

Structured Light in Matlab

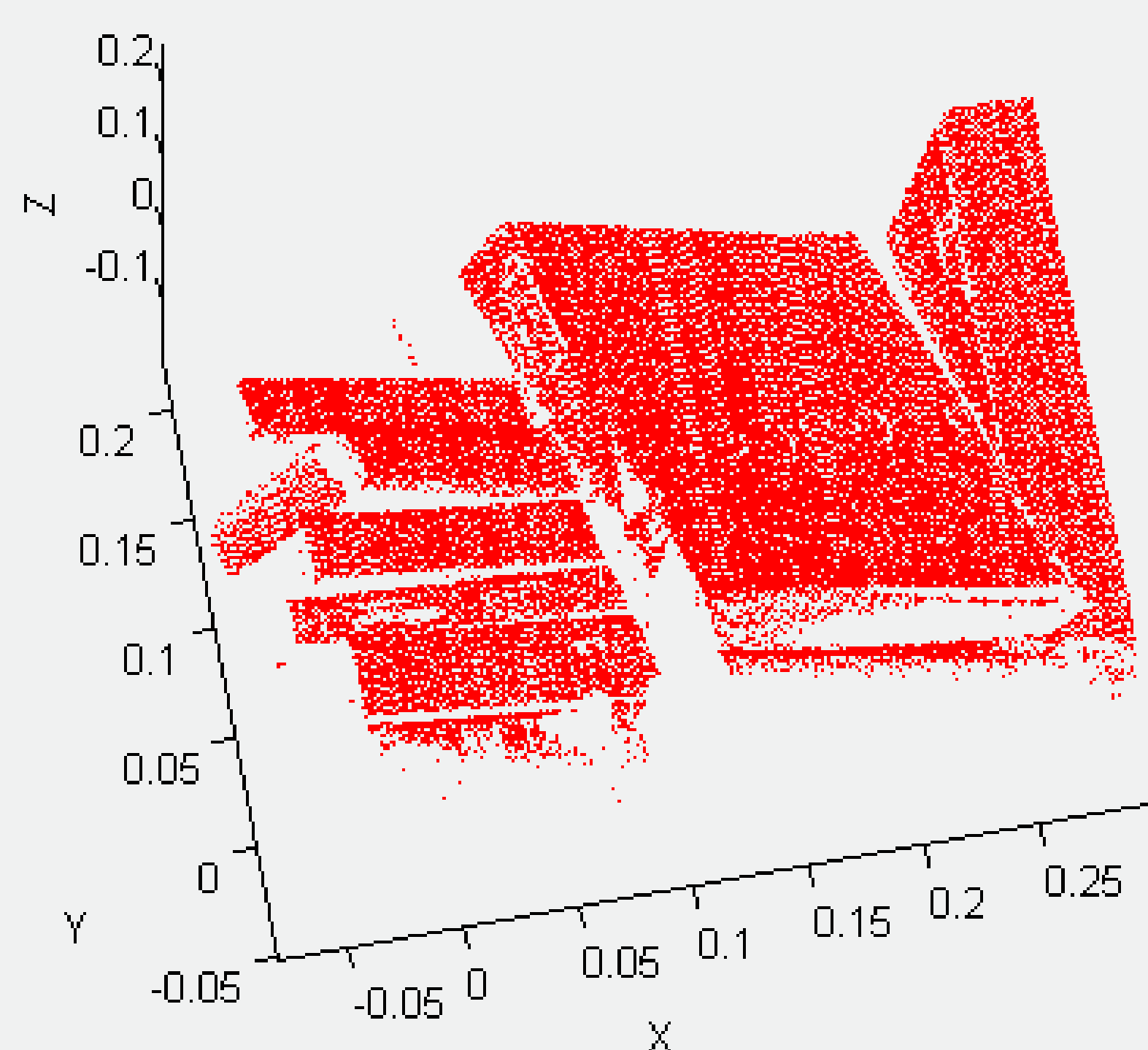
