



SonoSpeech™ User Guide

Version 2.20.04

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1 INTRODUCING THE SONOSPEECH™ APPLICATION

SOFTWARE FEATURES

- **Simple data management.** The software automatically manages files, grouping files according to client and session without the need to open, save or name individual files.
- **Client-based.** Each client's data is stored in an individual folder in an encrypted form.
- **Easy to use.** The software comes with an intuitive interface designed to be easy to operate for non-technical users. (But we are always open to suggestions to make it even easier)
- **Flexible.** The display can be configured to include only the windows that are needed for the task in hand.
- **Encouraging.** Best attempts in a previous session can be labelled and recalled to give a client the confidence that the target sound is achievable. Rewarding animations can be played after successful attempts. Symbols and colours can be chosen to mark target positions for the tongue.
- **Compatible.** Data recorded using SonoSpeech can be read by AAA software that researchers can use to study speech in more detail.

OVERVIEW

SonoSpeech™ is a full-featured interface for the Micro or EchoB ultrasound systems running on Windows 7/8/10/11. SonoSpeech™ is designed to allow Speech & Language Therapists/ Speech-language Pathologists to observe, record, review and assess ultrasound images produced by their clients.

Sonospeech™ also has features which may be helpful when using the live visual display for clinical intervention including the following:

- Overlays showing palate position and markers for where the tongue should or should not be placed.
- Pre-recorded template videos of key target sounds which may be played to demonstrate typical tongue position and movement for the target sound being treated.
- The ability to save and recall the client's own best effort from the current or previous session.
- A reward animation which can be played to provide positive reinforcement.

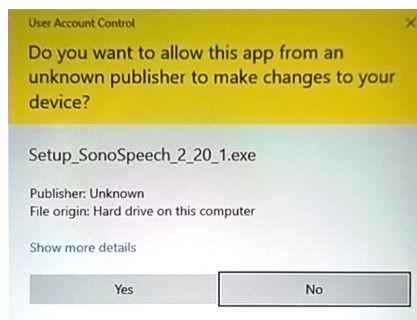
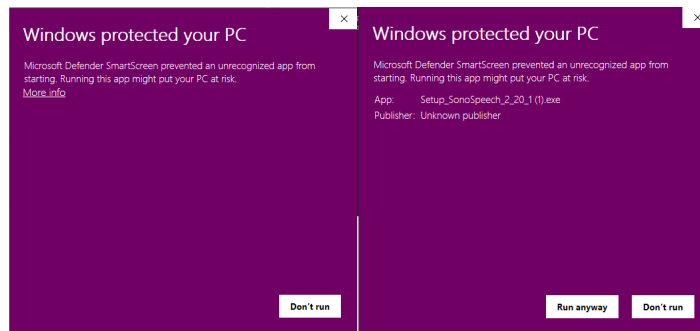
- An animated tongue contour providing a simpler display of tongue shape than the ultrasound image.

Sonospeech™ may be operated by a touch screen or a mouse whichever is most convenient.

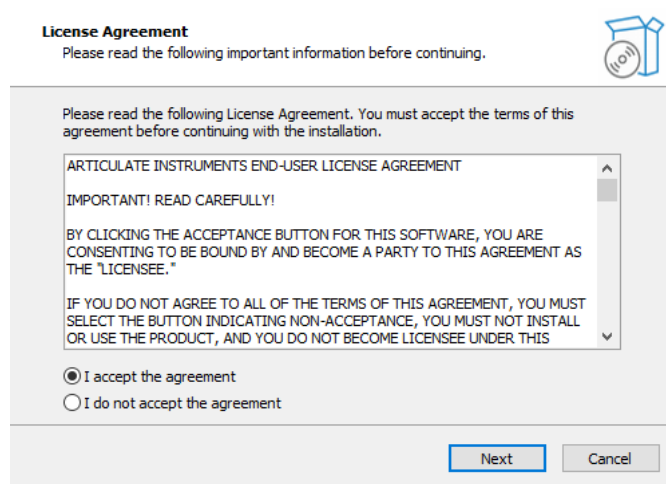
2 INSTALLING THE SONOSPEECH™ APPLICATION

To install the software, either:

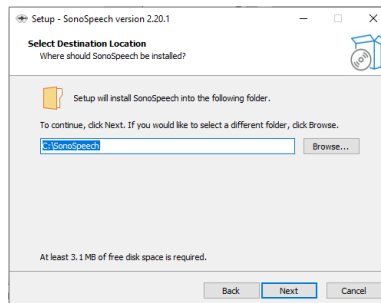
- Download and run Setup_SonoSpeech.exe from www.articulateinstruments.com/downloads/
- Run setup_SonoSpeech.exe from the Articulate Instruments flash drive supplied with Micro system
- It is recommended to close all other applications before installing as the system will automatically reboot at the end of the installation.



