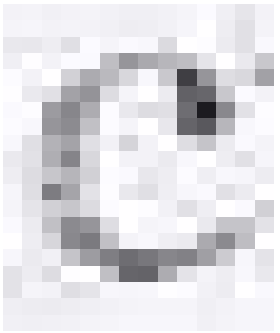
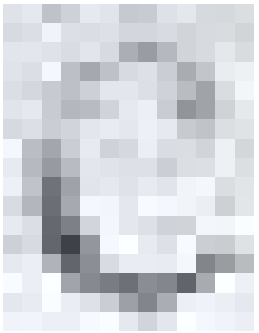
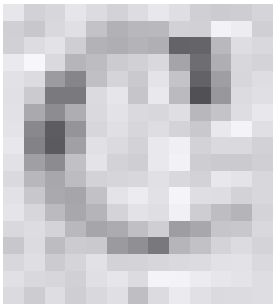
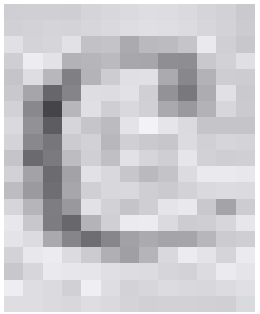
Optical Character Recognition





C





Learning:

X – set of character images
K – set of character names

Input: labeled character images
Output: template

Methods:
- generative learning (Gaussian noise)-averaging
- discriminative learning:
Linear → linearization of a squared distance
Kernels → weighted sum of input data

Optical Character Recognition

Can you recognize the character in the middle without context?

No? Then read **Section 7.1** in the Lecture draft:

Example: Markovian Sequence of Images ...

License Plates

(a) license plate

(b) license plate (c) ADR/RID plate

Figure 1: Examples of images with short structured texts with a priori known geometrical and grammatical structure.

This application is covered by Stochastic 2D grammars – behind our course

Rathousky, Urban, Franc *Recognition of text width known geometric and grammatical structure* www.cmp.cvut.cz

Stereo

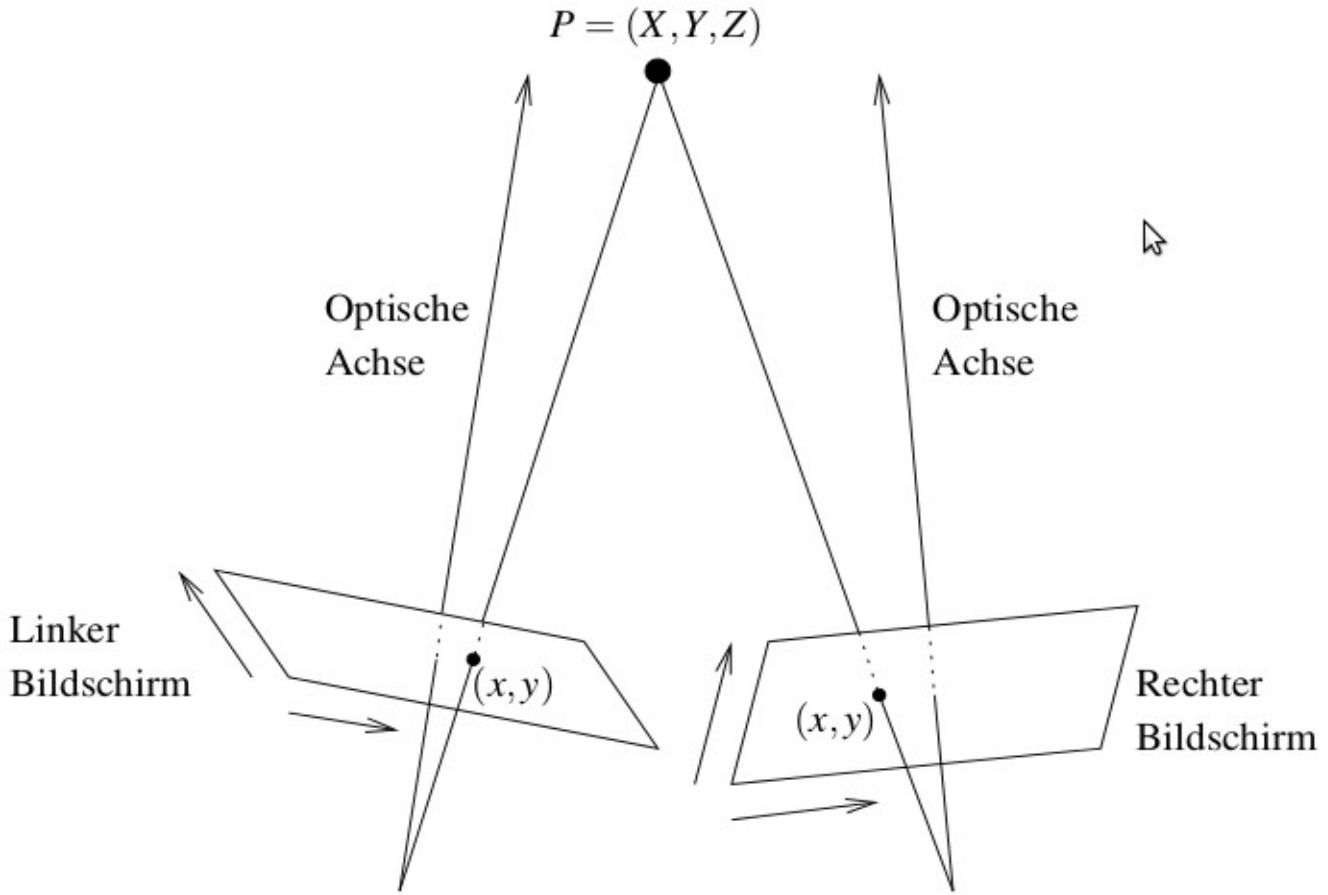


ABBILDUNG 2.1. Grundprinzip der Stereorekonstruktion

D. Shlezinger, *Strukturelle Ansätze für die Stereorekonstruktion*, PhD thesis, Dresden University of Technology, in German, 2005.

