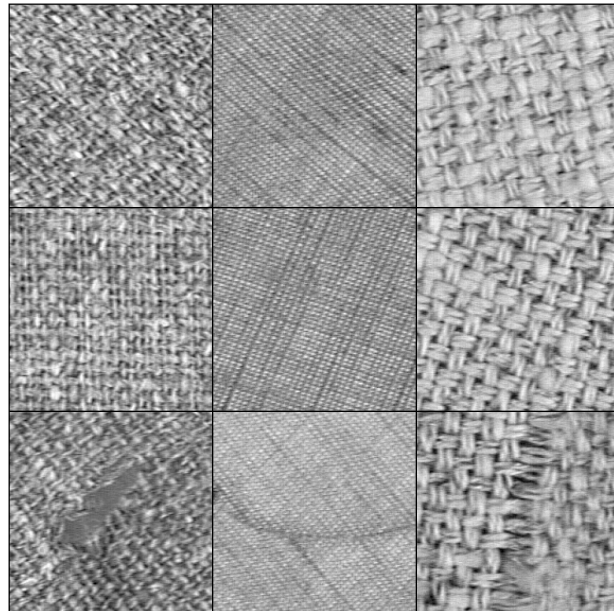


Anwendungen: Invarianten über Gruppenmittel

- Sichtprüfungsaufgaben (Textilien)
- Bildsuchmaschinen (query by example)
SIMBA und MICHELSCOPE
- Automatische Klassifikation von
Blütenpollen

Visual inspection of textiles with anisotropic texture

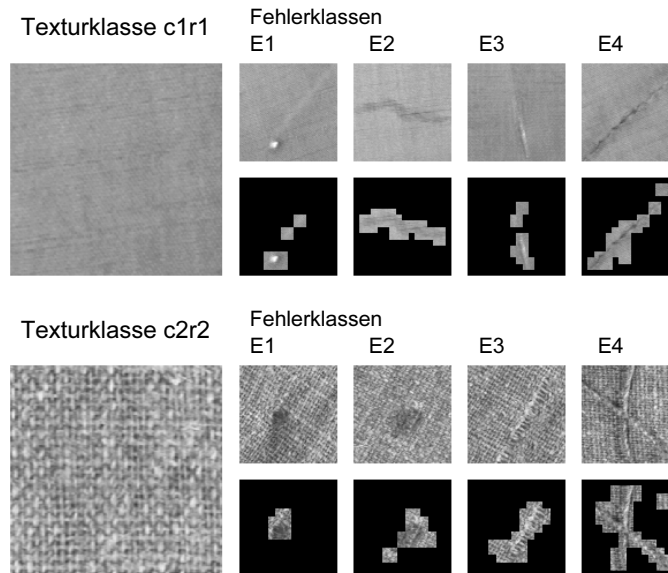


Textildatenbank TILDA

<http://www.informatik.uni-freiburg.de/~lmb/tilda> (ca. 3200 images)

