



## AUSBILDUNG für INDUSTRIELLE BILDVERARBEITUNG - Skizze für tertiären Bereich

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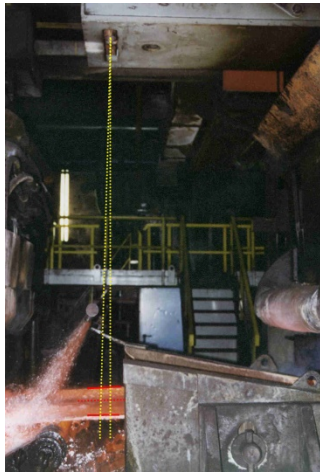
[kurt.niel@fh-wels.at](mailto:kurt.niel@fh-wels.at)

@MachVisNie

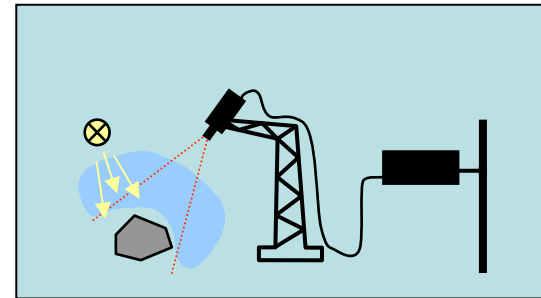




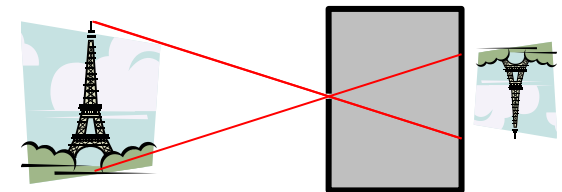
Examples



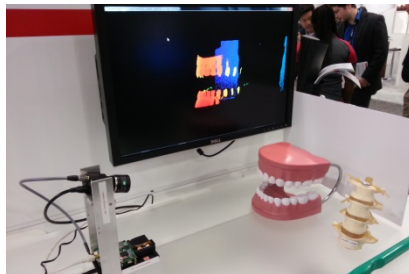
Components



**Industrielle  
Bildverarbeitung**



Models

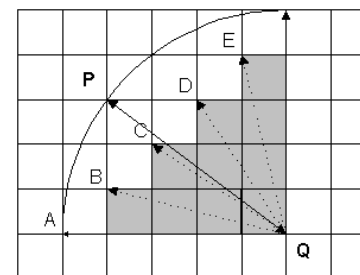


3D Capture

Funkentst

**Funker**

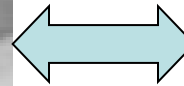
Methods



Mathematics



## Was ist Digitale Bildverarbeitung?



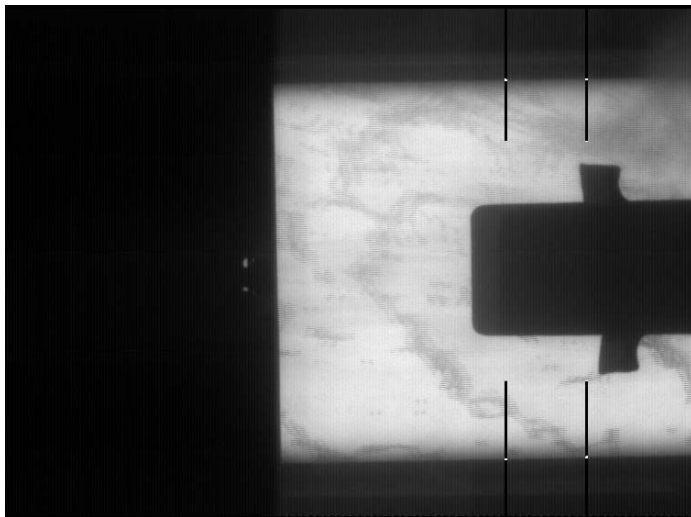
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165	156	142	141	136	107	113	100	76	64	62	60
154	142	119	104	100	72	74	61	55	55	60	58
135	122	92	63	66	57	54	58	56	55	57	56
96	82	64	61	64	53	59	61	60	54	61	67
66	61	57	63	56	54	55	64	57	58	76	90
62	56	52	55	59	57	55	63	68	56	91	130
56	50	50	47	52	64	62	85	118	97	80	159
48	48	54	50	49	60	60	94	150	133	74	163
64	57	52	48	48	64	63	79	145	142	80	153
72	67	58	49	43	64	64	72	102	110	74	147
88	84	68	48	50	75	88	75	87	82	73	152
98	104	93	79	73	91	108	90	80	63	92	165
89	101	104	97	90	91	93	91	75	69	127	176
69	89	107	105	99	102	86	74	76	116	164	181
95	81	79	93	92	89	80	82	119	161	182	184
118	109	93	84	84	90	106	127	159	185	184	180
139	132	126	118	122	141	146	161	181	188	183	176
146	147	141	142	146	154	162	170	177	182	176	166
144	156	152	152	156	155	161	164	161	161	155	143