Stereo

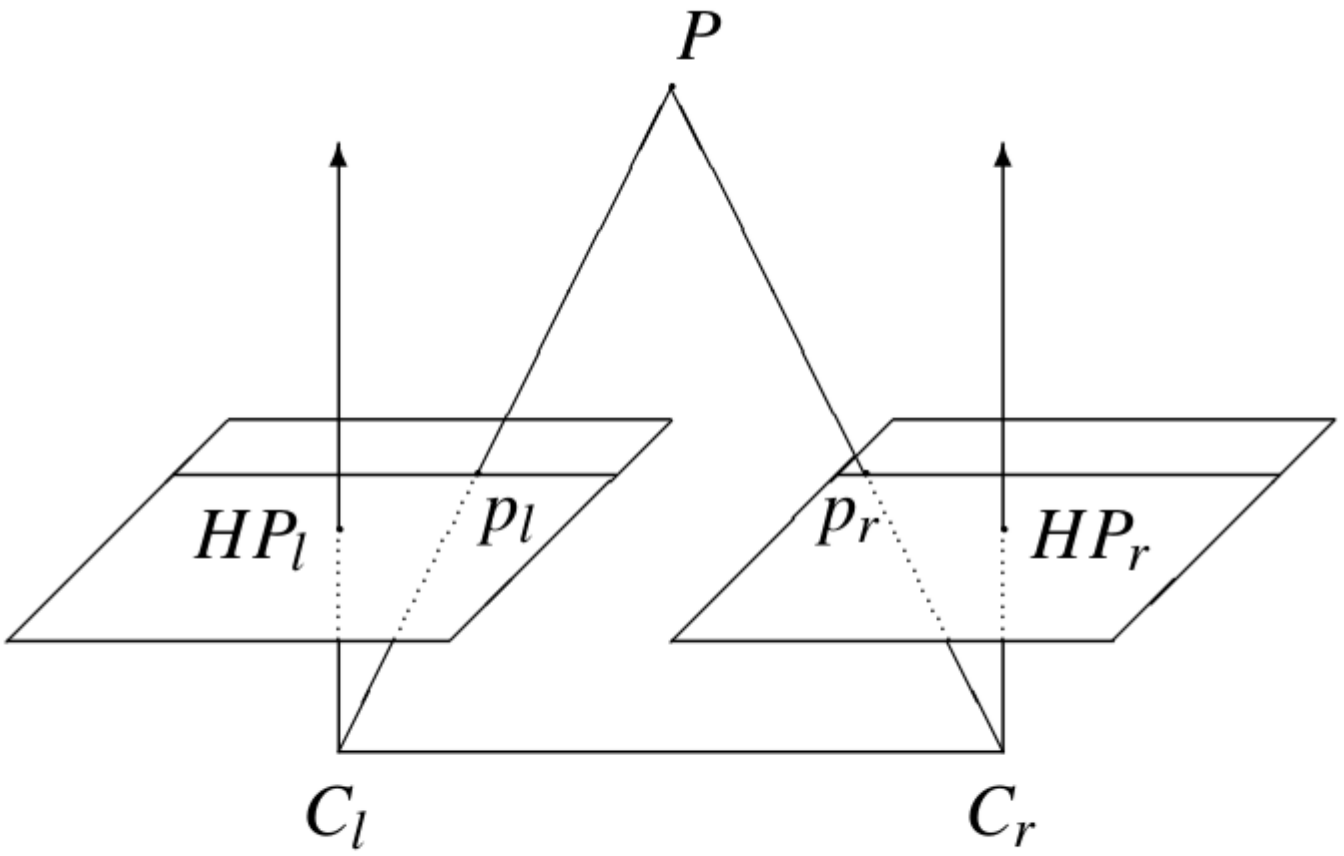
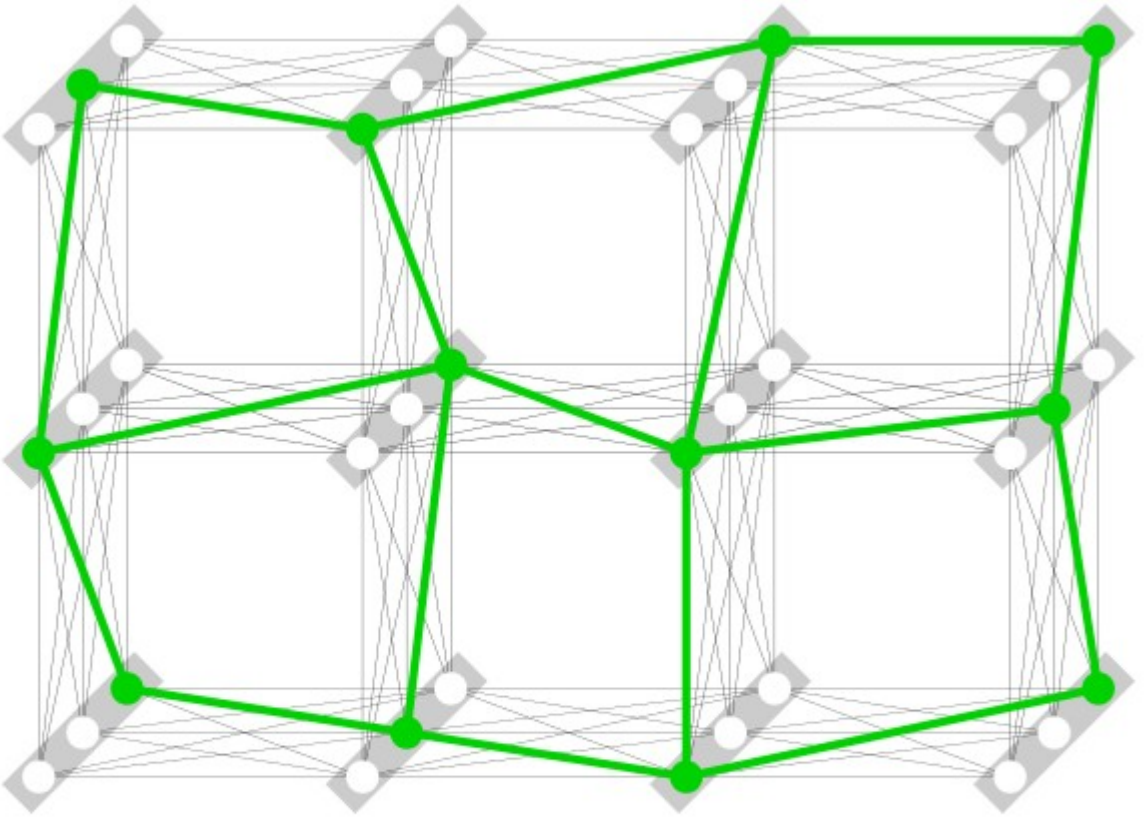