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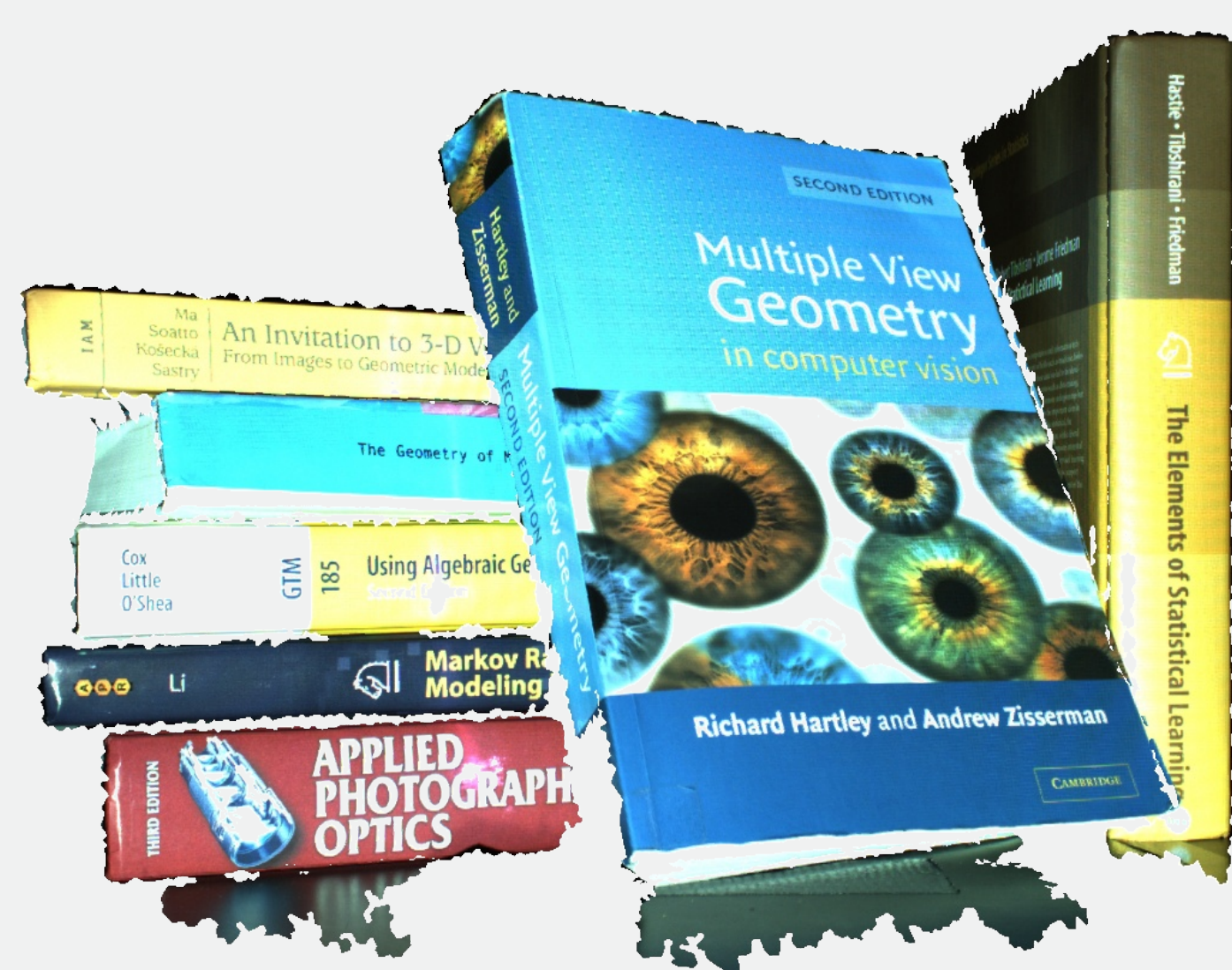


