

Automated Segmentation of Microtomography Imaging Using Machine Learning

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X-ray microtomography using synchrotron radiation can be used to capture volumetric scans at high resolution, and can image soft tissues in the absence of contrast agents thanks to the phase contrast effect. One application is in Egyptology, where animal mummies are scanned and manually segmented into textiles, organic tissues, balm resin, ceramics and bones [1]. This process is very time consuming, taking several weeks even for a small animal mummy.

In the ASEMI (Automated SEgmentation of Microtomography Imaging) project we are developing artificial intelligence techniques to automatically segment volumetric microtomography images, labelling textiles, organic tissues and bones. We use features that combine the voxel intensity, 3D texture and shape to determine the class of every voxel while enforcing continuity across slices. The objective of this approach is to reduce the time required to segment a volume from a few months to a few days or even hours. This would enable the analysis of several related artefacts from museum collections, which is currently not possible for practical reasons. In this presentation we report on our progress to date, showing examples of our automatic process, an analysis of the principal challenges, and our plans for further work.

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References

[1] Porcier S M, Berruyer C, Pasquali S, Ikram S, Berthet D and Tafforeau P. *Wild Crocodile Hunted to Make Mummies in Roman Egypt: Evidence from Synchrotron Imaging*. Journal of Archaeological Sciences. 2019; 110:105009