ABBILDUNG 2.2. Paralleles Stereo

1D label set = point disparities along the line

D. Shlezinger, *Strukturelle Ansätze für die Stereorekonstruktion*, PhD thesis, Dresden University of Technology, in German, 2005.

Stereo: MRF



Quality function: $F(\mathbf{x} \mid \mathbf{g}) = \sum_{t \in T} g_t(x_t) + \sum_{\{t,t'\} \in E} g_{tt'}(x_t, x'_t)$

T Werner. *A Linear Programming Approach to Max-sum Problem: A Review*. IEEE Trans. on Pattern Recognition and Machine Intelligence (PAMI) 29(7), July 2007

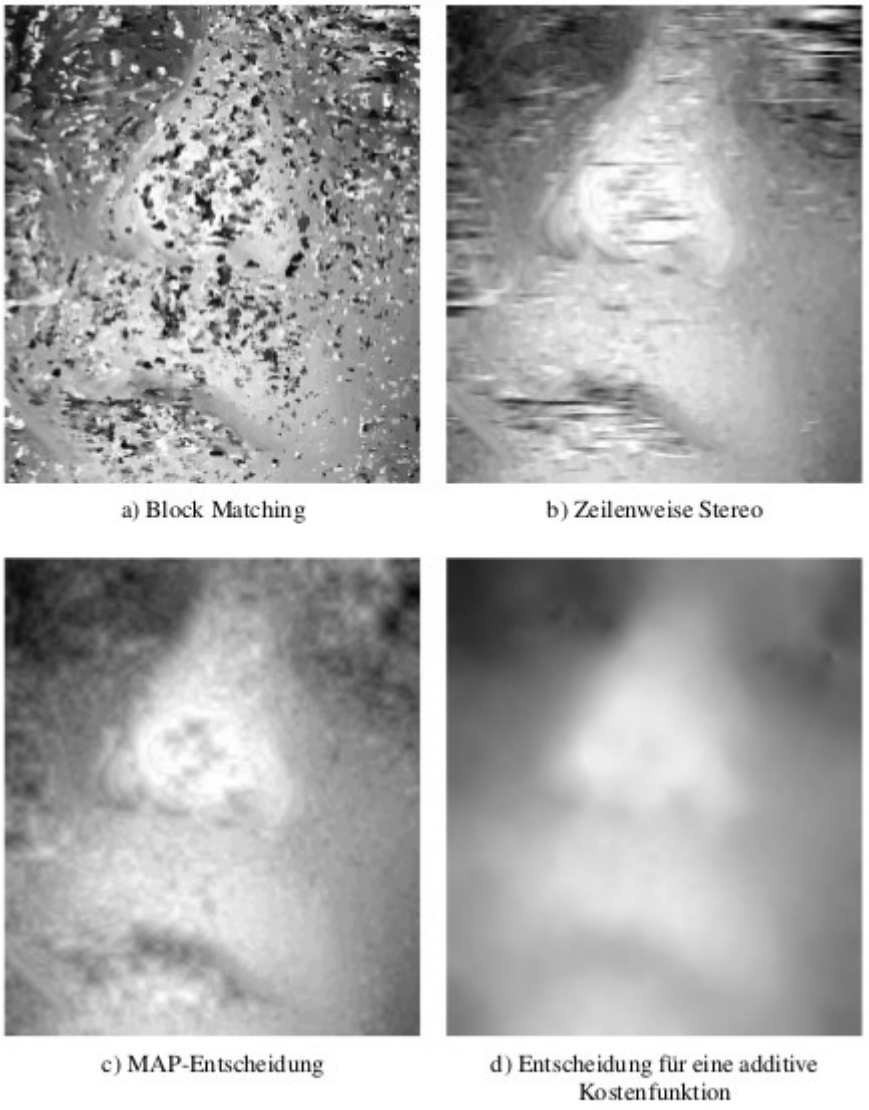
Stereo

a) Das linke Bild b) Das rechte Bild

ABBILDUNG 4.7. Beispiel „Raucher“

D. Shlezinger, *Strukturelle Ansätze für die Stereorekonstruktion*, PhD thesis, Dresden University of Technology, in German, 2005.

Stereo



a) Block Matching

b) Zeilenweise Stereo

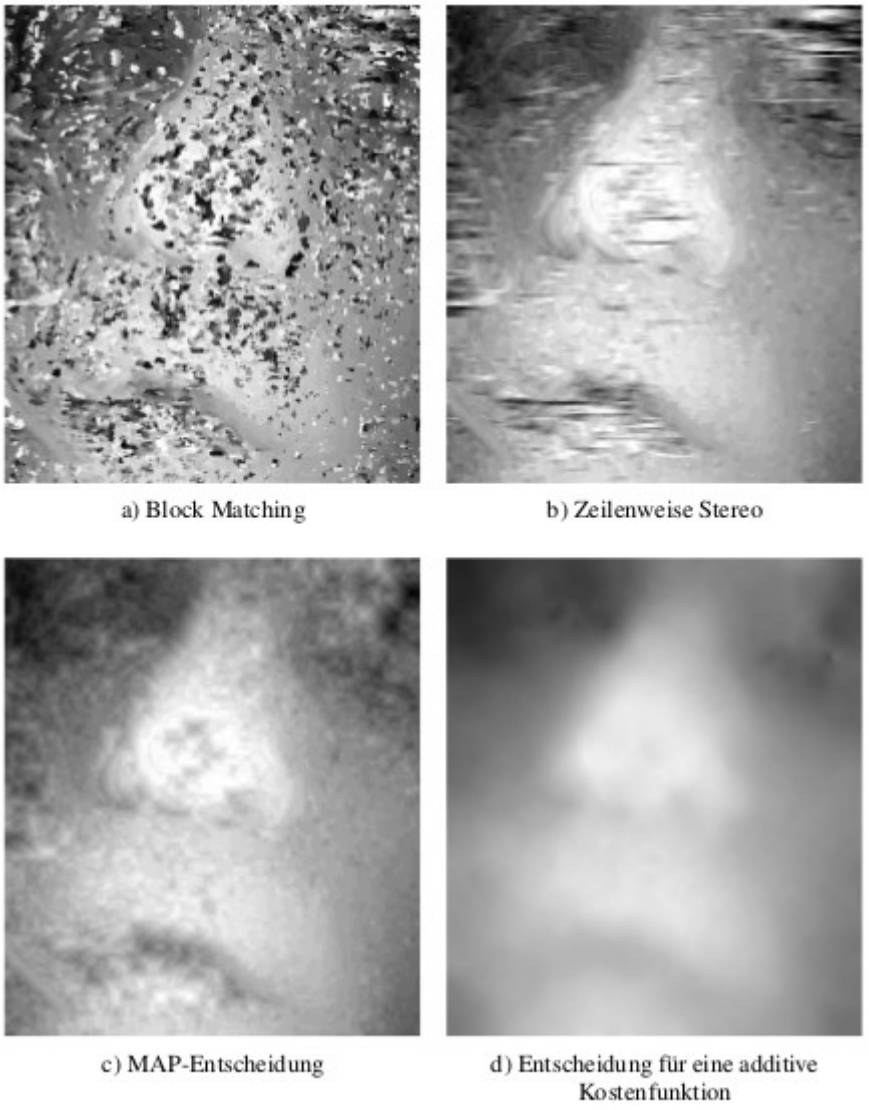
c) MAP-Entscheidung

d) Entscheidung für eine additive Kostenfunktion

ABBILDUNG 4.8. Die Ergebnisse von verschiedenen Algorithmen

D. Shlezinger, *Strukturelle Ansätze für die Stereorekonstruktion*, PhD thesis, Dresden University of Technology, in German, 2005.