Scan-data from a structured light 3D scanner has been used to reconstruct the above 3D point cloud in Matlab.

To create a 3D model of an object by use of computer stereo vision, two images of the object is required where correspondences in the two images are known. By use of gray encoded structured light, these correspondences can be found automatically and furthermore the setup for the 3D scanner consists only of a camera and a projector. When the 3D model has been reconstructed UV-mapping can be used to map texture onto the surface of the model.

Texture mapping

To increase the visualization of the model, UV-mapping has been used to add texture to the surface of the model. The surface has been reconstructed from the 3D point cloud by use of MRFSurface which has been developed by Postdoc Rasmus Paulsen, IMM DTU. The information for the model has been exported to a VTK-file and can thus be loaded into a various number of 3D application including Sumatra, which has been used to visualize the model below.



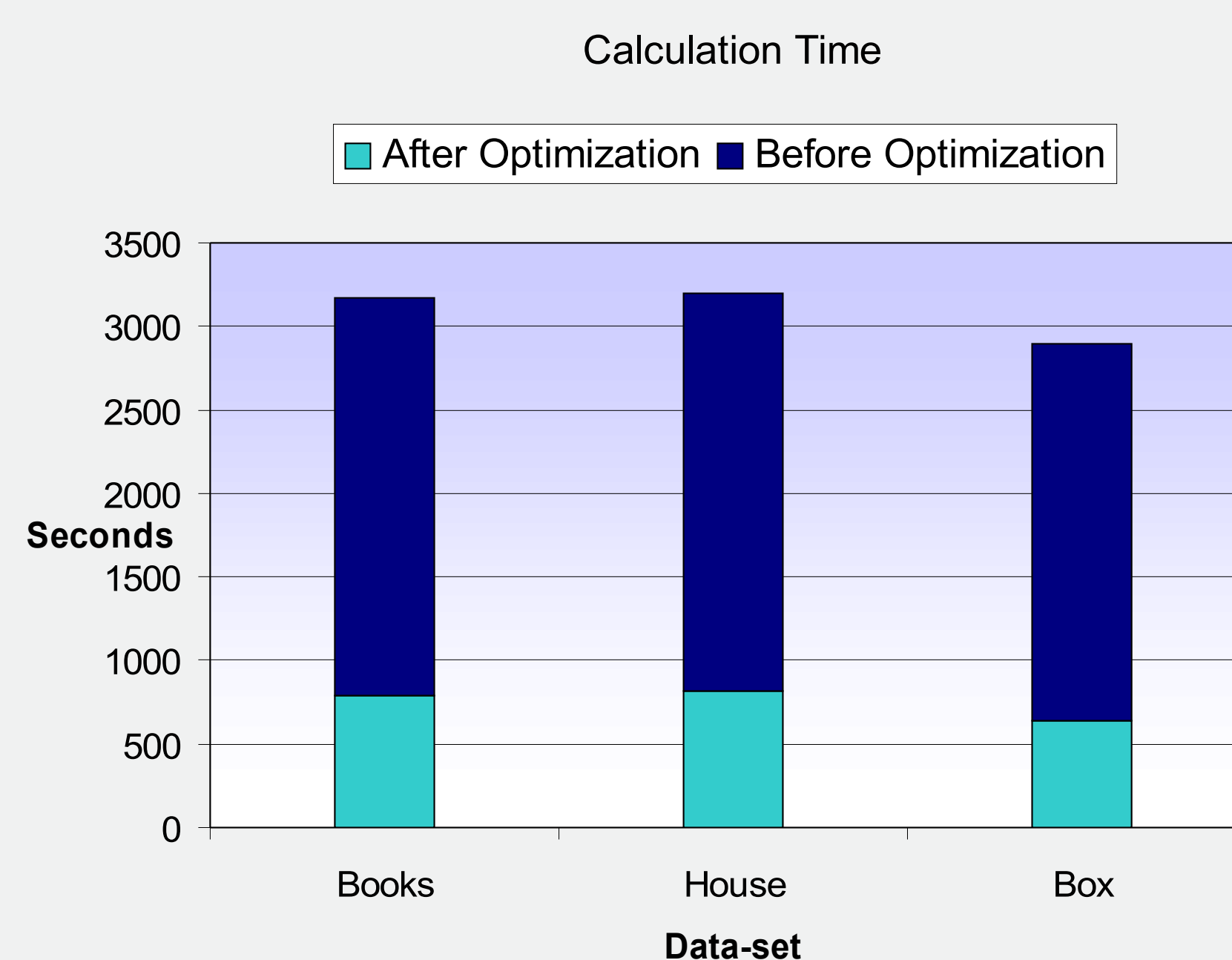
Surface reconstructed and texture-mapped model by use of MRFSurface and UV-mapping.

