BESCHÄDIGTE BAUTEILE AUF BASIS PRÄZISER (TEIL-/)AUTOMATISIERTER SCANMETHODEN REKONSTRUIEREN

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Mobile 3D-Erfassung und 3D-Druck für industrielle Anwendungen – M3D
M3D Demonstrators at a Glance

**Spare Part Recognition**

**Demo 1a**
Generic part recognition using a smartphone with depth sensor
Spare part ordering Printability validation

**Demo 1b**
Generic part recognition using a smartphone and a cloud based 3D reconstruction service

**Demo 1c**
Printed part recognition and sorting using a webcam

**3D Scanning, Reconstruction & Printing**

**Demo 2a**
Creating an optimized printable model from a sample object:
3D scan station
Mesh reconstruction & repair
Structural validation & optimization

**Demo 2b (Video)**
Reconstruction and printing process for damaged spare parts:
3D Scanning
CAD Surface Reconstruction
3D Model Repair
3D Printing
Postprocessing
Challenges

Scanning is an optical method!

- Dirty, rusty
- Shiny and reflecting
- Transparency
- Damaged
- Hidden areas
- Assembly

chrome strip
transparent part
lightweight part
armrest
Scanning method

- With photos
  - Mobile
  - Online feedback required
  - Still limited accuracy

- Step by step with structured light => state of the art equipment available
  - best accuracy with tripod => needs educated user and doesn’t fit into trouser pocket

- With structured light automated by robot
  - Fast
  - Economical
  - reliable
Reconstruction process

- Read data values
- Post-processing scanned data
  - Removal of overlapping triangles
  - Correction of sharp triangles
  - Removal of intersecting triangles
- Dividing scan data into „sets“
- Reconstruction based on the scanned data
Clean-up and repair

• **Repair:**
  • Proactive post-processing of the dataset by adding, removing or refining triangles
  • „filling in“ holes, modelling edges, removal of „outliers“
  • Aim of a „waterproof“ STL

• **Clean up:**
  • Passive post-processing of the dataset by removing protruding contours, overlapping triangles, small groups or creased triangles
  • Aim of a „neat“ dataset

→ To avoid distorting the reconstruction’s results, it does not make any sense to add triangles or refine the mesh.
Potential defects
Reconstruction of a gear knob
Repair by reconstruction

Why?

- Achieve proper parametric CAD-Modell and compensate scan deviations by „correct“ geometries
Reconstruction of a chrome strip
Repair by reconstruction

Broken domes

Scan data from structured light scanner „GOM“

Processed scan data with proposed identification of regions

Reconstructed scan data as proper CAD model, with repaired domes

Colours show deviation from original scan
Additively manufactured component

- Produced by SLA
- Polished and metallised
Reference Ro80 rear light

- Old original
- Assembled spare part
- Metalised 3D-printed reflector
The end