

Case Study: Temporal Bone Structure Segmentation by a Team of Otolaryngologists



Client Profile

Industry: Scientific Research Location: California, USA Size: 10K+

Company Bio

Our client conducts research in the medical field to study, predict, and prevent different types of pathologies.

Overview

A team of otolaryngologists needed to create a temporal bone structure segmentation. The following temporal bone structures needed to be marked for 3D printing and further research: the carotid arteries, facial nerves, inner ear (cochlea, vestibule, semicircular canals), ossicles, and sigmoid sinuses. To complete this task, 500 CT scans had to be annotated. Each structure had to receive a different label and color for multiclass segmentation.

Our project was complex given the volume of CT scans that had to be annotated and the quality of the CT scans themselves. Mindy Support saved us a lot of time by automating the annotation process and getting everything done on a tight schedule.

> — Client Professor, MD

Target Time for Each CT scan	Volume, scans	Structures to be Segmented	
40 min	500	2,500	

Challenge

The biggest challenge was to segment structures in poor quality CT scans. Poor quality resulted in the absence of clear boundaries between the cranial dura mater and sigmoid sinuses in the images to segment the sigmoid sinuses, making the process longer and more complicated. As the volume of scans was large and the deadlines were tight, the team could not afford to label each CT scan for hours. They had to find a solution to process the scans faster and with high accuracy.

Human Resources

Mindy Support involved three otolaryngologists with 3+ years of medical experience each and provided one dedicated project manager.



For this particular case, we decided that 3D Slicer was the most suitable tool for 3D segmentation. 3D Slicer is a software platform for the analysis (including registration and interactive segmentation) and visualization (including volume rendering) of medical images and for research in image guided therapy. The tool supports multimodality imaging including MRI, CT scans, and nuclear medicine, and microscopy.



Solution Process

- To better visualize and segment the structures, we restored each CT scan using a multiplanar reconstruction (MPR) technique.
- The Mindy Support Operations Department provided training to our medical team on how to segment structures in the fastest way using 3D Slicer. Our dedicated otolaryngologists accurately segmented temporal bone structures, resulting in 500 3D models.
- The data was checked by a senior radiologist and sent to the client in NRRD format.

WE GET IT DONE



Results

- Cost efficiency 84%
- Accuracy of segmentation 99%
- Segmented structures 2,500



Mindy Support is ISO 9001 certified. Our information security management system (ISMS) is built on the basis of ISO 27001:2013 international standards, which help organizations keep information assets secure.

GDPR

We are committed to respecting all rights of data subjects under the General Data Protection Regulation (GDPR) (EU) 2016/679. According to Article 28 of the GDPR, the relationship between data controllers and data processors is regulated by a Data Processing Agreement, which we put in place with every client.

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About Mindy Support

Mindy Support is an international brand with five offices across Ukraine. Since 2013, Mindy Support has been empowering companies all over the world by providing cost-efficient business process outsourcing with no compromise on quality. We build effective teams in customer care, marketing, sales, research, data processing, and annotation as well as provide back-office support for businesses of all sizes.

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