# 3D Scan Data Processing

3D sensors offer the possibility to digitize even complex components within seconds. The result is one or several point clouds which describe the component's surface. The software module **Scanprocessing** offers sophisticated methods for processing any kind of 3D scan data. Due to a high automation level, a top quality triangle mesh can be calculated and exported without any user interaction (open system / „STL scanner").

Applications

➢ Quality assurance: measuring and inspection

➢ CAD/CAM

➢ Additive fabrication (rapid prototyping)

➢ FEM simulation

➢ Virtual reality

Features

➢ Preprocessing scan data: correction of errors and artifacts

➢ Tools for the calibration of optical sensors

➢ Methods to calculate confidence values

➢ Matching of 3D scan data from different views

➢ Merging and uniform sampling of scans regarding confidence values

➢ Triangular meshing with curvature dependent reduction

➢ Filling of holes with homogeneous transition

➢ Handling of color information, calculation of textures
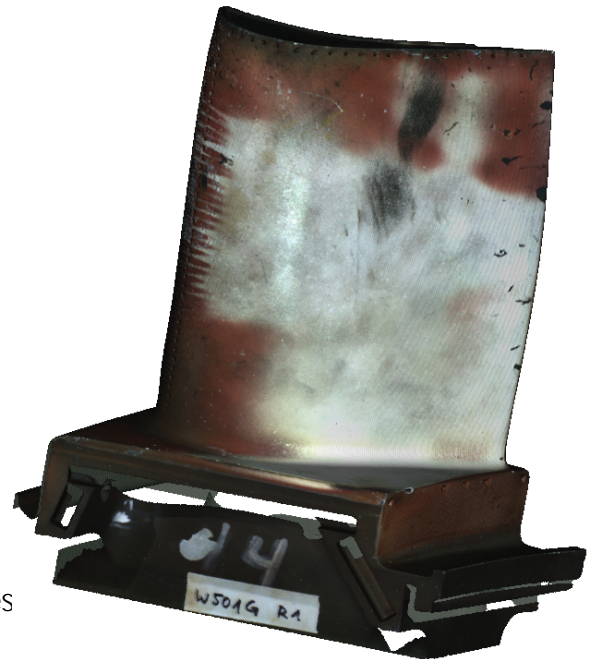
3D model of a turbine blade including color information
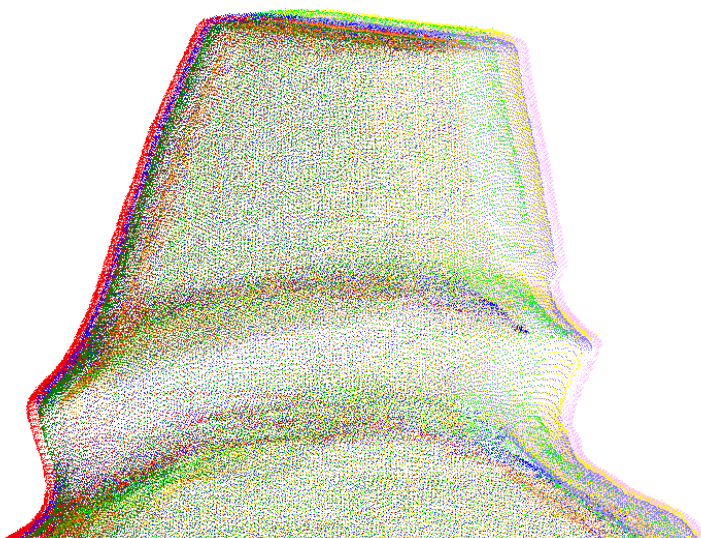
*Digitized tooth stump, 8 different scans, with calibration errors*
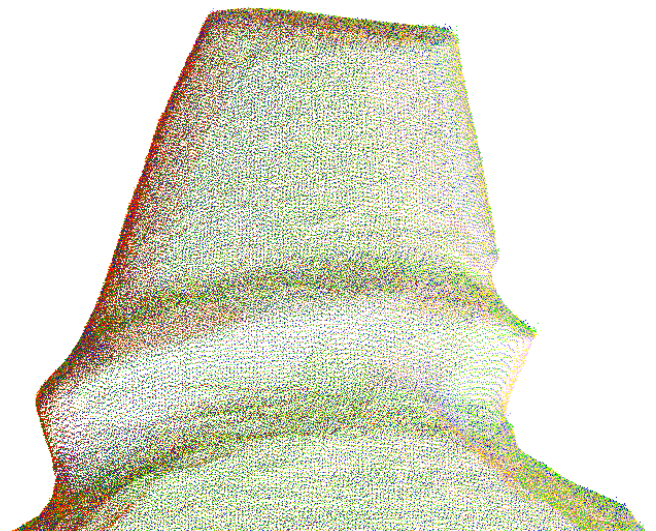
*Digitized tooth stump, 8 different scans, after matching*