Optimization

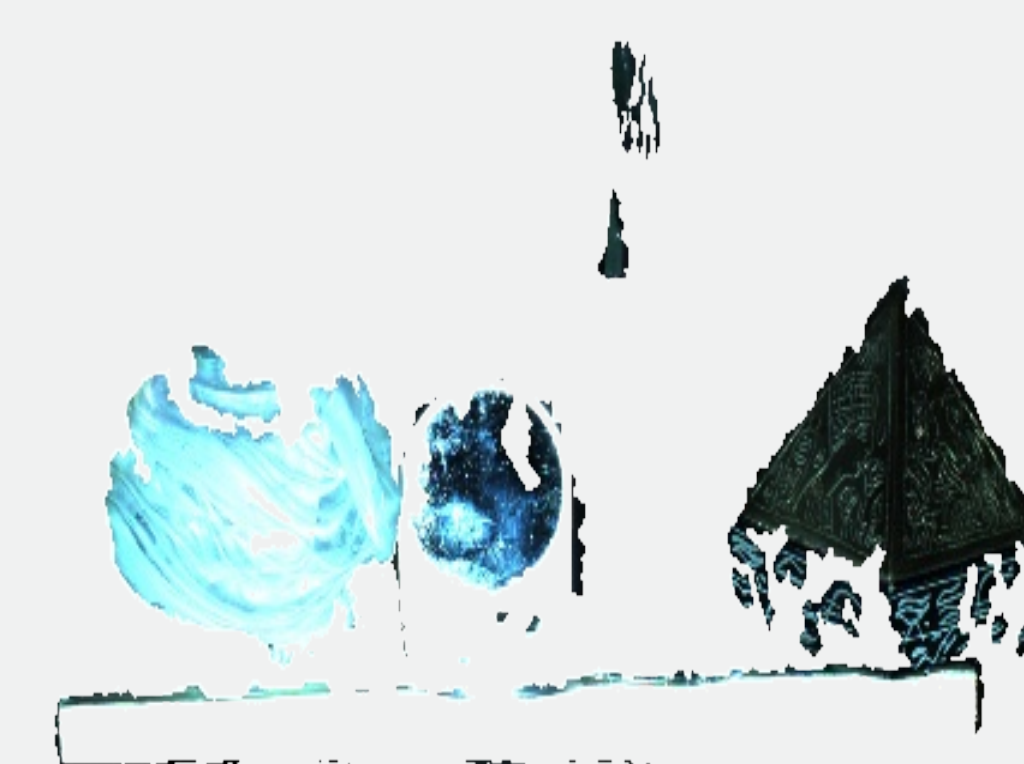
The implementation used to reconstruct the 3D point cloud from the scan-data has been optimized with respect to calculation time.

This has been possible by use of preprocessing of the scan-data and vectorization and simplification of existing functions.

The overall calculation time has been decreased with a factor of 4 which can be seen by testing 3 datasets.



Reduction in calculation time for the reconstruction of the 3D point for three different datasets.



Objects such as glasses or mirrors will result in erroneous 3D reconstructions, because the concept of the reconstruction-technique is to achieve information from the structured light.

Object constraints

Because the reconstruction of the model is dependent on the structured light, this give rise to some constraints for the object.

If the object is transparent or has perfect reflection this will result in missing or erroneous points as seen for the reconstruction above