Stereo



a) Block Matching

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ABBILDUNG 4.8. Die Ergebnisse von verschiedenen Algorithmen

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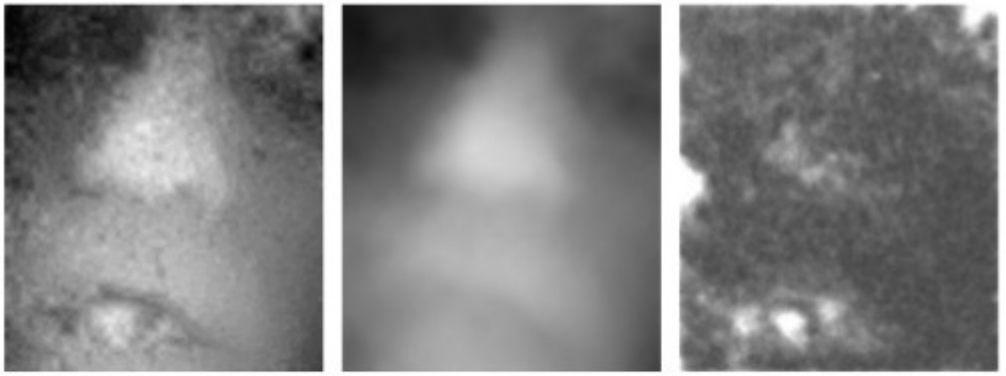
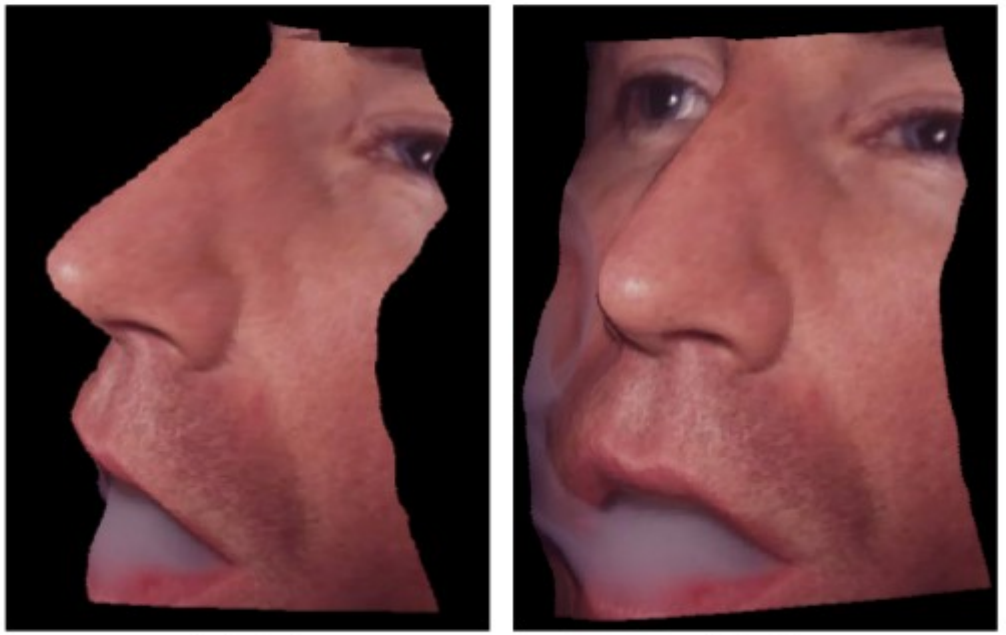
Stereo



a) MAP-Entscheidung b) Generierung c) Karte der Streuungen



d) Ansicht e) Ansicht

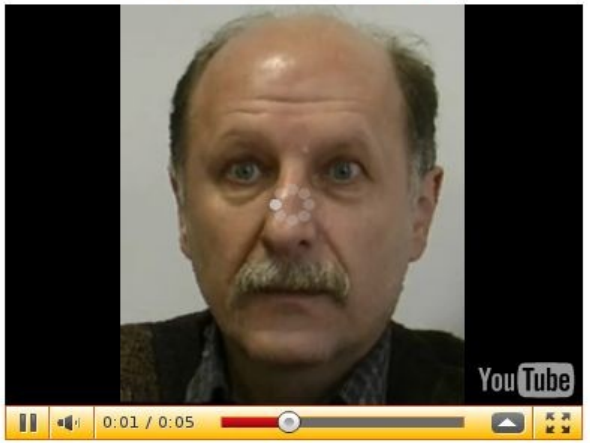
ABBILDUNG 4.25. Ergebnisse für das Beispiel „Raucher“

D. Shlezinger, *Strukturelle Ansätze für die Stereorekonstruktion*, PhD thesis, Dresden University of Technology, in German, 2005.