Methods

- ➢ Optimized data structures and algorithms for 3D scan data
- ➢ 3D filter functions: Gauss, Laplace, etc.
- ➢ Matching: generalized multi-view iterative closest point algorithm (ICP)
- ➢ Triangular meshing: incremental surface reconstruction
- ➢ Reduction: feature preserving multi-pass vertex removal algorithm or iterative edge contraction with quadric error metric
- ➢ Hole filling based on minimum area triangulation
- ➢ Fitting of geometric entities according to Gauss and Chebyshev with non-linear optimization
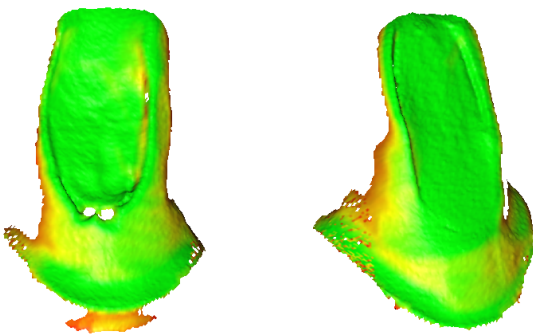
Implementation

- ➢ Programming language C++
- ➢ Modular design either for the integration into existing software systems or as stand-alone application including visualization
- ➢ All tools optional as separate modules
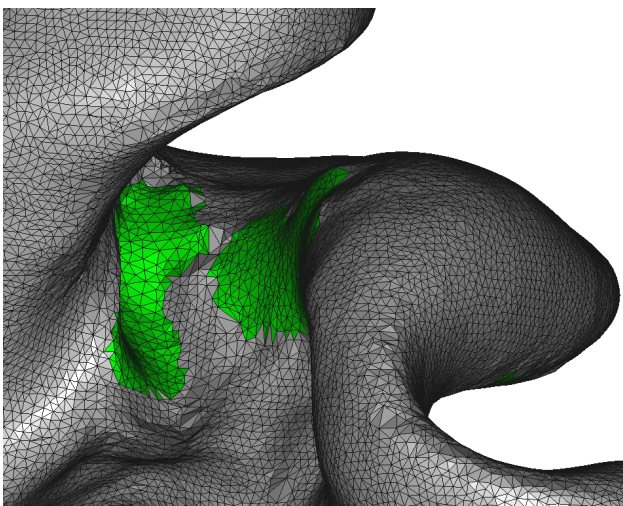- ➢ Support of multi-core architectures and 64-bit platforms
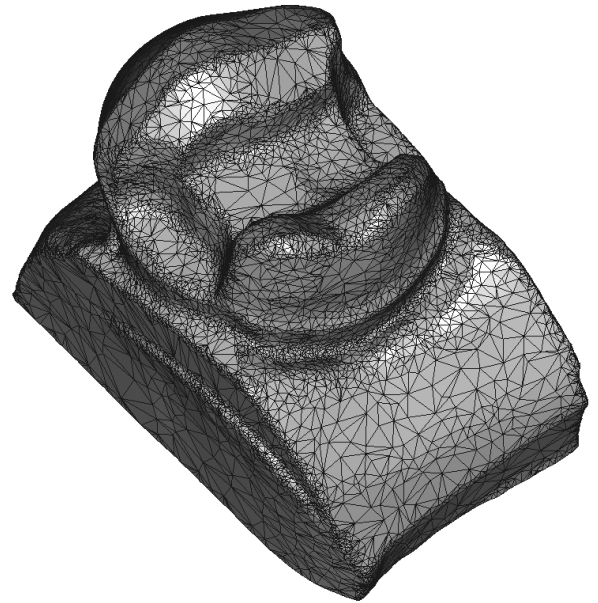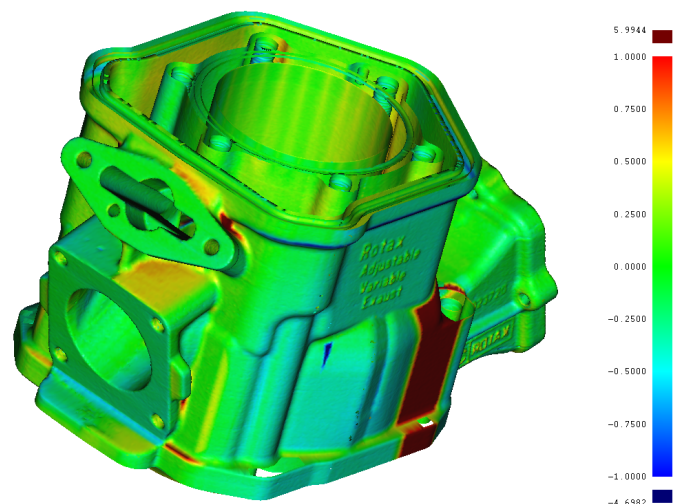

Curvature based reduction of triangle mesh
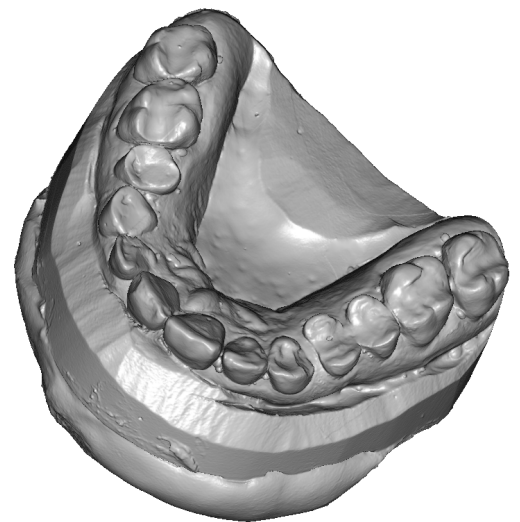
Jaw calculated from 54 single scans

Color-coded confidence values of scanned data

Filling of holes in occluded areas

Inspection with 3D deviation plot