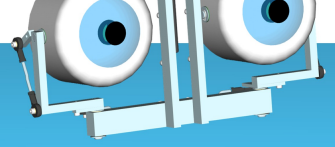

Towards Object Structure Detection and Verification with a Range Camera

Stefan Gächter

robots@home, November 2007

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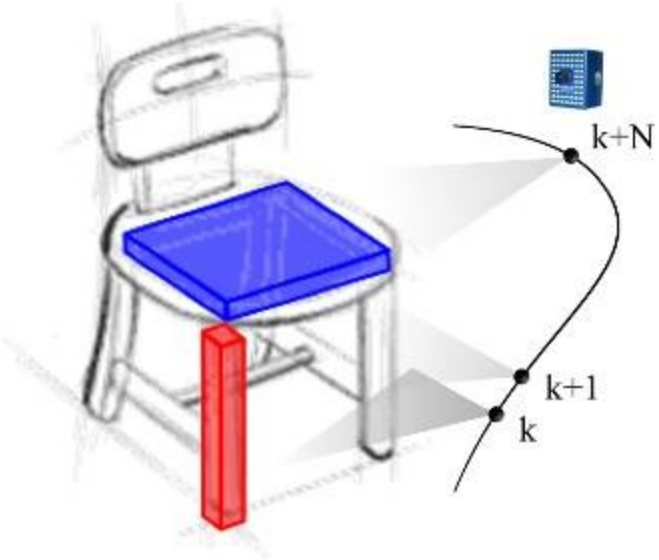
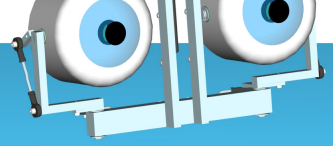
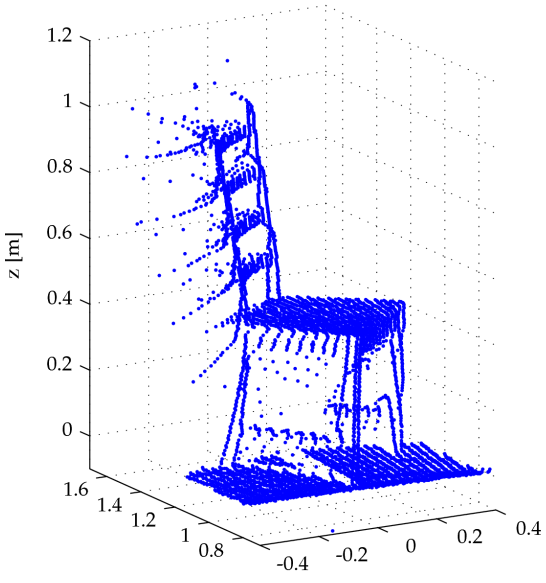
Overview



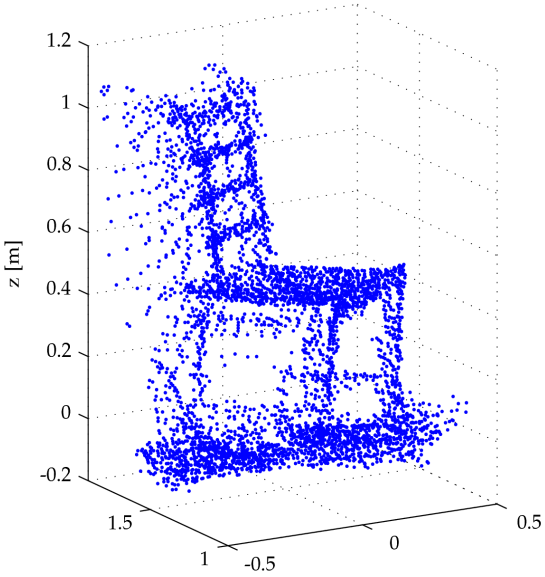
Incremental object structure detection and verification.