Face Expression Synthesis

удивленный

Facial expression synthesis



Technique outline

TAKE photos of facial expressions

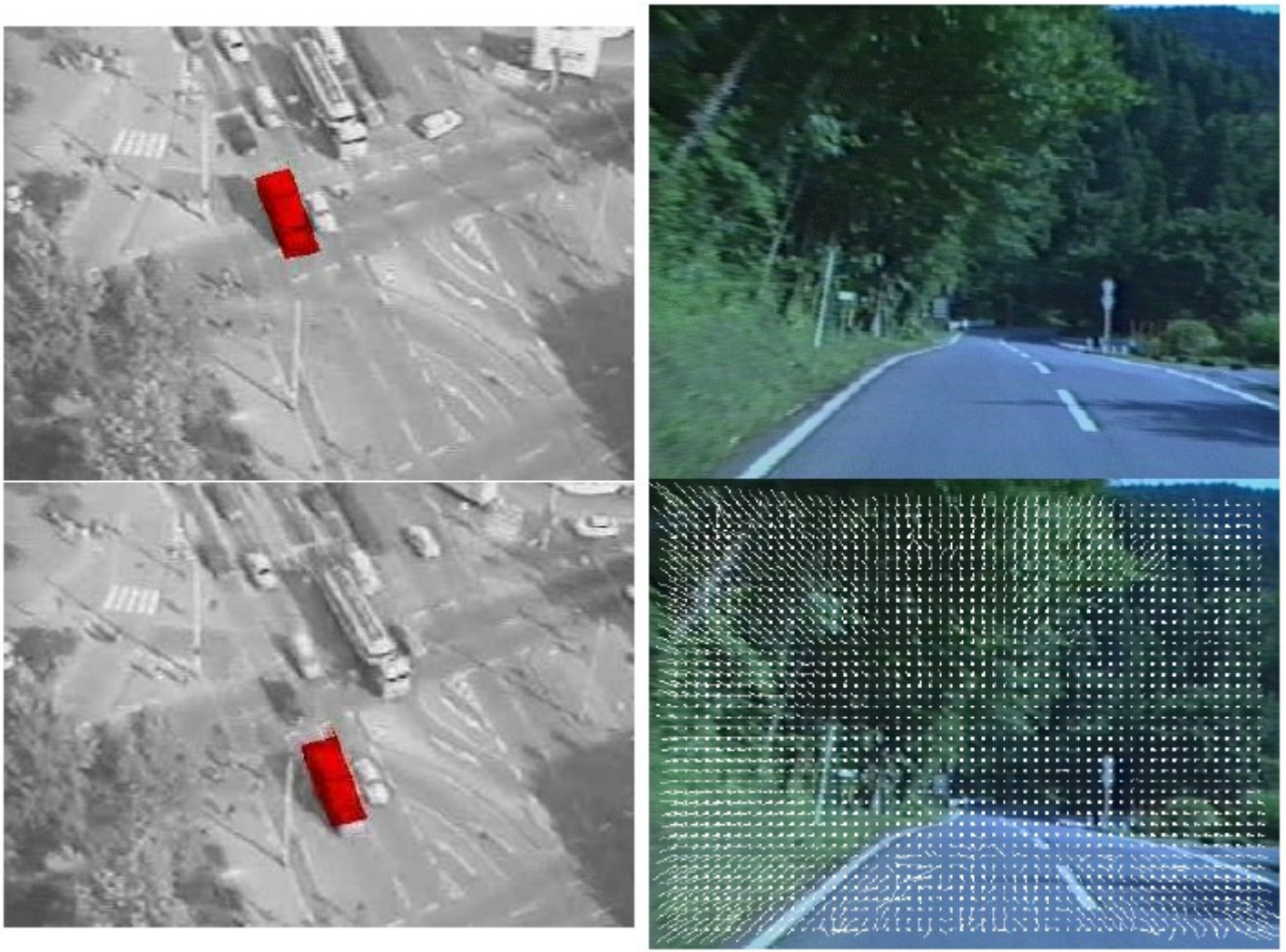
Pictures and movies are taken from www.irtc.org.ua/image