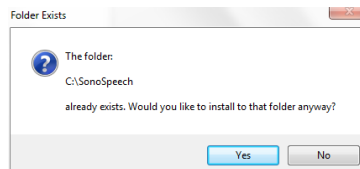
Click **Yes**



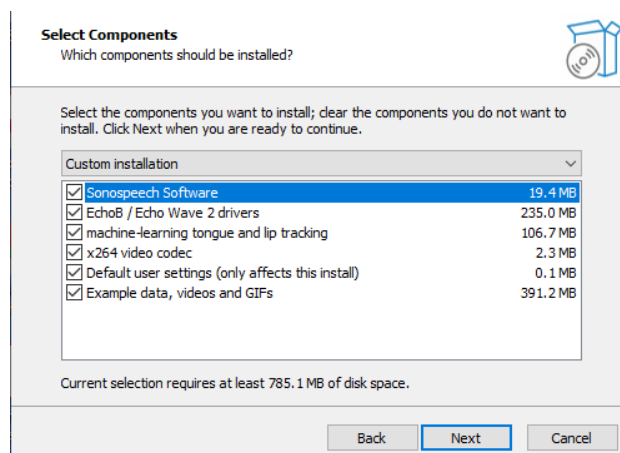
Read and accept the license agreement. Then click **Next**.



Click **Next**.

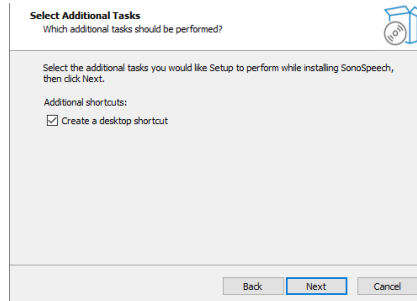


If the software is already installed, a warning will appear. To upgrade, click **Yes**. Or change the name of the folder to create an alternative installation while preserving the old one.

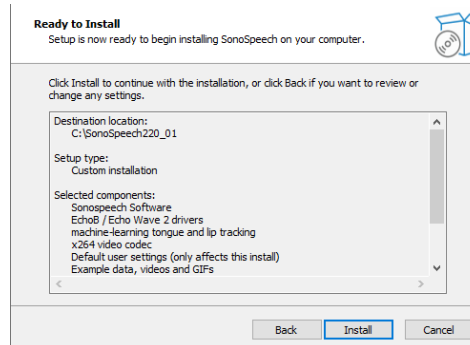


Recommended to Click **Next**.

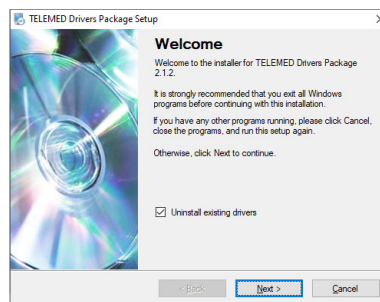
EchoB/EchoWave II drivers needed to allow Micro and EchoB ultrasound to operate. Machine Learning option will install MiniConda and DeepLabCut and is required for tongue contour estimation. The X264 codec is required to view the example videos.



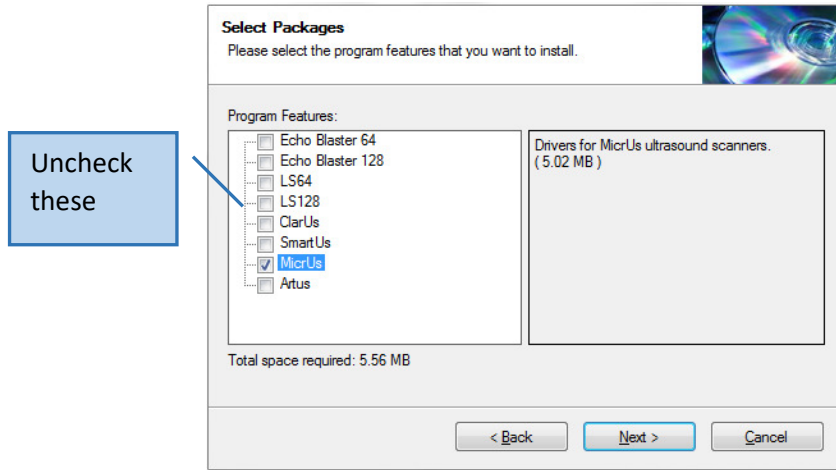
Click **Next**.



