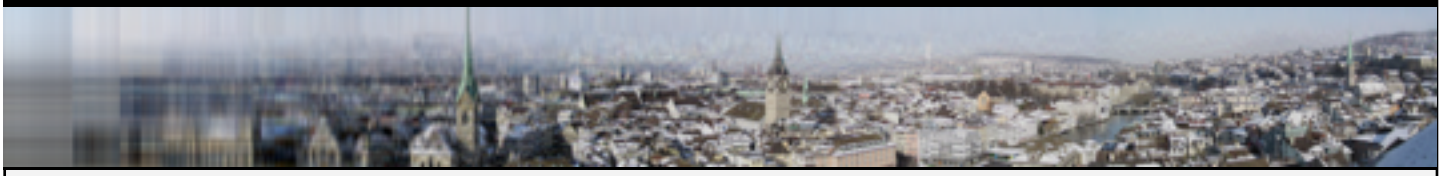
Student Project

3D Metrics for Quality Assessment of Volume Features

University of Zurich[UZH]



Topic

Quality metrics for visual data are widely used for automatic evaluation of processing and compression algorithms. While most efforts in the past concentrated on image quality assessment, 3D evaluation is more challenging. At VMML we are using Tensor Decomposition (a generalization of the Singular Value Decomposition) for volume compression and feature extraction, and we need good automatic quantitative quality descriptors for tensor compressed data. Because 3D volume visualization relies on factors such as the transfer function choice and interactive exploration, a subjective measure of feature quality is also desired. We have realized that tensor compression is a good feature-preserving technique, and that it allows to select features at different scales. The main goal of this project is to help quantitatively support this idea, also from the user's point of view. A further possible extension is to use these subjective scores to aid in the design and benchmark of a potential tensor-based volume feature metric.

Assignment

First, the student should conduct literature research on already existing volume quality assessment metrics. Next, typical compression distortion artifacts have to be generated for several 3D data sets. The compression methods should include at least tensor approximation and wavelet-based encoding for comparison (Matlab toolboxes for this will be provided); using others in addition is also interesting. Then, different 3D metrics should be computed for each data set and distortion type and degree. Finally, the student will conduct a user study that should provide an additional subjective quality assessment for the data to be compared with the automatic metrics. For this user study part, online crowd-sourcing approaches like Mechanical Turk are a possibility.

Requirements

Previous programming experience with Matlab or Octave is beneficial. Previous knowledge on image, video or volume compression methods is beneficial, but not mandatory.

Work Load

- 20% theory
- 40% implementation
- 40% testing and user study

Student Project Type

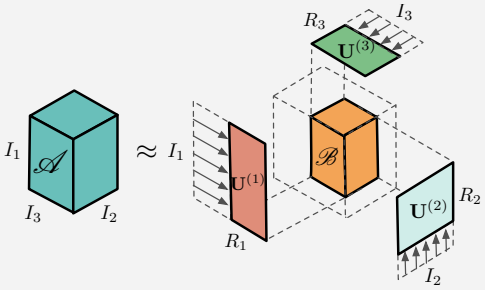
Based on the optional tasks, the project can fit into a Vertiefung, Facharbeit, or Master Basis Modul. Goals will be adjusted depending on the project type.

Supervision

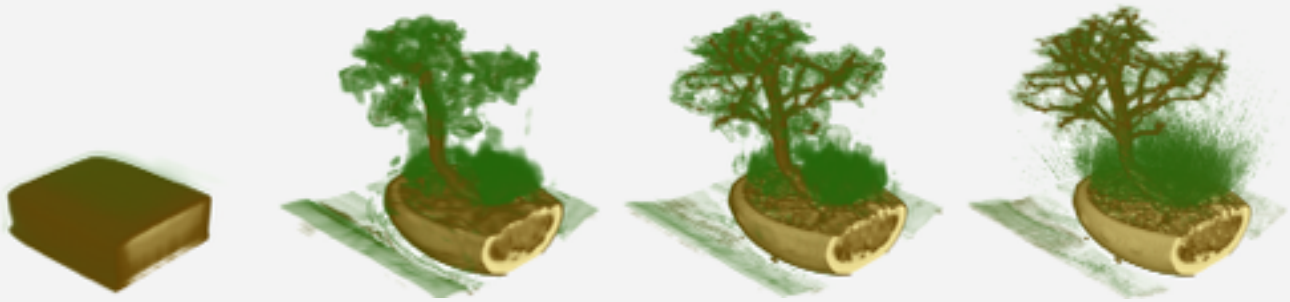
Prof. Dr. Renato Pajarola
Rafael Ballester (Assistant)

Contact

If interested, please write an email to rballester@ifi.uzh.ch



3D tensor compression



Different feature scales of a bonsai data set

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