Image Segmentation

Description and Objectives

Image segmentation is a well known problem in Computer Vision and Image Processing, which groups pixels into regions of similar viusal properties. In the simplest case, the segmentation differentiates between forground and background pixels. While the monocular case has been extensively studied over the last decades, few works consider the case where several images of the same scene are available from different viewpoints. In these cases, image segmentation should not be applied independently in the images since they should exhibit regions with similar properties. For example, regions corresponding to the same object in different images will have similar photometric properties and they should define the same 3D region in space where the object lies. The objective of this thesis is to develop new methods for the incorporation of spatial and photometric consistency into multi-view image segmentation and to experiment with them.

The work will include the following tasks:

- Literature research on image segmentation, feature detection and matching, 3D geometry.
- Investigate a first naive solution exploiting feature matches between images to incorporate spatial consistency
- Investigation of further photometric and spatial consistency constraints
- Evaluation of the implemented methods based on test data

Required Skills

- Studies in Computer Science, Communication Science, Electrical Engineering or Mathematics
- Basic knowledge in computer vision and 3D geometry
- Good programming skills in C++ and/or Matlab
- Enthusiasm for theoretic and academic research
- Creativity, flexibility and abstract, analytical thinking
- Good communications skills, ability to work in a team as well as independently

Remarks

The Fraunhofer-Gesellschaft undertakes applied research and maintains around 70 research Institutes, at over 40 different locations throughout Germany. The Fraunhofer Institute for Telecommunications - Heinrich-Hertz-Institute (Fraunhofer HHI), located in Berlin, is a leading research institute in the fields of mobile broadband communications, photonic networks, and electronic imaging for multimedia. The Computer Vision and Graphics group (CVG) is an active research group carrying out innovative research in the field of image and video analysis and synthesis. We combine methods from Computer Vision, Computer Graphics and Visual Computing to develop new solutions for a broad range of applications in multimedia and augmented reality as well as medicine and security. Our research covers the whole processing chain from capturing, image and video analysis and understanding to modelling and rendering. Current topics include image-based modeling and reconstruction, model-based image and shape analysis, 3D face processing, tracking and estimating rigid or complex deformable motion as well as image- and video-based rendering techniques.

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