Texturdefektdetektion bei Textilstoffen

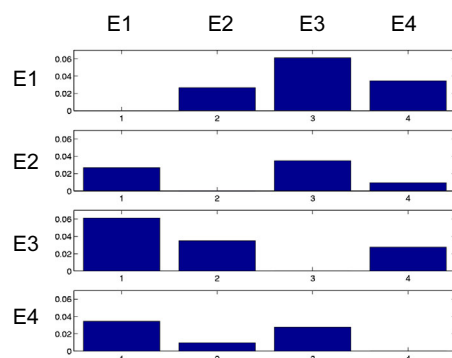
Segmentierung der Defekte



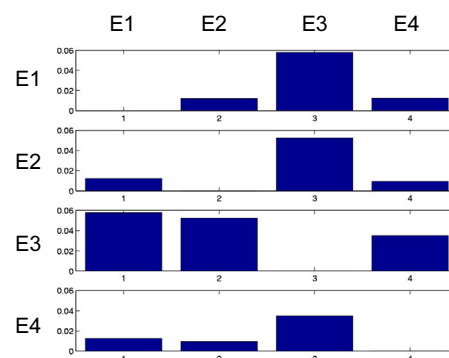
Texturdefektdetektion bei Textilstoffen

Diskriminierung der Defektklassen

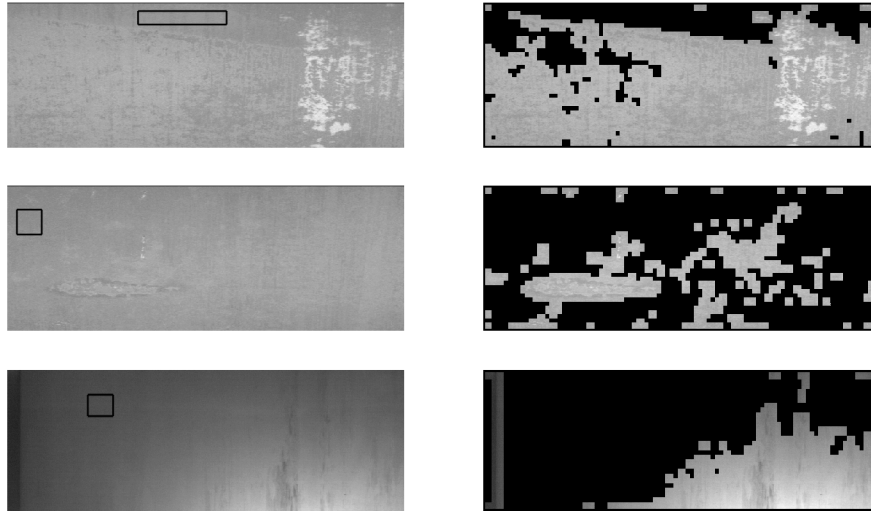
Klassendistanzen Texturklasse c1r1



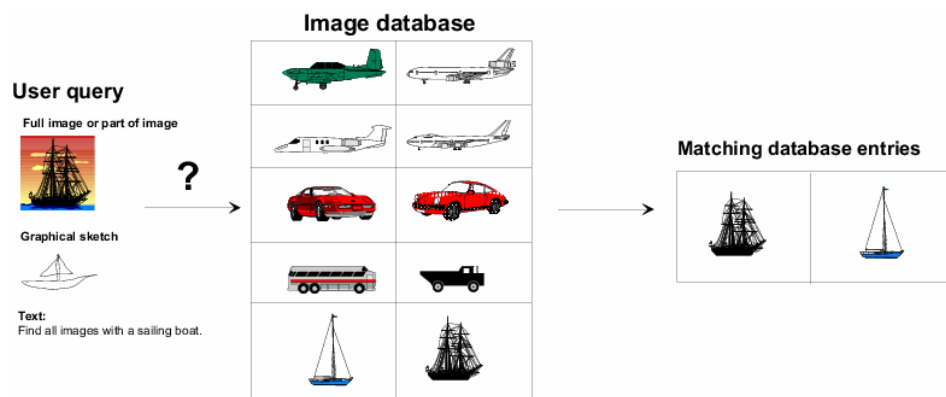
Klassendistanzen Texturklasse c2r2



Texturdefektdetektion auf Stahloberflächen Segmentierung der Defekte



Content based image retrieval



<http://lmb.informatik.uni-freiburg.de/SIMBA/>



Query image



0.978



0.828



0.792



0.686



0.674



0.649



0.630



0.595



Query image



0.98



0.82



0.81



0.79



0.78



0.78



0.77



0.76



Query image



0.99



0.79



0.77



0.68



0.68



0.66



0.66



0.66



Query image



0.98



0.82



0.79



0.77



0.74



0.73



0.71



0.71



Query image



0.98



0.79



0.77



0.68



0.68



0.65



0.65



0.63



Query image



0.98



0.80



0.78



0.74



0.70



0.60



0.59



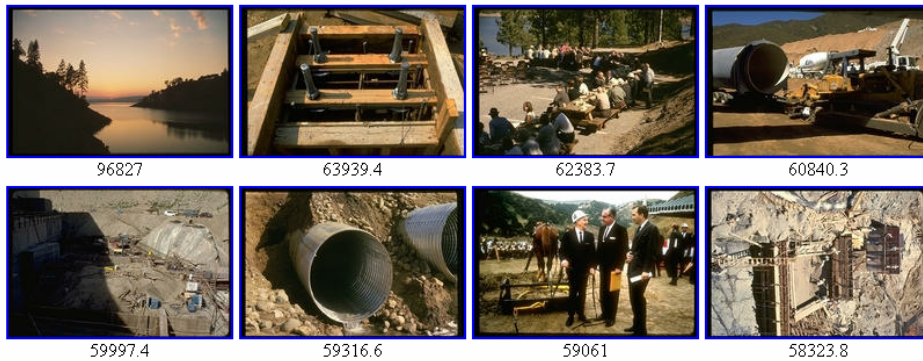
0.57

SIMBA – Search IMages By Appearance

COLOR only