Menschliche Wahrnehmung –  
zuerst Objekte

Maschinelle Wahrnehmung –  
zuerst Pixel



## Was ist Industrielle Bildverarbeitung?



Informationsgehalt  
**1.132.000 Byte**



Entscheidung  
zu Messergebnis:  
➤ Breite, oder  
Geschwindigkeit, oder  
Position

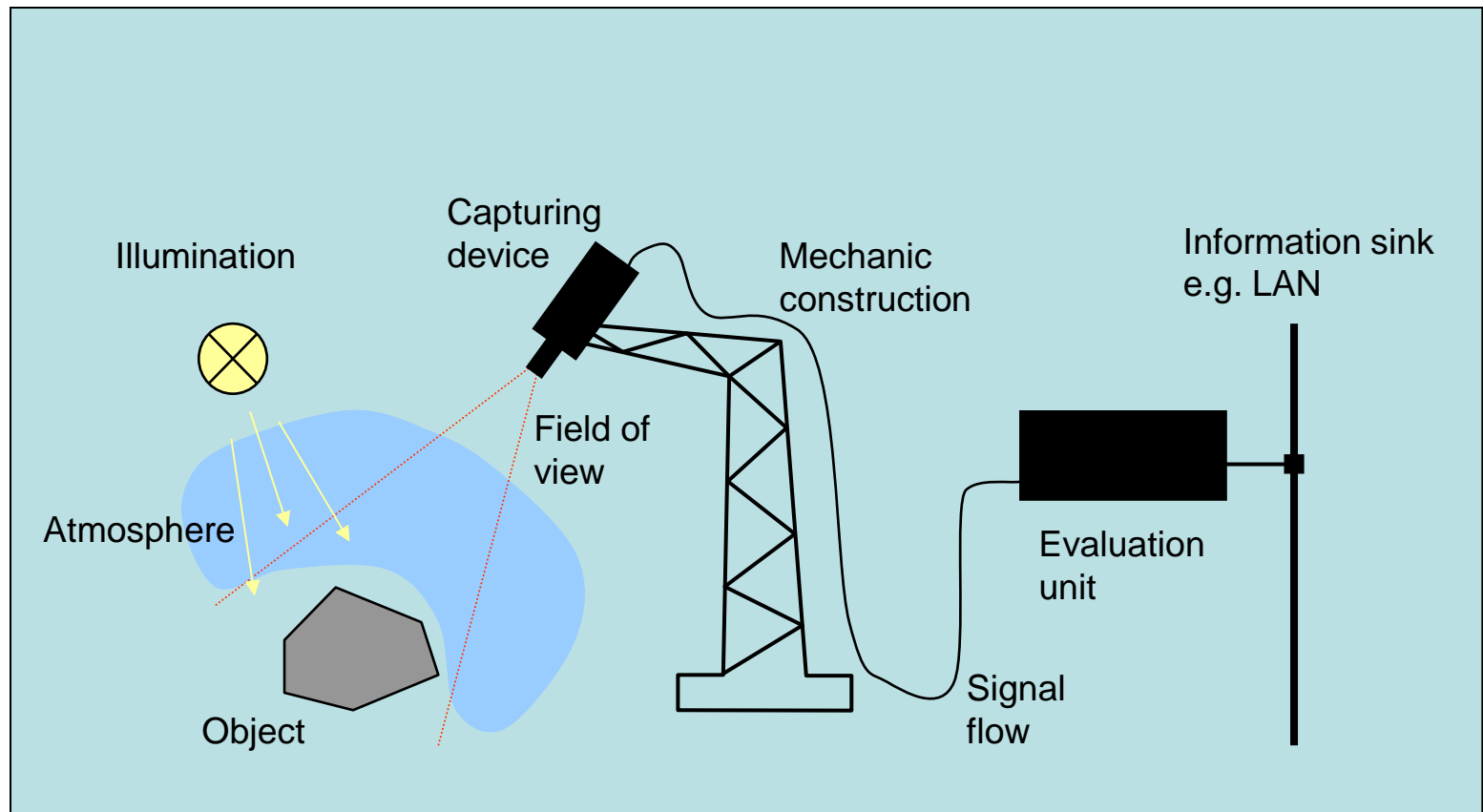
Informationsgehalt  
**4 Byte**



<b>MACHINE VISION</b>	<b>Characteristics</b>	<ul style="list-style-type: none"> <li>Metrology</li> <li>Quality control</li> <li>Identification / Recognition</li> <li>Restoration</li> <li>Visualization</li> </ul>
	<b>Components (outer imaging chain)</b>	<ul style="list-style-type: none"> <li>Sensor, Lens (capturing device)</li> <li>Illumination</li> <li>Evaluation unit</li> <li>Communication to the automation process</li> </ul>
	<b>Methods</b>	<ul style="list-style-type: none"> <li>Image capture</li> <li>Segmentation</li> <li>Registration / geometric mapping</li> <li>Projection</li> <li>Identification</li> </ul>
	<b>Technologies</b>	<ul style="list-style-type: none"> <li>Physics</li> <li>Electrical engineering</li> <li>Informatics</li> <li>Mathematics</li> <li>Bionics</li> </ul>



