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Letter to the Editor

3D reconstructions from CT-scans on smartphones and tablets: a simple tutorial for the ward and the operating room using public domain softwares

short title: 3D reconstructions on portable devices

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Abstract

Handling 3D reconstructions from CT-scans on portable devices is problematic due to the size of the DICOM stacks. Here we provide a user-friendly method allowing the production, transfer and sharing of good quality 3D reconstructions on smartphones and tablets.

Keywords

3D reconstruction; CT-scan; portable device; public domain

Text

3D reconstructions based on DICOM files from medical CT-scans are difficult to transfer between users and to handle on portable devices due to their size. Here we provide a simple and user-friendly method that allows the conversion of a stack of DICOM files into an STL file weighing less than 3 MB. The process does not require specific skills, is not time-consuming and only involves public domain softwares available for free online. This method provides a suitable solution for the straightforward visualization of 3D CT-scan reconstructions during ward rounds or in the operating room.[1] Due to the decrease of image quality during compression, this method is not suitable for primary diagnosis but mainly for teaching purposes and patient education.

Medical CT-scans were uploaded on OsiriX (version 5.7, 32-bit, open source)[2] on an Apple iMac desktop. 3D surface renderings were produced and exported as STL files. The initial DICOM stack of files was cropped if required using the Scissors function on 3D volume renderings before producing 3D surface renderings. Meshlab (version 1.3.2, 64-bit, open source) was used to open the STL file and export it under the compressed CTM format. The final CTM could be attached to emails or transferred directly to portable devices using USB connections. Meshlab application was used to open the CTM file on the portable devices.

A tutorial video showing the file transfer process was displayed to 5 residents in surgery. from our department. Residents then applied the process to 5 head and neck medical CT-scans. The duration of the file transfer process was measured and the size of the CTM file was recorded.

The file transfer process took on average 159.76 sec. (+/- 78.9 sec.). The ratio between the size of the STL file exported from OsiriX (201.81 Mb +/- 74.19 Mb) and the final CTM file (5.12 Mb +/- 1.68 Mb) was 40.22 (+/- 3.45).

3D reconstructions on portable devices facilitate discussions on difficult cases and can be used for education, before, during and after surgery.[3,4] Previous reports have described the use of OsiriX and similar programs to produce and export 3D files from DICOM stacks into various

formats.[5] Here we provide a user-friendly method that allows the display and handling of 3D reconstructions from CT-scans on portable devices by producing files 40 times smaller than the raw data. This method aims to support maxillofacial surgeons working in teaching hospitals in their everyday practice.

References

1. Sclafani J, Tirrell TF, Franko OI: Mobile tablet use among academic physicians and trainees. J Med Syst 37:9903, 2013

2. Rosset A, Spadola L, Ratib O: OsiriX: an open-source software for navigating in multidimensional DICOM images. J Digit Imag 17:205, 2004

3. Dala-Ali BM, Lloyd MA, Al-Abed Y: The uses of the iPhone for surgeons. Surgeon 9:44, 2011

4. Murphy AD, Belcher HJCR: A novel method for sterile intra-operative iPad use. J Plast Reconstr Aesthet Surg 65:403, 2012

5. Phelps A, Naeger DM, Marcovici P: Embedding 3D radiology models in portable document format. AJR 199:1343, 2012

Legend of figures

Figure 1. Final CTM file visualized on a portable device using the Meshlab application (available for free download).

Conflicts of Interest

No conflict of interest.