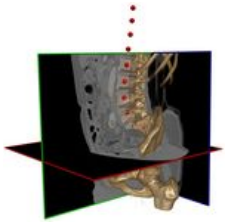
Annotated Spine CT Database for Benchmarking of Vertebrae Localization and Identification

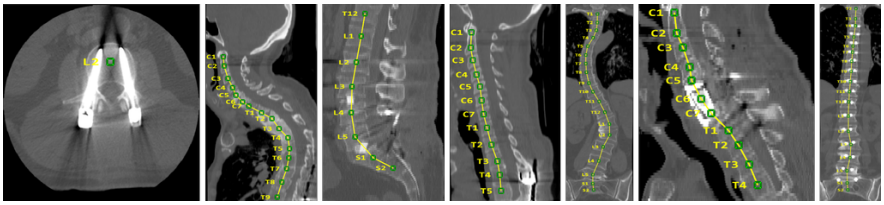


Accurate localization and identification of vertebrae in spinal CT imaging is important for many clinical tasks such as diagnosis, surgical planning, and post-operative assessment. Clinical datasets raise many difficulties for automatic methods. These arise from the frequent presence of abnormal spine curvature, small field of view, and image artifacts caused by surgical implants. To facilitate the advance of research on this topic, we provide a database of 242 annotated spine CT scans.

Data Description

- The database consists of spine-focused (i.e. tightly cropped) CT scans of adult patients (older than 18) with varying types of pathologies. These include abnormal curvature, such as high grade scoliosis and kyphosis, fractures, and numerous post-operative cases where surgical implants are causing severe image artifacts. The images have a varying field of view such that different images capture different parts of the spine depending on the pathology. In a few scans the whole spine is visible, while in most scans the view is limited to 5-15 vertebrae.
- The data has been acquired at the *Department of Radiology, University of Washington, Seattle, USA*
- Images were acquired with General Electric multidetector CT scanners with varying slice thickness and a standard bone algorithm.
- The data release is provided by the *Medical Imaging Initiative, Microsoft Research Connections* and the *Medical Image Analysis Group, Microsoft Research Cambridge, UK*
- The database currently consists of **125 patients**. For most patients, multiple scans from longitudinal examinations are available, resulting in overall **242 scans** in the database.
- Image data is provided in **MetaImage file format** (mhd/raw).
- The database is organized into individual patient folders with subfolders for each scan (from possibly different time points). Each scan is named with a unique 7-digit identifier.
- More detailed information about the individual scans is available in the following excel file.

Annotations



- In each scan, the centroids of the vertebral bodies have been manually annotated. Annotations are provided in text files which are located next to the image data.
- Although annotations have been done carefully, they might contain errors. If you spot an error in the centroid annotations, please send us a note together with the 7-digit scan identifier.
- Matlab code for reading/writing annotation files is provided HERE.

Comparison to Results of our MICCAI 2013 Paper

To enable a comparison to our results from the MICCAI 2013 paper we state below the specifics for the testing procedure used in that work:

- 2-fold cross-validation was performed, i.e. the results on data from fold 1 were obtained after training the method on fold 2, and vice versa.
  The following folds were used: fold1-miccai2013.txt, fold2-miccai2013.txt (subset of the data release here).
- The LML-files with the results from MICCAI 2013 can be found HERE.

Terms and Conditions

- If you use the database for publication of any kind, please reference the following paper:

  Ben Glocker, Darko Zikic, Ender Konukoglu, David R. Haynor, and Antonio Criminisi
  Vertebrae Localization in Pathological Spine CT via Dense Classification from Sparse Annotations
  International Conference on Medical Image Computing and Computer Assisted Intervention (2013)

- This data is intended for research purposes, and is provided for non-commercial use only. By downloading the data, you accept the license agreement.

People Involved

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Download

By downloading the data, you accept the terms and conditions above.

- DATA (in sets of 25 patients, each set is approximately 2-2.5 GB large)
  - DATA SET 1
  - DATA SET 2
  - DATA SET 3
  - DATA SET 4
  - DATA SET 5
- DATA INFO
- MATLAB CODE
- MICCAI 2013 RESULTS

Acknowledgement

This data release has been supported by the Microsoft Research Connections Medical Imaging Initiative.

Publications

- Ben Glocker, Darko Zikic, Ender Konukoglu, David R. Haynor, and Antonio Criminisi, Vertebrae Localization in Pathological Spine CT via Dense Classification from Sparse Annotations, in *MICCAI 2013 - 16th International Conference on Medical Image Computing and Computer Assisted Intervention*, Springer, September 2013