Face Expression Synthesis

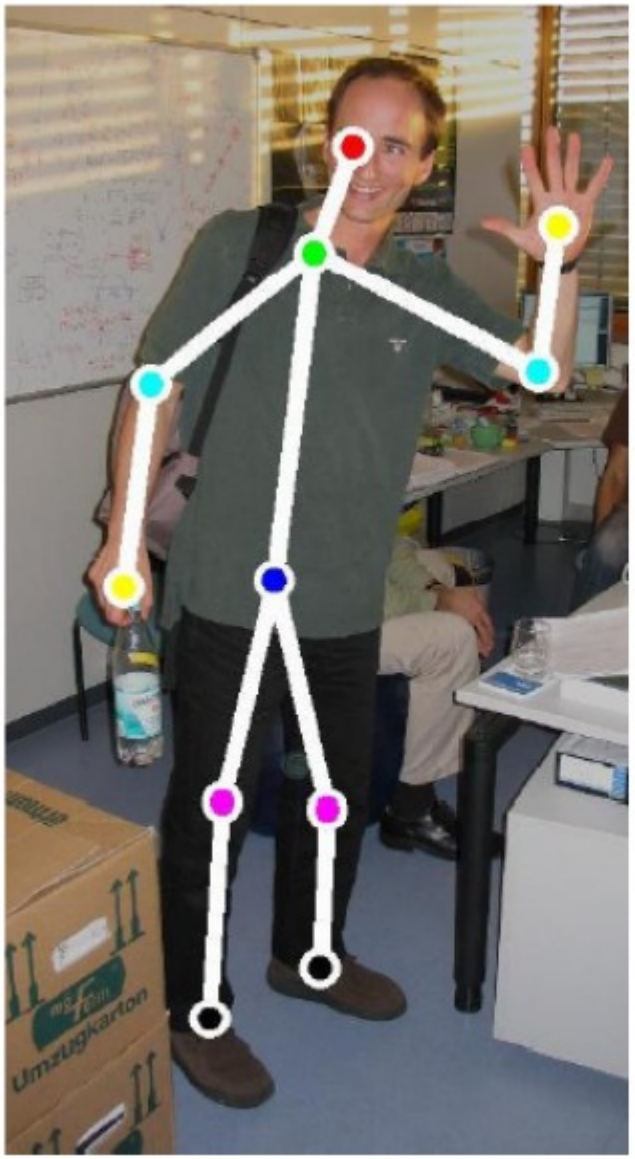
2D label set = point disparities

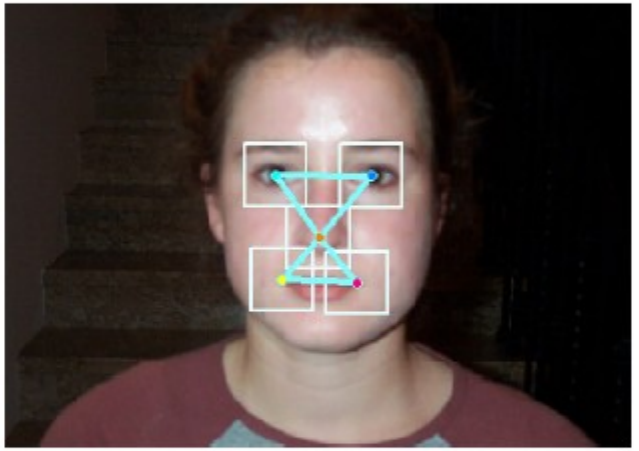
Pictures and movies are taken from www.irtc.org.ua/image

