

Timesaving features of AAA

Tongue and hyoid tracking, shape measures and exporting data

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Background: The Articulate Assistant Advanced (AAA) application was first released in 2003. It is modelled on the earlier Articulate Assistant software interface but differs in that it uses a database to manage the synchronization and simultaneous analysis of many different types of data stream. These include speech audio, Electropalatography (EPG), raw ultrasonic data, video from NTSC camera, ultrasound, MRI or X-ray, AG501 electromagnetic articulography (EMA), VICON and an experimental prototype photoglottograph (PGG). The aim of the software is to facilitate multichannel speech production data recording and analysis, shrinking the time required to analyse such data from weeks to hours while not compromising on accuracy. To gain an insight into speech production and speech motor control it is desirable to visualize the patterns of movement of the tongue, lips, jaw, velum and glottis together. Historically, it has been very difficult to record them all simultaneously. The goal of continuously improving the AAA application is to advance the field of speech science by allowing this to be practically achieved.

Methods: As might be expected from an application that has been continuously developed for 17 years there are a huge number of features, included at the request of users. These can be broadly assigned to the following categories:

- Useability – e.g. screen setups, hotkeys, automation.
- Prompting options – text, picture, sound and video prompts, delayed prompting, separate display prompting.
- Recording options – Short duration and continuous.
- Labelling – e.g. searchable annotations, automatic feature finding.
- Objective data extraction – Manual and automatic tongue and hyoid tracking, freeform and fan-based splines.

- Analysis measures – e.g. formants, tongue shape measures, averaging, velocity, acceleration, smoothing etc.
- Compatibility – e.g. importing and exporting to PRAAT, Exporting to MATLAB & R, importing video.
- Plotting – 2D or 3D plots of analysis values including EMA sensors, spline workspace for comparing tongue shapes.
- Data export – exporting analysis values at a choice of timepoints withing labelled segments.
- Presentation – publisher tool for high resolution image creation, movie creation.
- Live processing – e.g. contour tracking on live display, vocal tract carving.

By far the most popular current use for AAA is the recording and analysis of ultrasound data. Ultrasound data takes two distinct forms. Either a video stream recorded from an NTSC device or imported from a video file. Or an ultrasonic raw scanline data stream recorded from an Ultrasonic, EchoB, Micro ultrasound system (also in preparation a new high resolution Art system). The raw data format is much more efficient to store and process, leading to faster automatic contour tracking than with video.

Results and discussion: This presentation will cover the basics of recording and analysing ultrasonic data including tracking the tongue surface contour, hyoid and mandible, applying spline averaging and shape measures such as the Dorsum Excursion Index (Zharkova, 2013), labelling and exporting data.

References:

Zharkova, N. (2013). Using ultrasound to quantify tongue shape and movement characteristics. *The Cleft Palate-Craniofacial Journal*, 50, 76-81.

Keywords:

- Methodological research, AAA, image processing

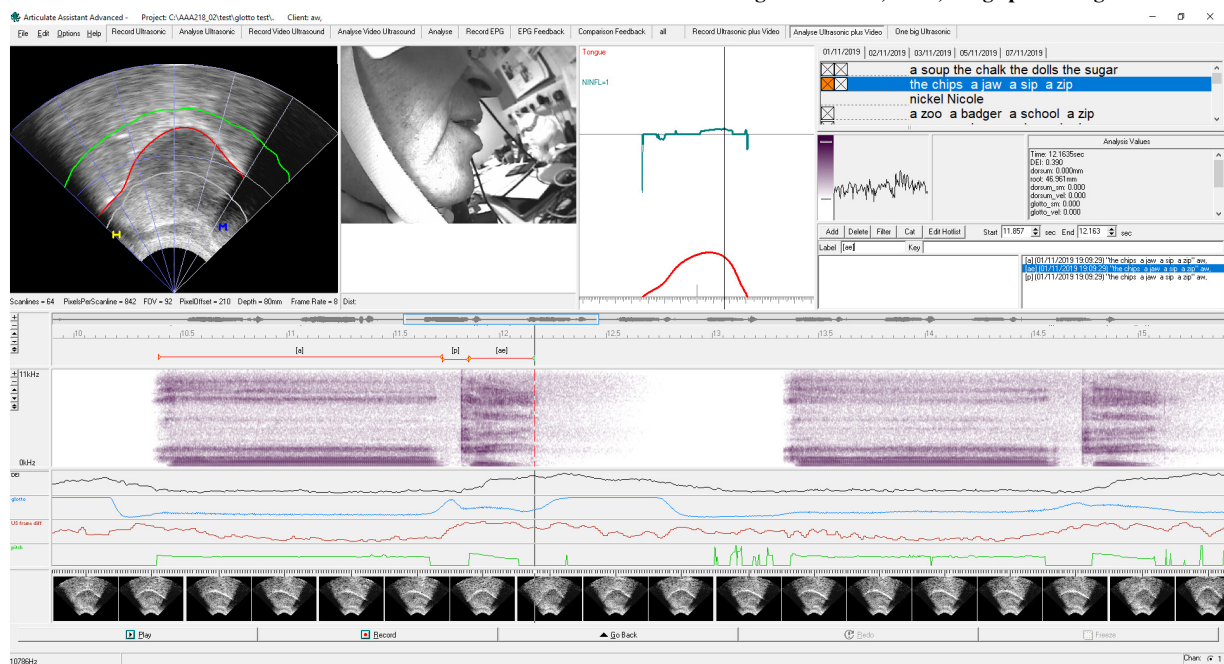


Figure 1 AAA display showing Ultrasound, Video and acoustic signals along with tongue contours and extracted analysis values.