Search template



96827

63939.4

62383.7

60840.3

59997.4

59316.6

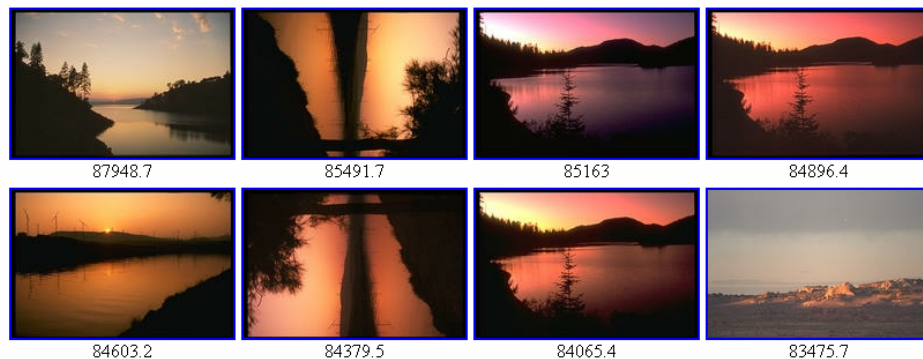
59061

58323.8

SIMBA – Search IMages By Appearance



Search template



87948.7

85491.7

85163

84896.4

84603.2

84379.5

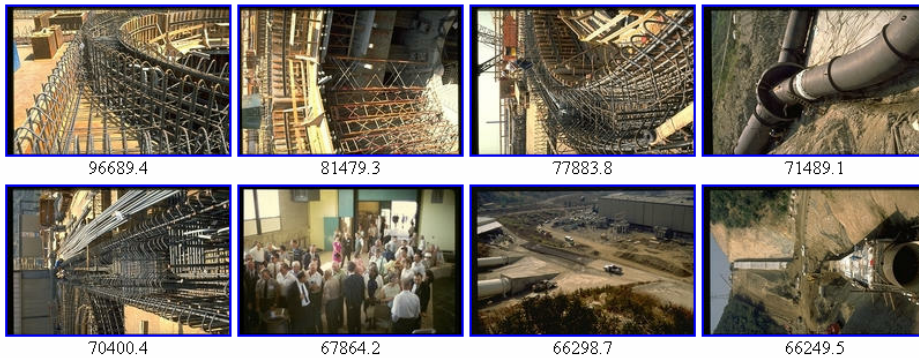
84065.4

83475.7

SIMBA – Search IMages By Appearance



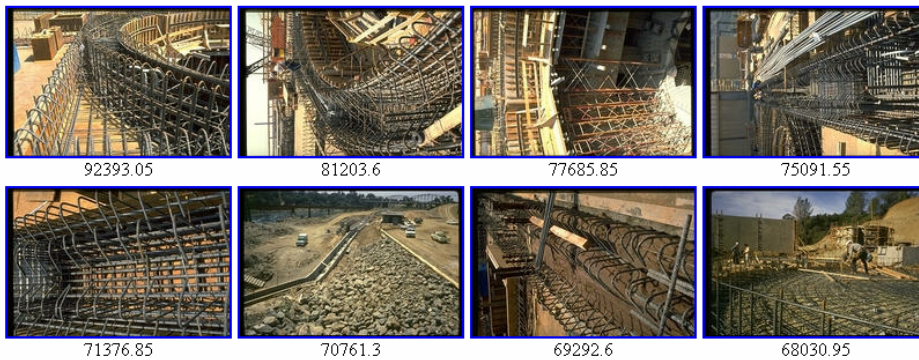
Search template



SIMBA – Search IMages By Appearance



Search template

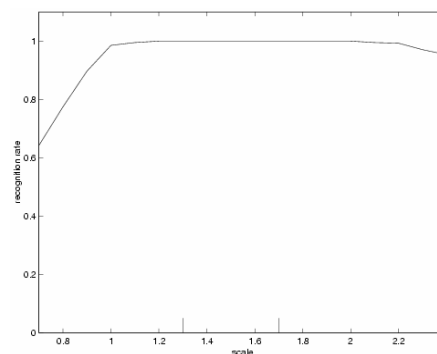


Experiments



Robustness to scaling

- Database as before, grayvalue features only
- Kernels $\mathbf{M}(1,0)\mathbf{M}(0,2)$, $\mathbf{M}(2,0)\mathbf{M}(0,4)$
- Images reduced/zoomed (bilinear interpolation) to scales from 0.7 to 2.4
- Database contains scales 1.3 and 1.7 only



→ Good recognition from scale 1 to 2.2, i.e. scale 4.8 in area

Suchbild



Suchmethode

Farbe Textur

Motiv

Größe

Seitenverhältnis

Datenbank

BRD

Suche starten

Ergebnisse

 Brd0644	 Brd0638	 Brd0732	 Brd0689
 Brd0729	 Brd0636	 Brd0727	 Brd0637
 Brd0645	 Brd0640	 Brd0642	 Brd0635
 Brd0691	 Brd0730	 Brd0639	 Brd0643