Optical Flow and Moving Objects Detection



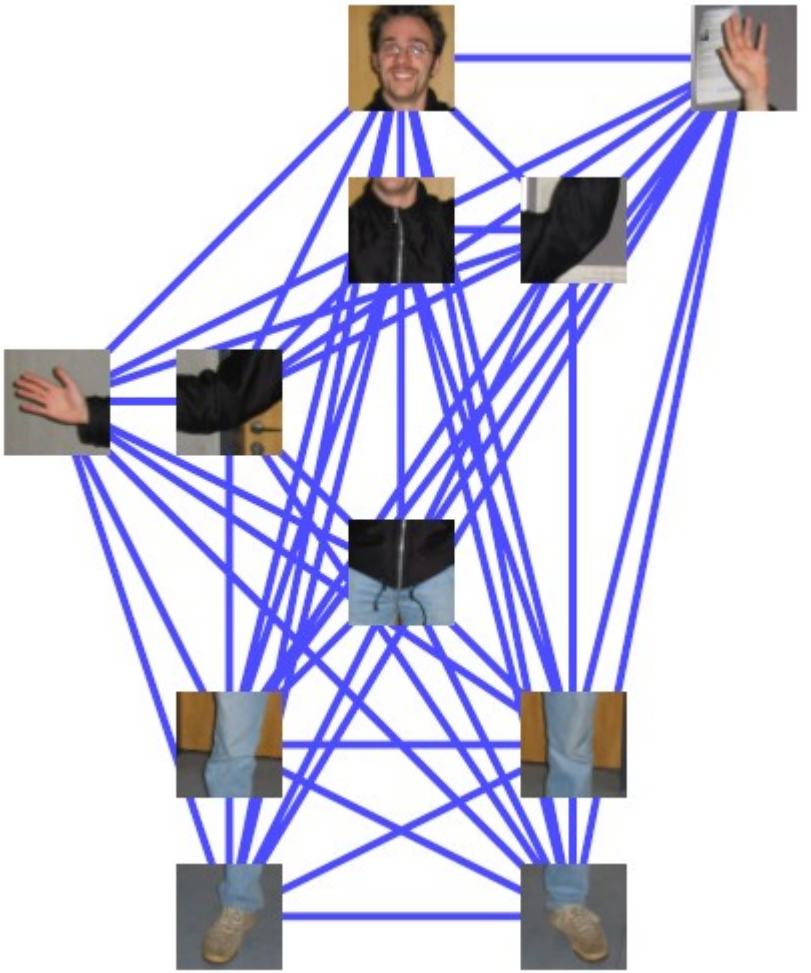
Object Recognition





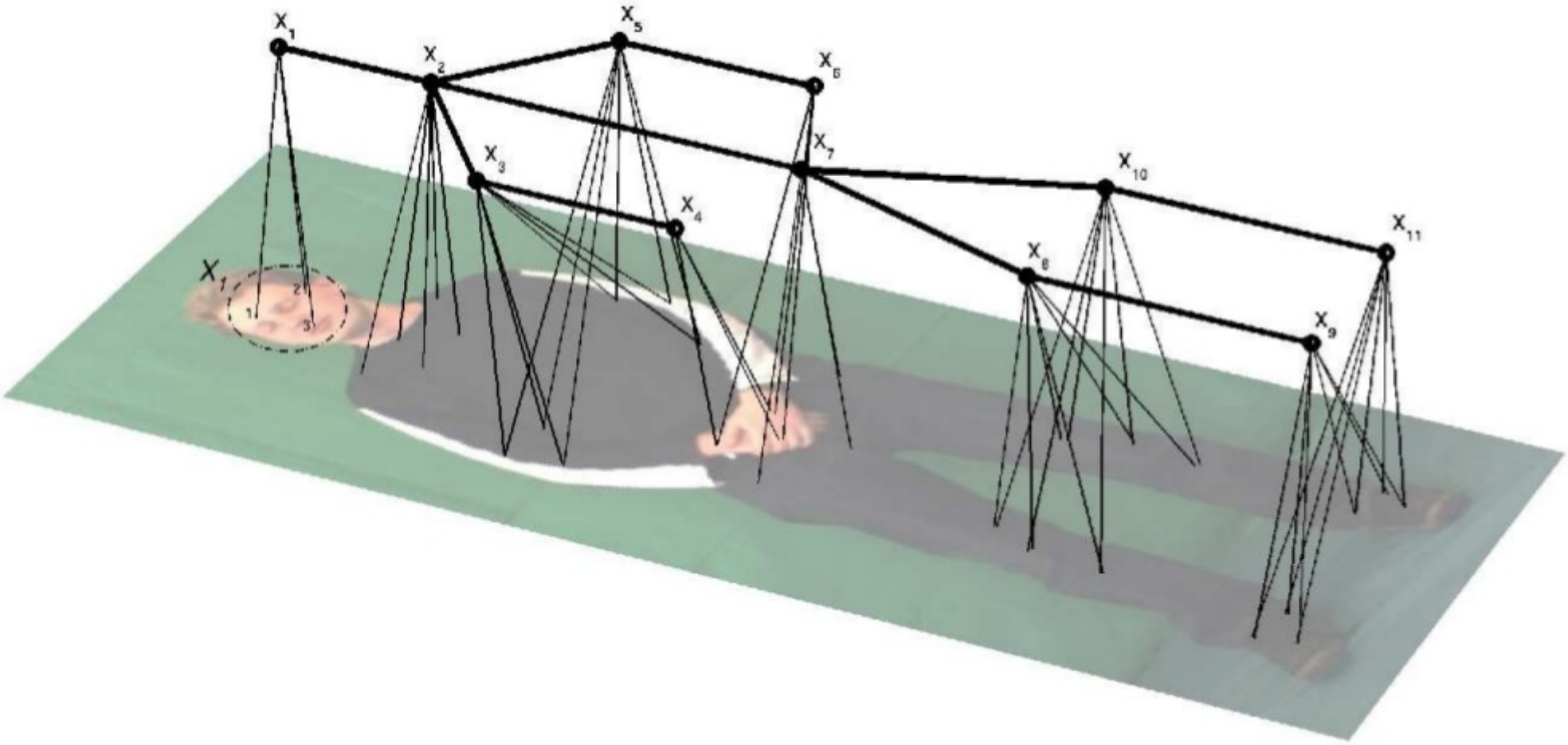
Bergtholdt, M. and Kappes, J. H. and Schmidt, S. and Schnörr, C.: *"A Study of Parts-Based Object Class Detection Using Complete Graphs*". In International Journal of Computer Vision, 87 (1-2): 93-117, 2010

Object Recognition



Kappes, J. H.: "*Inference on Highly-Connected Discrete Graphical Models with Applications to Visual Object Recognition*". Ph.D. Thesis, Ruprecht-Karls-Universität