Range Camera
Context

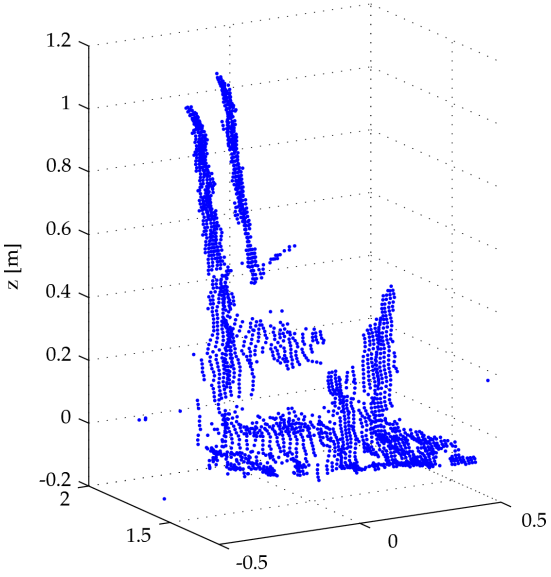




Laser Scanner



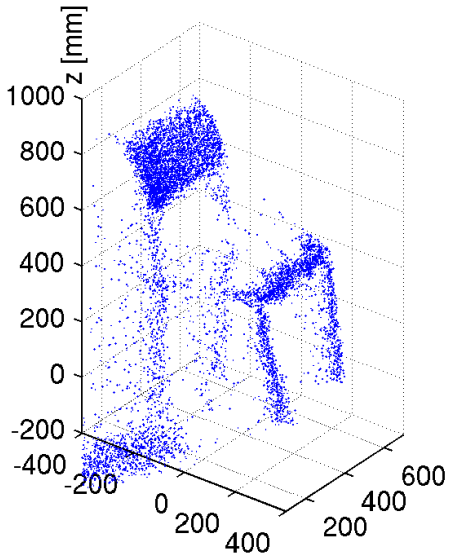
Range Camera

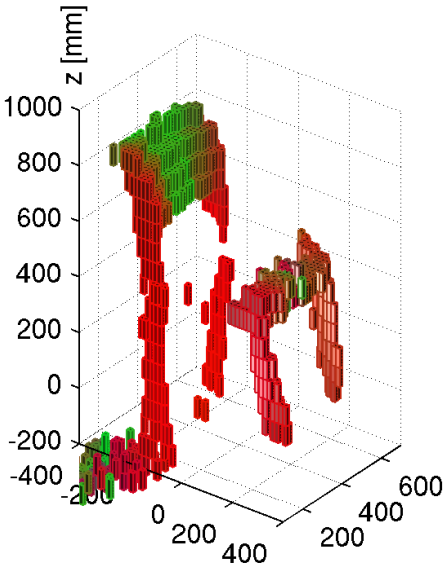


Stereo Camera

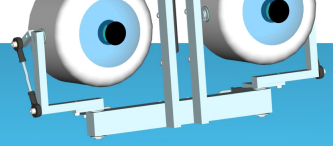
Quantization

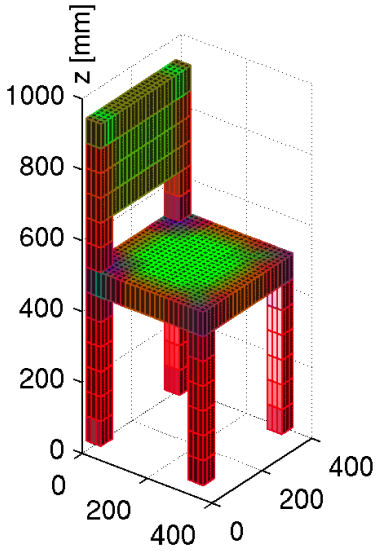
Voxel Set



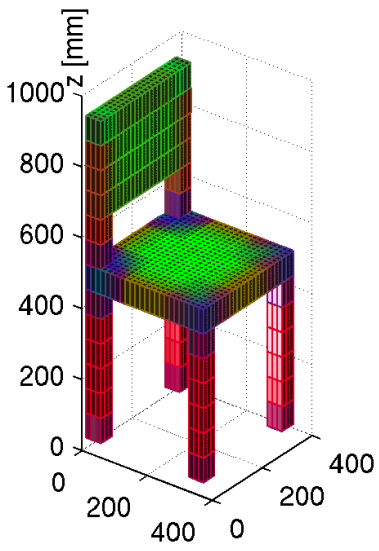


Shape Factor
Comparison

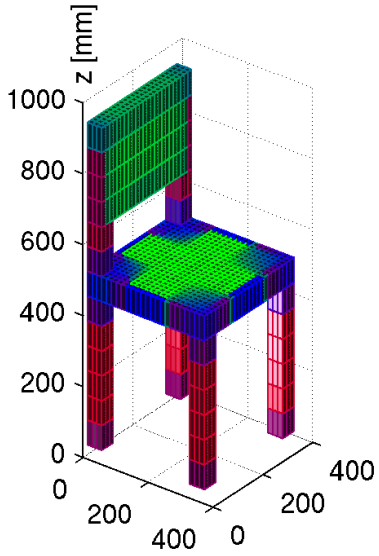