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Suchbild



Suchmethode

Farbe Textur

Motiv

Größe

Seitenverhältnis

Datenbank

BRD

Suche starten

Ergebnisse

 Brd0644	 Brd0637	 Brd0689	 Brd0636
 Brd1138	 Brd0489	 Brd0727	 Brd0502
 Brd0494	 Brd0854	 Brd0193	 Brd0492
 Brd0191	 Brd0635	 Brd0168	 Brd0857

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Suchbild



Suchmethode

Farbe Textur

Motiv

Größe

Seitenverhältnis

Datenbank

BRD

Suche starten

Ergebnisse

 Brd0523	 Brd0485	 Brd0538	 Brd0232
 Brd0408	 Brd0409	 Brd0486	 Brd0447
 Brd0540	 Brd0164	 Brd0449	 Brd0266
 Brd0386	 Brd0173	 Brd1610	 Brd0487


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MICHEL Philaskop _ _ _ x

Datei Einstellungen Hilfe

📁 📄 🔍 🔄

Suchbild



Suchmethode

Farbe Textur

Motiv

Größe

















Seitenverhältnis

Datenbank

BRD

Suche starten


Ergebnisse

 Brd1361	 Brd1363	 Brd1360	 Brd1362
 Brd0815	 Brd0840	 Brd1803	 Brd0968
 Brd1033	 Brd1382	 Brd0936	 Brd1815
 Brd0817	 Brd0896	 Brd1655	 Brd1285

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MICHEL Philaskop
Datei Einstellungen Hilfe

Suchbild



Suchmethode














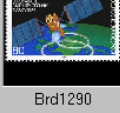


Farbe Textur

Motiv
 Größe
 Seitenverhältnis

Datenbank
BRD

Suche starten

Ergebnisse

 Brd1362	 Brd1361	 Brd1360	 Brd1363
 Brd0815	 Brd1285	 Brd1503	 Brd1430
 Brd1655	 Brd1816	 Brd1815	 Brd0816
 Brd0737	 Brd1290	 Brd0936	 Brd1103

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Suchbild



Suchmethode

Farbe Textur

Motiv
 Größe
 Seitenverhältnis

Datenbank
BRD

Suche starten

Ergebnisse

 Brd0700	 Brd0694	 Brd0697	 Brd0773
 Brd0703	 Brd0702	 Brd0698	 Brd0696
 Brd0701	 Brd1623	 Brd1140	 Brd0695
 Brd1379	 Brd1137	 Brd0699	 Brd1038

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Automated Pollen Recognition in Air Samples by Digital Microscopy

O. Ronneberger, U. Heimann, V. Dietze, E. Schultz

- ▶ **Motivation**
 - Time-consuming, but still inaccurate visual pollen counting
- ▶ **Demand**
 - Reliable pollen data for pollen forecast
- ▶ **Approach**
 - 3D fluorescence imaging (tomography) instead of 2D conventional translucent microscopy
 - Image recognition based on general »grey scale invariants«, instead of traditional object specific features
- ▶ **First results** (see table on the right)
 - »Grey scale invariants« have characteristic shapes for different pollen species
 - Recognition rate of 82% already in a first run
- ▶ **Outlook**
 - Employment of digital microscopy for automated particle analysis in general.

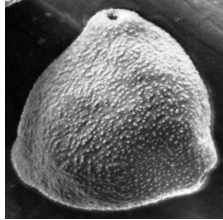
Pollen species	Grey Scale Invariants	No.	Misclassifications
Maple		5	1 (1) → Goose.
Birch		8	3 (1) → Alder (3) → Alder (1) → Alder
Yew		2	-
Alder		10	2 (1) → Birch (1) → Birch
Goosefoot		7	-
Hornbeam		2	-
Hazel		10	2 (1) → Goose. (1) → Alder.

Collaborating institutions:

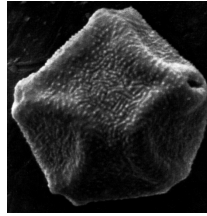
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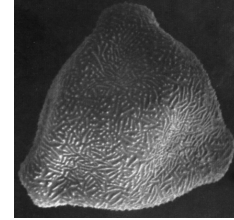
Pollen examples



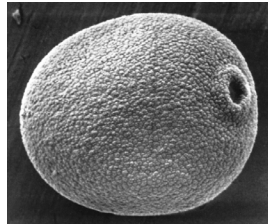
Hasel



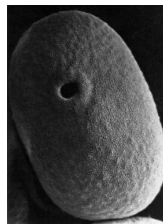
Erle



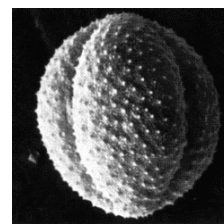
Birke



Gräser



Roggen



Beifuß

+ 33 further species (not relevant for allergies)