# Äußere Bildverarbeitungskette



System: PC basierend, extra Beleuchtung



<b>MACHINE VISION</b>	<b>Characteristics</b>	<b>Metrology</b> <b>Quality control</b> <b>Identification</b> / Recognition <b>Restoration</b> <b>Visualization</b>
	<b>Components (outer imaging chain)</b>	<b>Sensor, Lens</b> (capturing device) <b>Illumination</b> <b>Evaluation</b> unit <b>Communication</b> to the automation process
	<b>Methods</b>	<b>Image capture</b> <b>Segmentation</b> <b>Registration</b> / <b>geometric</b> mapping <b>Projection</b> <b>Identification</b>
	<b>Technologies</b>	<b>Physics</b> Electrical engineering <b>Informatics</b> <b>Mathematics</b> Bionics



<b>AT Bakk [3 ECTS]</b>	<b>Lecture</b>	<b>Laboratory</b>
1 Components	Sensor Optics Illumination	Image Acquisition Camera, Sensor Lens
2 Basics	Discrete Mathematics	Image, Calibration, Edges
3 Software	SW Categories	NI Vision Assistant HALCON
4 Methods	Segmentation Filter 3D Vision	Threshold Morphologic Filter OCR
5 Applications	e.g. Tiger Stripes, Crack Detection, etc.	Project
THESIS		