Maximum



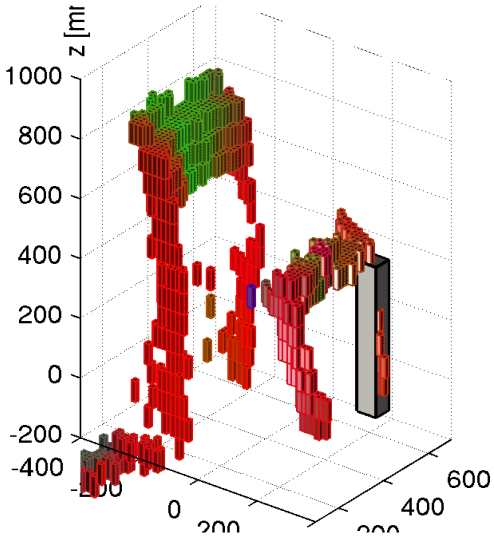
Sum

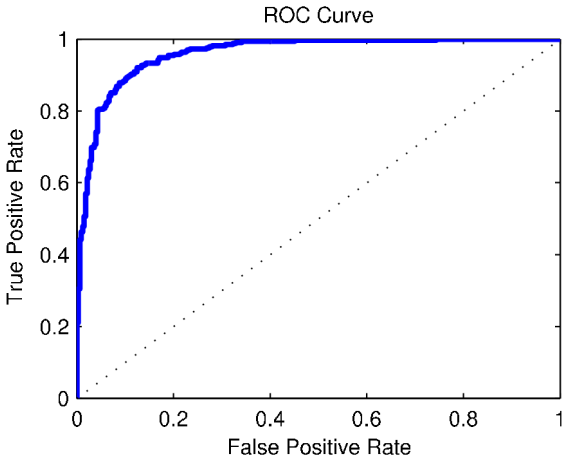


Volume

Object Part

Bounding Box with Shape Factor Histogram

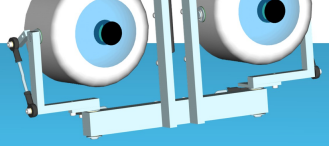


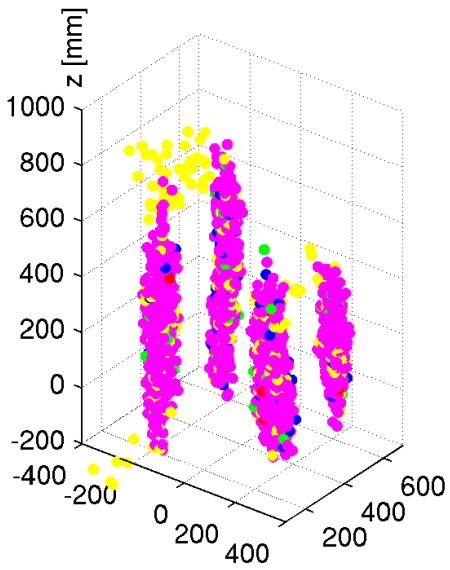


SVM Classifier

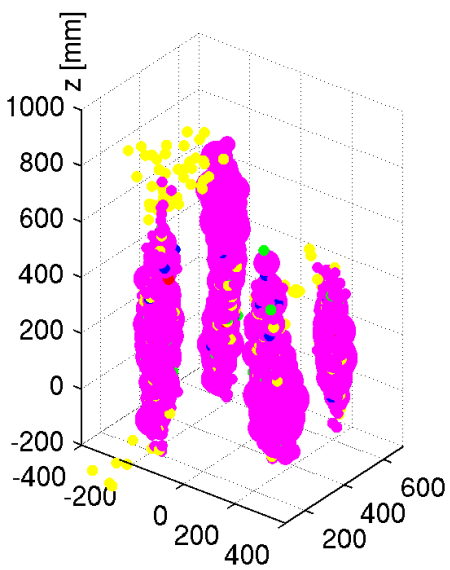
Part Detection

Particle Filter

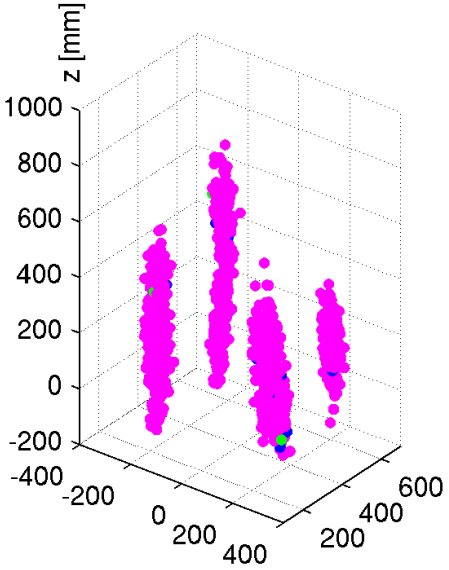




A Priori

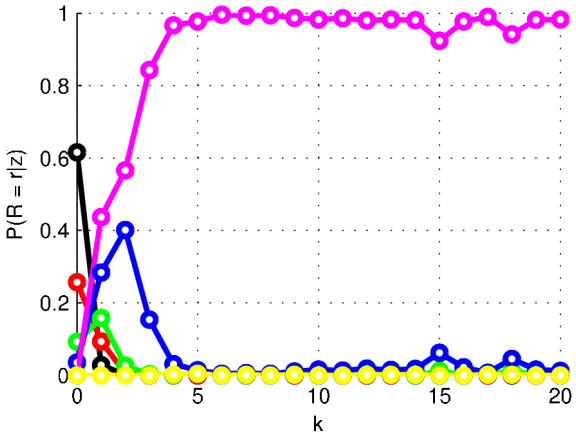


