chain and laid lines

Discussion: downloadable versus not-downloadable

Matlab-dependent versus Matlab-independent

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