Heidelberg, Faculty of Mathematics and Computer Sciences, "Heidelberg, 2011

Object Recognition



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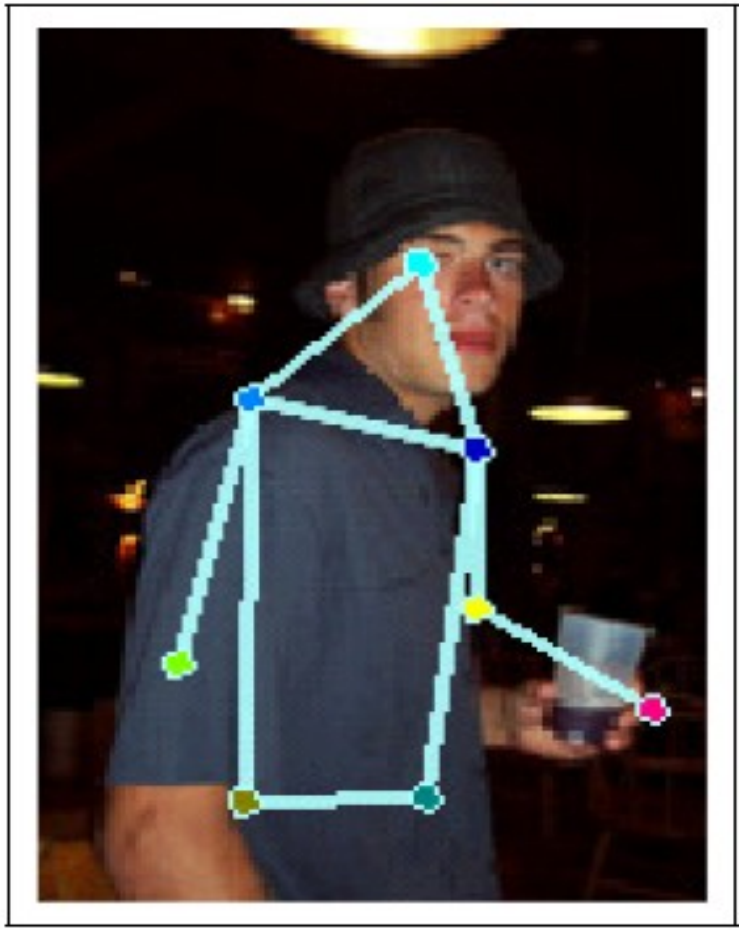
Object Recognition



Tree-structured (left) vs. complete graph (right) inference results

Kappes, J. H.: "*Inference on Highly-Connected Discrete Graphical Models with Applications to Visual Object Recognition*". Ph.D. Thesis, Ruprecht-Karls-Universität Heidelberg, Faculty of Mathematics and Computer Sciences, "Heidelberg, 2011