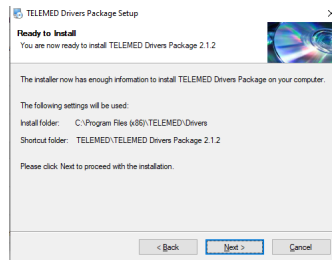
Click Install.



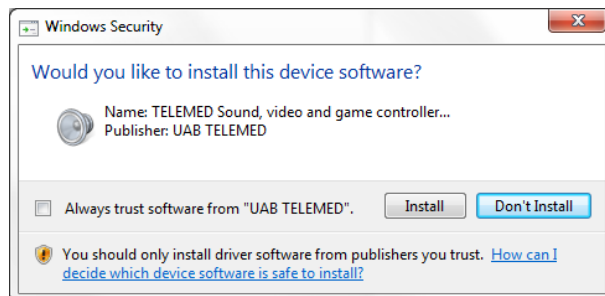
Click **Next** to install ultrasound hardware drivers.



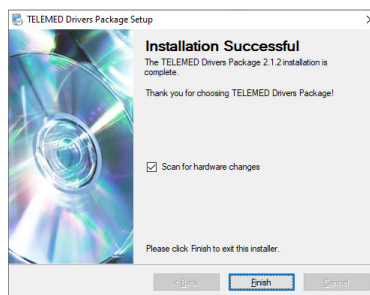
Leave MicrUS checked and **uncheck all the rest to save time** then click **Next**. If you have an old EchoB system then check “Echoblaster 128”



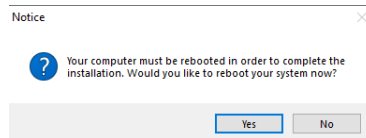
Click **Next**.



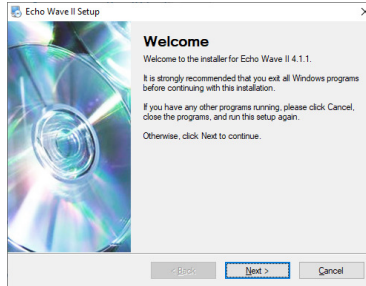
This message may appear several times. Click **Install** each time.



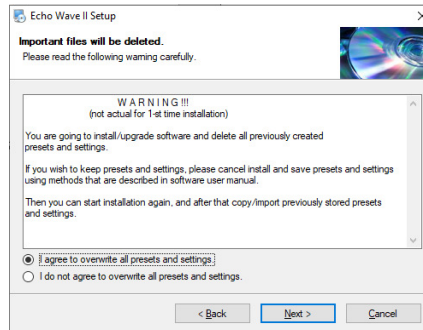
Click **Finish**.



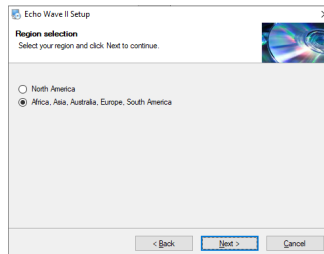
Click **No** The installer will reboot your computer after the full installation has completed.



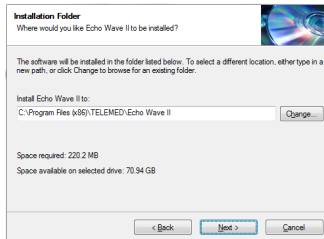
Click **Next** to install the default software that comes with the Micro system.



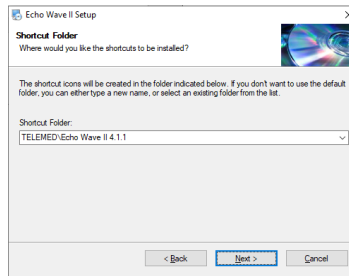
Agree to overwrite all presets and settings and click **Next**.



