HPI Hasso Plattner Institut
IT Systems Engineering | Universität Potsdam

Fachgebiet Computergrafische Systeme
Prof. Dr. Jürgen Döllner
Masterprojekt Sommersemester 2014

Video Analysis & Digitalization of Cultural Heritage

This master project is generally concerned with analysis and visualization of digital content. There are two (independent) topics that can be addressed:

- Topic 1 aims at developing concepts and techniques for video analysis, abstraction, and summarization.
- Topic 2 aims at developing new techniques to visualize and provide 3D point clouds on mobile devices in the context of cultural heritage applications.

The students get an extraordinary opportunity to get in touch with real world data, state-of-the-art research challenges, and high-performance system development. The project offers up to 8 students an excellent entry point for research in the fields of software engineering, computer graphics, and visualization.

Video Analysis, Abstraction, and Summarization

Today, digital images and videos represent two major categories of media captured, delivered, and shared on the Web. To efficiently identify and explore relevant or interesting digital media, video analysis and indexing are common tools. Image-based abstraction techniques can be utilized to further highlight relevant parts of the image to ease information extraction and communication. Further, videos can be automatically summarized and, thus, shortened to convey only relevant information or hide privacy-critical content. This topic will include:

- Feature detection: Extend computer-vision modules by robust and accurate feature-detection techniques (e.g., identification and tracking of people and cars).
- Change detection: Change metrics to identify video portions with a high or low degree-of-action (e.g., still shots or action shots).
- Video summarization: Summarization techniques that comprise image collages as well as video-based representations of prominent video parts.
- Image-Processing: hardware-accelerated image-processing operations ensure privacy and anonymity in videos.

Digitalization of Cultural Heritage using Service-based Processes

3D point clouds are one category of geospatial data to represent real-world 3D objects and environments. Laser scanning and photogrammetric methods can be used to generate 3D point clouds of buildings, cities, and landscapes. Application domains are archeology, cultural heritage, and architecture. Challenges are the amount of data (e.g., several terabytes) and deployment on mobile devices (e.g., tablets and smart phones). This topic will include:

- Data integration: Import and management of massive 3D point clouds using services for data management.
- Interactive Rendering: Design and development of a plug-in and resource management concept to integrate rendering techniques for 3D point clouds into a framework for service-base visualization of 3D city models.
- 3D client for mobile devices: Deployment of a 3D client to allow an efficient usage of the data on mobile devices.
- Usage scenario: Example data of a historical castle from terrestrial laser scans including indoor data.

Both topics link to current research and software projects of the HPI's Computer Graphics Systems group. It is especially suited for further research in the context of a master thesis or as preparation for a topic of doctoral thesis. Furthermore, the master project can be used to start working as a student assistant.

Contact

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