Data acquisition and post processing of MRI data from upper airways

Antti Ojalammi & Doc. Jarmo Malinen

Aalto University School of Science Department of Mathematics and Systems Analysis

http://speech.math.aalto.fi

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Vocal Tract Anatomy





As a Filter



Vocal tract, [u]



As a Filter



Vocal tract, [u]



Introduction

Vowels



Finnish vowels

Magnetic Resonance Imaging

Data Acquisition



MRI machine

- Non-intrusive, safe 3D imaging.
- VT geometry automatically extracted from the sequence.



Head coil



Sagittal plane

Sound in MRI



Collecting speech and noise



Faraday cage

Pipeline





Need to separate osseous tissue from air





- Data isn't always perfect (noise + movement artefacts)
- MRI sequence must be carefully chosen



Lower parts of VT not discernible



PerfectTM





Original



Edge enhancement + contrast

 Create a crude but high-contrast version (final extraction using the original image)

Extraction Method



Block tooth cavities using iterative smoothing

Extraction

Method (2)



Smoothing + tresholding



Masking



Isosurface extraction



Surface smoothing



Verification

Teeth Alignment



Markers visible in MRI data



Dental mould with markers, CT scanned

Conclusions

- Surprisingly adaptive method
- ... yet still rudimentary
- Training an extractor using existing data?



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Collaborators:

Department of Mathematics and Systems Analysis, Aalto University School of Science, Department of Signal Processing and Acoustics, Aalto University, Institute of Behavioural Sciences, University of Helsinki, Department of Oral and Maxillofacial Surgery, University of Turku, Department of Oral and Maxillofacial Diseases, Turku University Hospital, and Medical Imaging Centre of Southwest Finland at Turku University Hospital.