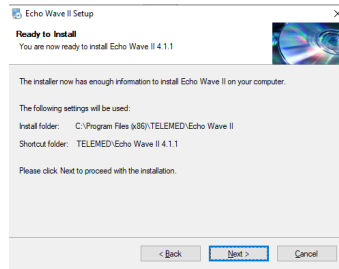
Select Region and click **Next**



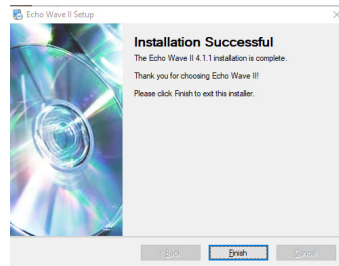
Click **Next**.



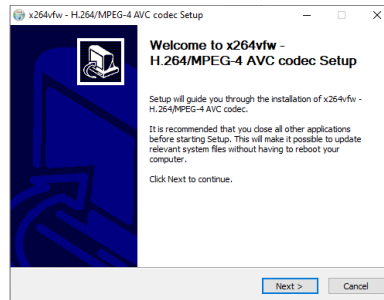
Click **Next**.



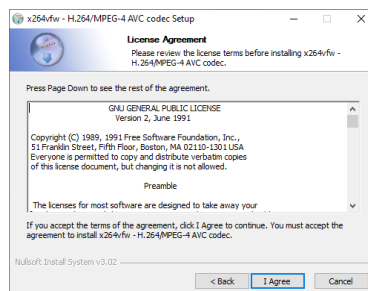
Click **Next**.



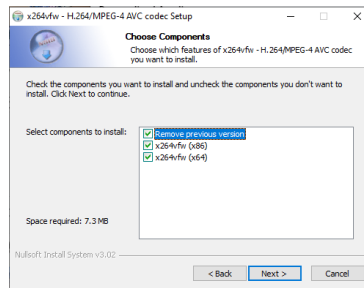
Click **Finish**.



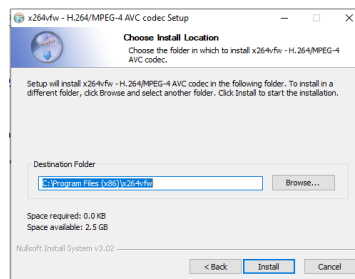
This codec is needed to play example videos. Click **Next** for all dialogue windows until installed