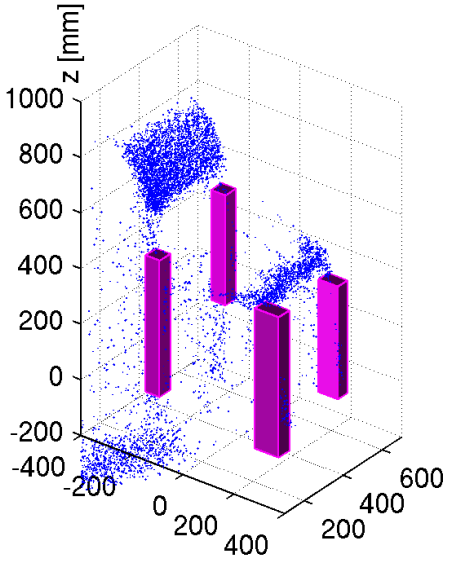
Observation



A Posteriori

Result
Part Estimation





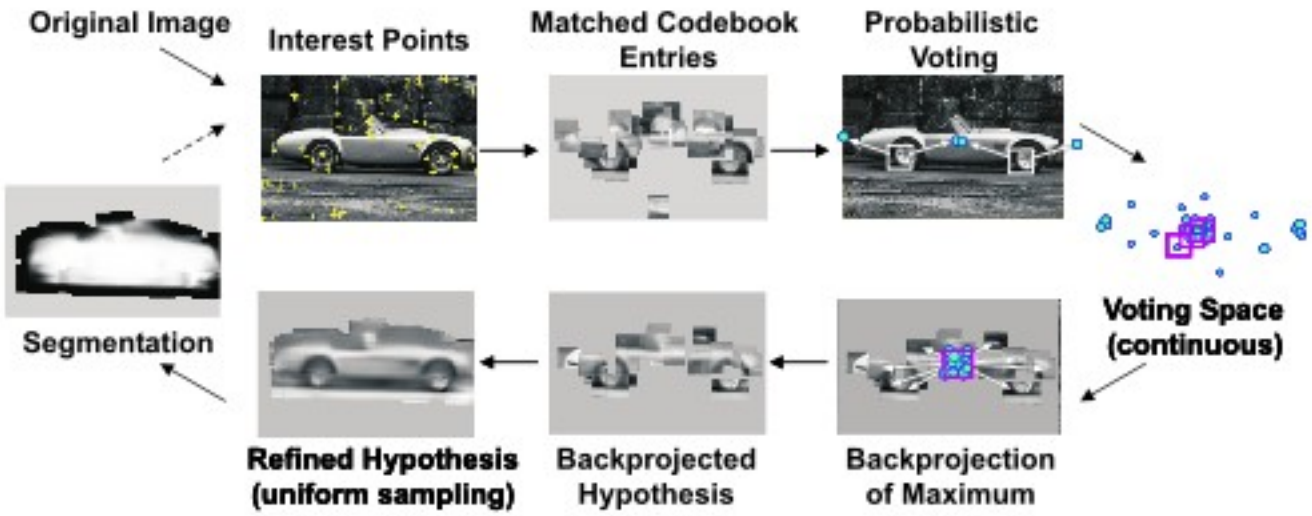
Part Number Probability

Structure Verification

Probabilistic Grammar / Implicit Shape Model

Probabilistic Grammar – Next Presentation

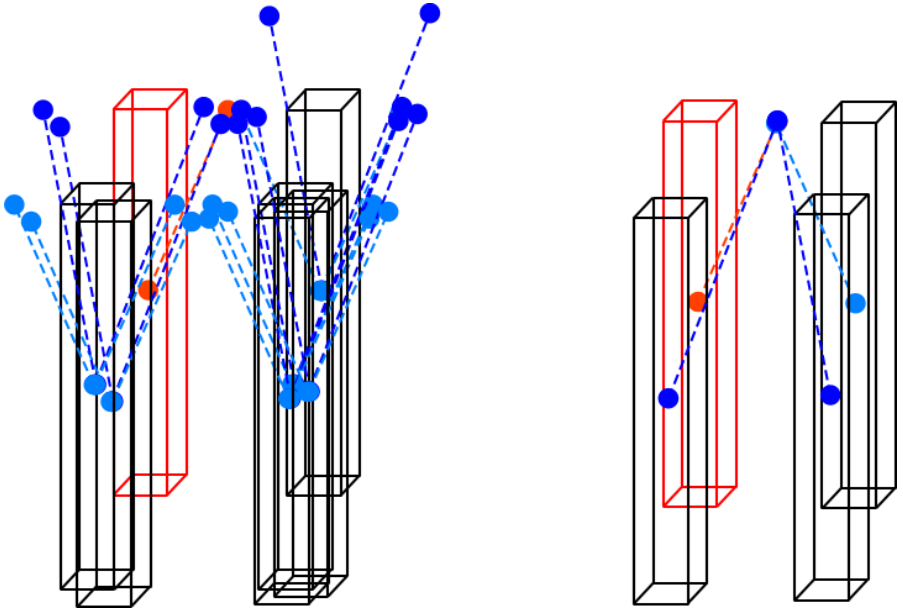
Implicit Shape Model



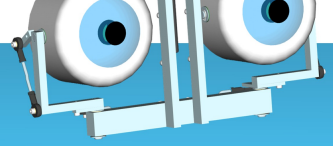
Leibe and Schiele, BMVC 2003

Implicit Shape Model

Example in 3D



Conclusion



- Conceptually the object part detection works, but for practical application, it needs a lot more development.
- Needs further theoretical investigations, if the estimation can be simplified.
- Global constraint for structure verification will be added to cope with clutter and missing parts.
- Probabilistic grammar and implicit shape models will be further investigated.