

Master Thesis

# Analysis of Shapes of Ear Canals

## Weekly Report 1

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### Literature

***Hint:** Try to write this section so it can be used directly in your Previous Work chapter in your thesis.*

Surface reconstruction from unorganised points has been an active research area for the last decade. One technique is developed by Hugues Hoppe in 1994 [2]. It is based on a signed 3D-distance transformation of the point cloud. The result of the distance transformation is a voxel volume where the value of each voxel is the distance to the nearest point. The surface can then be reconstructed by extracting the zero-value contour of the voxel set. A standard method to perform this contouring is the marching cubes algorithm [3].

Several methods of reconstructing surfaces are based on the 3D Delaunay triangulation of the input points. A recent method called the Power Crust is using the medial axis approximation given by a pruned Voronoi diagram called the power diagram [1].

### What has been done this week

***Hint:** Try to write this section so it can be used directly in your thesis. Also use drawings and figures.*

The data consists of laserscans of 30 ear impressions. The ear impressions are scanned using a 3Shape S-200 laser scanner. An ear impression and the corresponding laser scan can be seen in figure 1.

### Project status according to the study plan

According to the plan, the scanning of the ear impressions should have been completed last week. However, it took longer than expected and therefore the

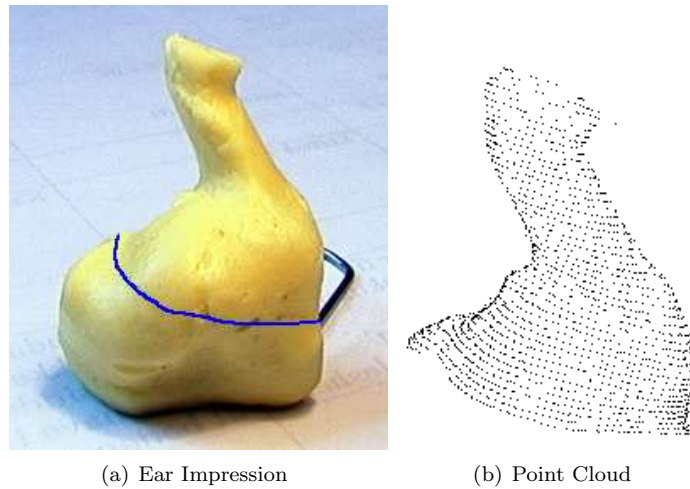


Figure 1: An ear impression and the corresponding point cloud. For clarity only the points on the visible surfaces are shown. The blue line on the ear impression corresponds to the lowest samples of the point cloud.

project is delayed one week.

## Plan for the next weeks

1. Scanning of ear impressions
2. Surface reconstruction
3. Initial 3D alignment

## References

- [1] N. Amenta, S. Choi, and R. Kolluri. The power crust. In *Proc. ACM Symposium on Solid Modeling*, pages 249–260, 2001.
- [2] H. Hoppe. *Surface reconstruction from unorganized points*. PhD thesis, University of Washington, Department of Computer Science and Engineering, June 1994.
- [3] W. E. Lorensen and H. E. Cline. Marching cubes: A high resolution 3D surface construction algorithm. *Computer Graphics (SIGGRAPH '87 Proceedings)*, 21(4):163–169, July 1987.