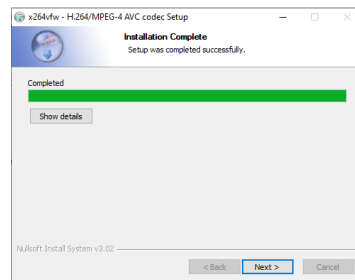
Click I Agree



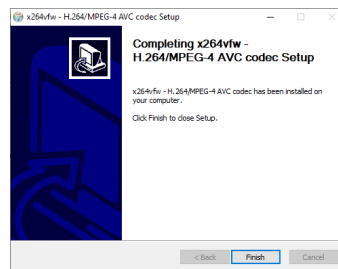
Click Next



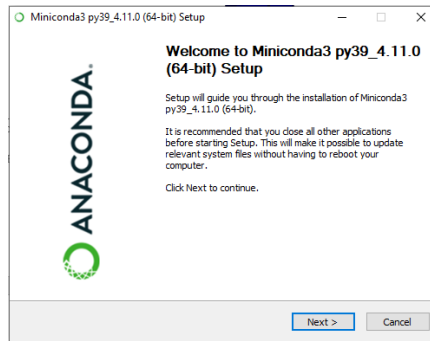
Click Install



Click Next

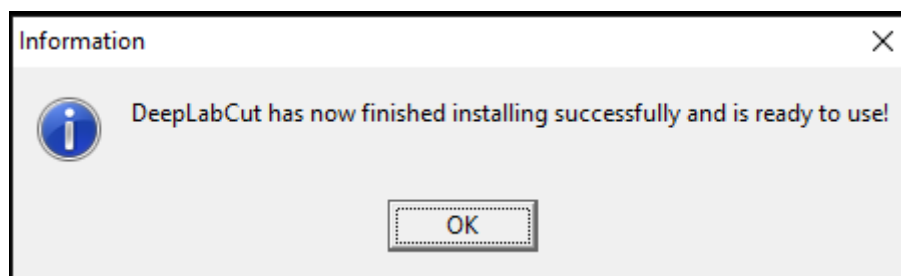
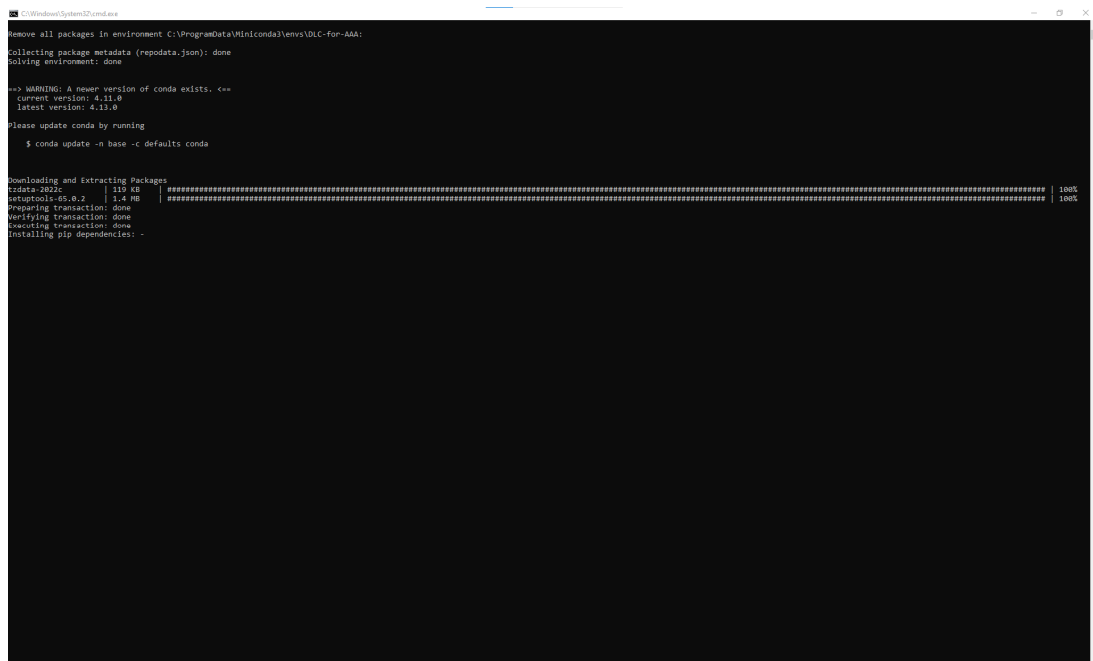


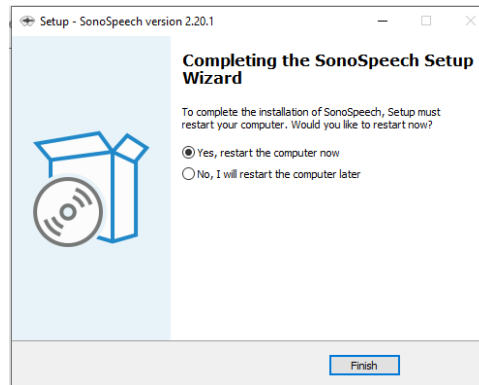
Click Finish



Miniconda is required to run the tongue estimation. Click **Next** until installed.

Sonospeech will then run and the following window will appear while DeepLabCut Machine learning environment is loaded.





Click Finish

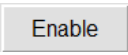
3 GETTING STARTED

RUNNING SONOSPEECH

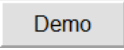
After installation the SonoSpeech™ application will be in the 'C:\SonoSpeech\' folder. The program can be run from the Windows Taskbar Start Menu ('Start:Programs:ArticAsst:SonoSpeech) or from a desktop icon.

