Lecture 26: Summary and Outlook

Contents

What Have We Done?

What Have We Done? (2)

Current Research Directions

Current Research Directions

- simplified methods with less parameters
- inclusion of specific a-priori-knowledge
- non-local models and integrodifferential equations
- algorithmic improvements
- relations to other image processing techniques:
  statistical methods, wavelets, simple linear or nonlinear filters, ...
- applications to other image processing problems:
  data compression, demosaicing, superresolution, tomographic reconstruction, segmentation ...
- applications in computer vision:
  optic flow, structure-from-motion, stereo, shape-from-shading, ...
- applications outside the image processing field:
  computer graphics, numerical analysis, medical imaging, ...
- performance evaluation

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Projects for Bachelor / Master / Diploma Theses

Image Processing

- dithering using error diffusion
- demosaicking methods
- compression of high dynamic range images
- iterated simple linear and nonlinear filters
- models with different conservation assumptions (moments)
- anisotropy beyond orthogonality
- evaluation of bilateral filtering and related methods
- diffusion and regularisation on graphs

Projects for Bachelor / Master / Diploma Theses (2)

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Computer Vision

- comparision of PDE-based and graph-based segmentation methods
- structure-from-motion: recovering 3-D information from optic flow
- optic flow versus tracking
- incorporation of illumination effects into stereo reconstructions
- image stitching
- registration of high dynamic range images
- photometric stereo

Numerical Analysis and Scientific Computing

- stability notions for nonlinear diffusion filters
- numerical schemes with higher accuracy (automatic stencil computation)
- PDEs and variational methods on alternative architectures:
  Playstation 3, mobile phones, GPUs, ...

Applications

- audio-visual speech recognition
- ophtalmology: fusing images with different focus
- finding line-like structures in cell biology
- flow visualisation

... and many others. Just tell us your specific interests.

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Lectures in the Next Semester

- Image Processing and Computer Vision
  (Joachim Weickert; 4 hours classroom, 2 hours tutorial, 9 CP)
- Probabilistic Methods in Image Analysis
  (Bernhard Burgeth; 3 hours classroom, 1 hour tutorial, 6 CP)
- Numerical Methods for Visual Computing II
  (Michael Breuß; 2 hours classroom, 2 hours tutorial, 6 CP)
- Introduction to Image Acquisition Methods
  (Andrés Bruhn; 2 hours classroom, 4 CP)
- Modern Methods in Image Analysis
  (Andrés Bruhn, Joachim Weickert; seminar)

Suitable for students of visual computing, computer science, and mathematics.
The language of instruction is English (seminar talks in German possible).

Written Exam

- Tuesday, July 22, in E2.5, Lecture Hall 1.
- From 2:00 to 5:00 pm. Please be there at 1:45 pm.
- Second chance:
  Tuesday, October 14, in E2.5, Lecture Hall 1, from 2:00 to 5:00 pm.
  If you participate in both exams, the better grade counts.
- 6 problems in total
- similar in style to the self-test problems
- recommendations:
  - try to solve the self-test problems
  - go through the assignments
  - get an overview of the topics that we treated

- **Please Do Not Forget To Bring**
  - student identity card with photo (Studierendenausweis)
  - course material from lectures and tutorial groups
  - dictionary, if required (all questions are both in German and in English)
- **Please Do Not Bring**
  - cellular phones
  - pocket calculators
  - books or copies of parts of books
  - formulary (Formelsammlung), but handwritten notes are okay
  - other aids

  Everybody should have the same chances.
- Much success and thanks for your interest in this class !

Self-Test Problems

- A problem sheet that contains 6 problems which are intended to be similar in style and difficulty to the 180-minutes written exam is available on the web page as of today, 2 pm.
- Solutions will be downloadable as of Monday.
- If you encounter problems, please feel free to discuss them in your tutorial group next week.