Bakk: i.A. 6 Semester; 180 ECTS





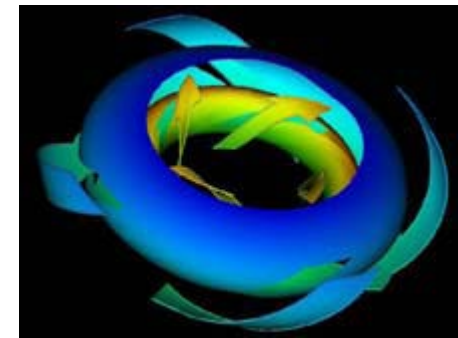
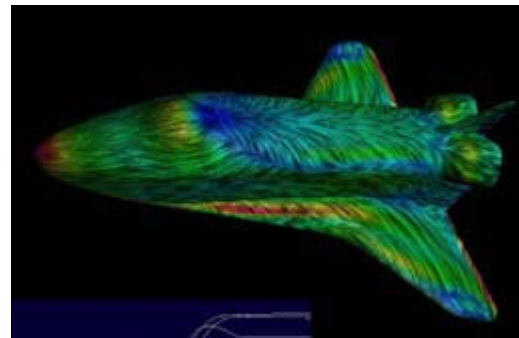
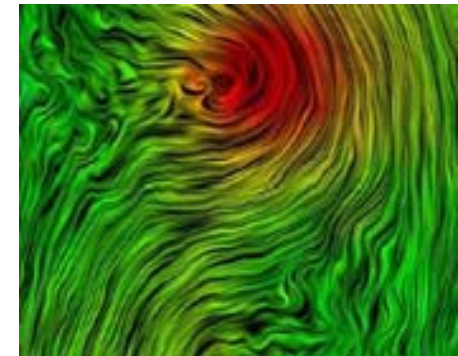
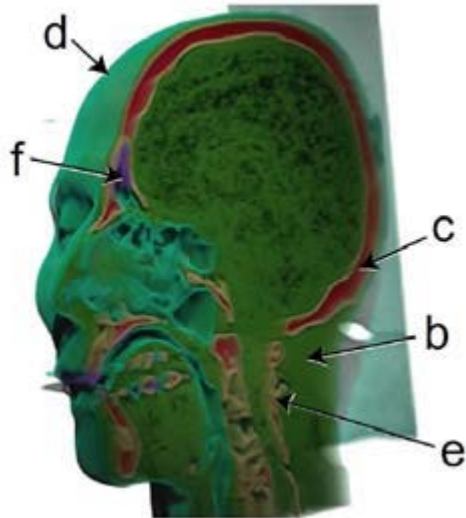
AT Mas [6 ECTS]	Lecture	Laboratory
<b>1</b> Methods	Registration Calibration Transformation	Projective Geometry / Homography Ransac Swift Surf
<b>2</b> Basics	3D Capturing / CT	Voxel
<b>3</b> Software	Languages Algorithms Fast Apps. (FPGA, DSP)	Matlab MeVisLab iAnalyze <sup>FH</sup>
<b>4</b> Applications		Image Stitching
<b>5</b> Visualization	CT, Simulation Data	Project
THESIS		

Mas: i.A. 4 Semester; 120 ECTS



## Visualisierung von sehr großen Datenmengen

- Statische Daten z.B. von Computed Tomography aufgenommen - Voxel
- Dynamische Daten z.B. von Finite Element Simulationen





## Spannungsfelder

### MÖGLICHKEITEN

- Qualitätskontrolle
- Messtechnik für Automatisierung
- Identifikation
- etc.

### GRENZEN

- Auflösung Sensor, Optik
- Störungen
- Undefinierte Helligkeiten, Oberflächen
- Unbekannte Situationen
- etc.

### STELLSCHRAUBEN

- Messfeld, Beleuchtung
- Spektralbereich
- Sensortechnik
- Betrieb
- Algorithmus
- Redundanz
- etc.

### Weitere Faktoren

- Zuverlässigkeit
- Speed / Echtzeit
- Wartung
- Wirtschaftlichkeit
- etc.



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