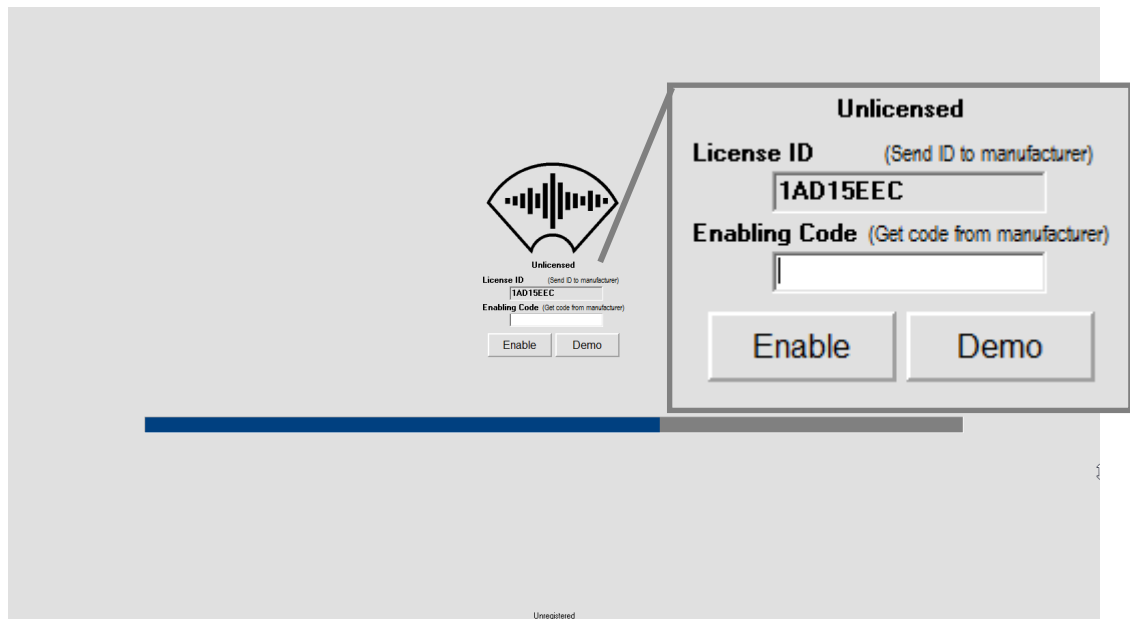


REGISTERING SONOSPEECH (ACTIVATING THE LICENSE)

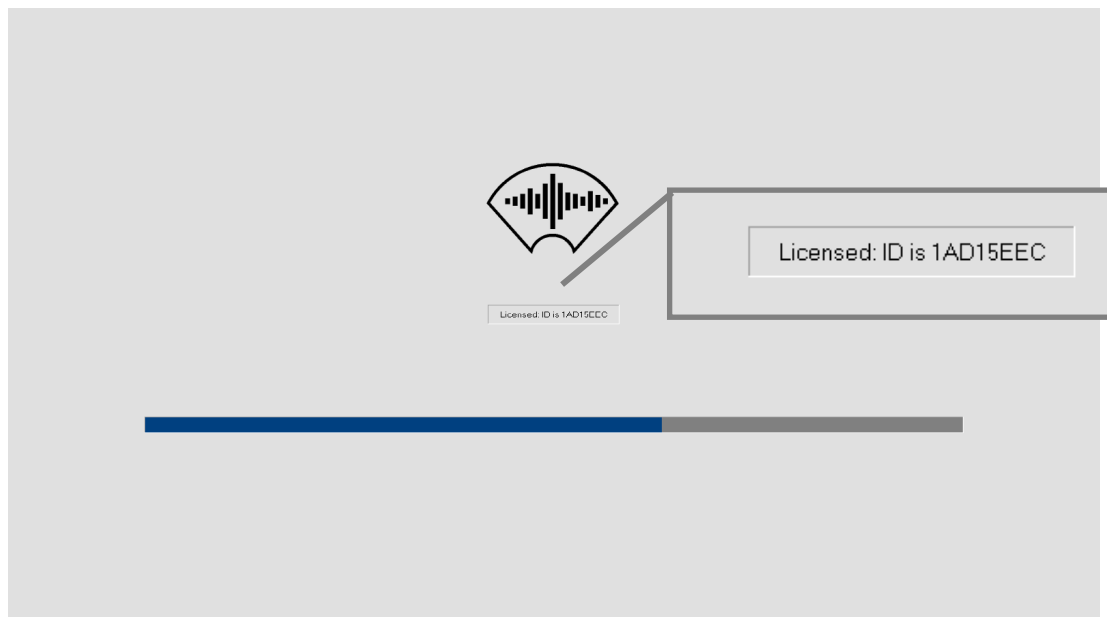
When SonoSpeech is run for the first time the startup screen will prompt for a registration code. If a license has been purchased then email the License ID to awrench@articulateinstruments.com. An enabling code will be sent by return email. Enter that code and click the  button. It is only necessary to do this once.

NB. The License is locked to the computer that it is installed on. To install the application on a different computer will require purchase of another license.

Otherwise select the  button to continue in demonstration mode. It is not possible to see live ultrasound data in this mode but pre-recorded data can be viewed.



After registration is complete the SonoSpeech application must be restarted. The startup screen will then show the License ID. This is confirmation that the application is fully functional.



4 USING THE SONOSPEECH™ APPLICATION

Managing the appearance of the application

The buttons down the right side of the application allow all windows (apart from the ultrasound display) to be hidden, simplifying the display.





All windows showing

All windows hidden

Clicking one of these buttons toggles between showing and hiding the corresponding display.

Adjusting the size of windows

Click and drag a grab-handle  with horizontal stripes to change the height of a window.

Click and drag a grab-handle  with vertical stripes to change the width of a window.

What the buttons do



Show client selection display



Show palate and marker overlay editor



Show word list editor



Show exemplar display



Show prompt display



Show currently loaded wordlist




Show spectrogram

-  Show additional buttons
-  Close application (Only visible in Client window, click  first)
-  Changes the ultrasound image from a recording to live input
-  Sets playback at normal speed
-  Sets playback at half speed
-  Sets playback at ¼ speed
-  Start/Stop playback (a recording needs to be loaded first)
-  Start/stop ultrasound recording (automatically saved at end of recording)
-  Show/Hide palate & marker overlays
-  Freeze/unfreeze the live ultrasound display
-  Show/hide animated gif
-  Copy/Save currently displayed image
-  Toggle between ultrasound image/ tongue contour estimation / both

THE BASICS

Loading a Client

The first thing to do when the program is started up is to select an existing client or create a new one. Each new client is given a code number automatically. A client name is added by the clinician and displayed beneath the code number (Figure 1C). The first time the program is started, only the demo client 'Ultrax_02TD1M' is visible. If a new client is to be recorded then the 'Add new client' button  must be clicked (Figure 1C)

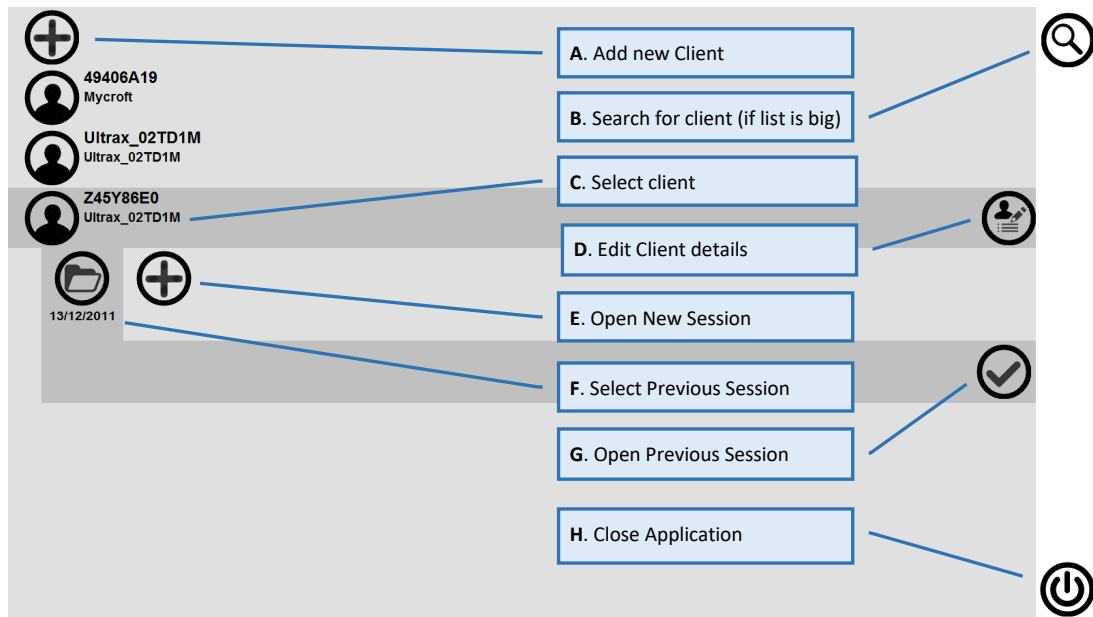



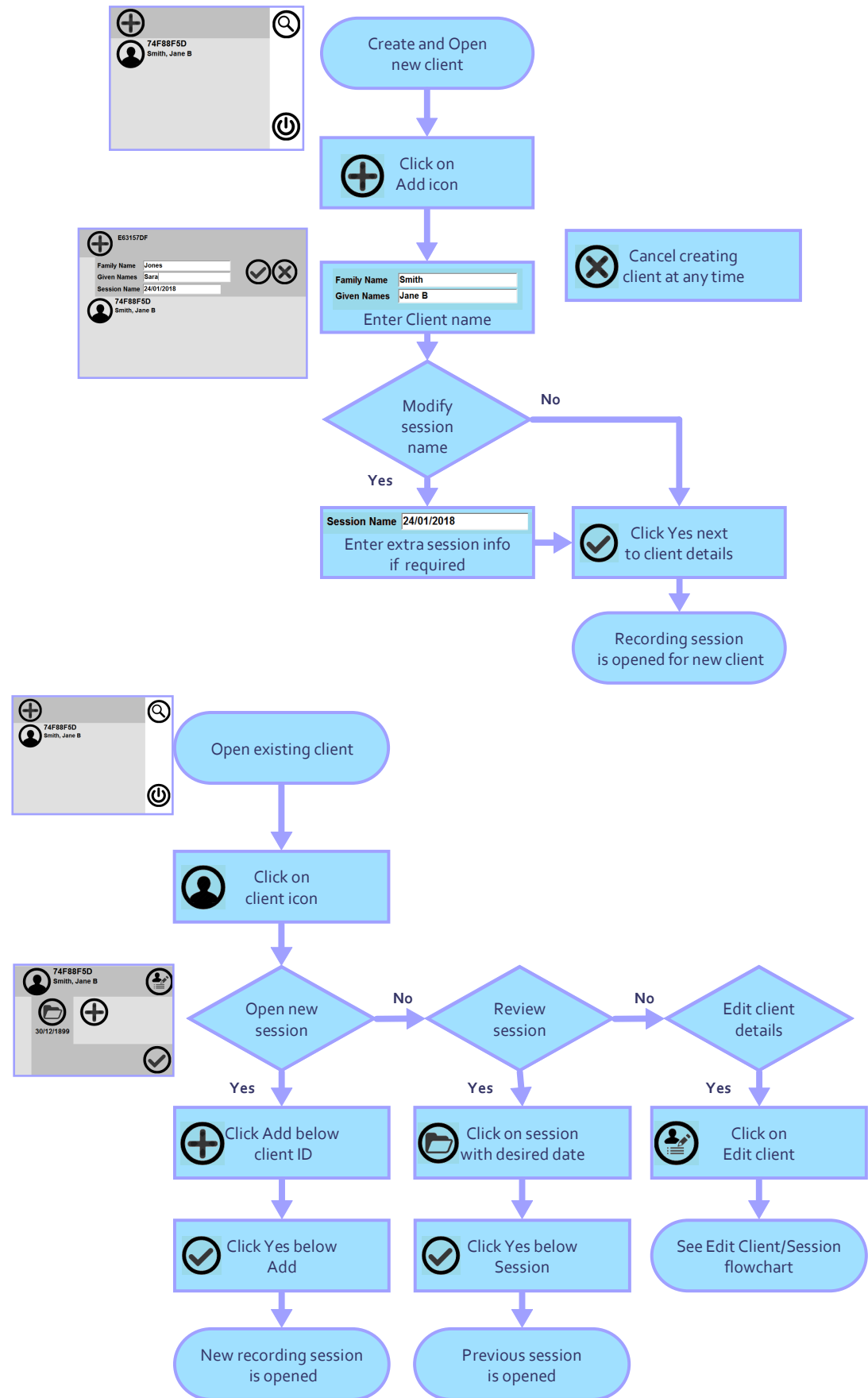
Figure 1 Client window: Create and open client sessions

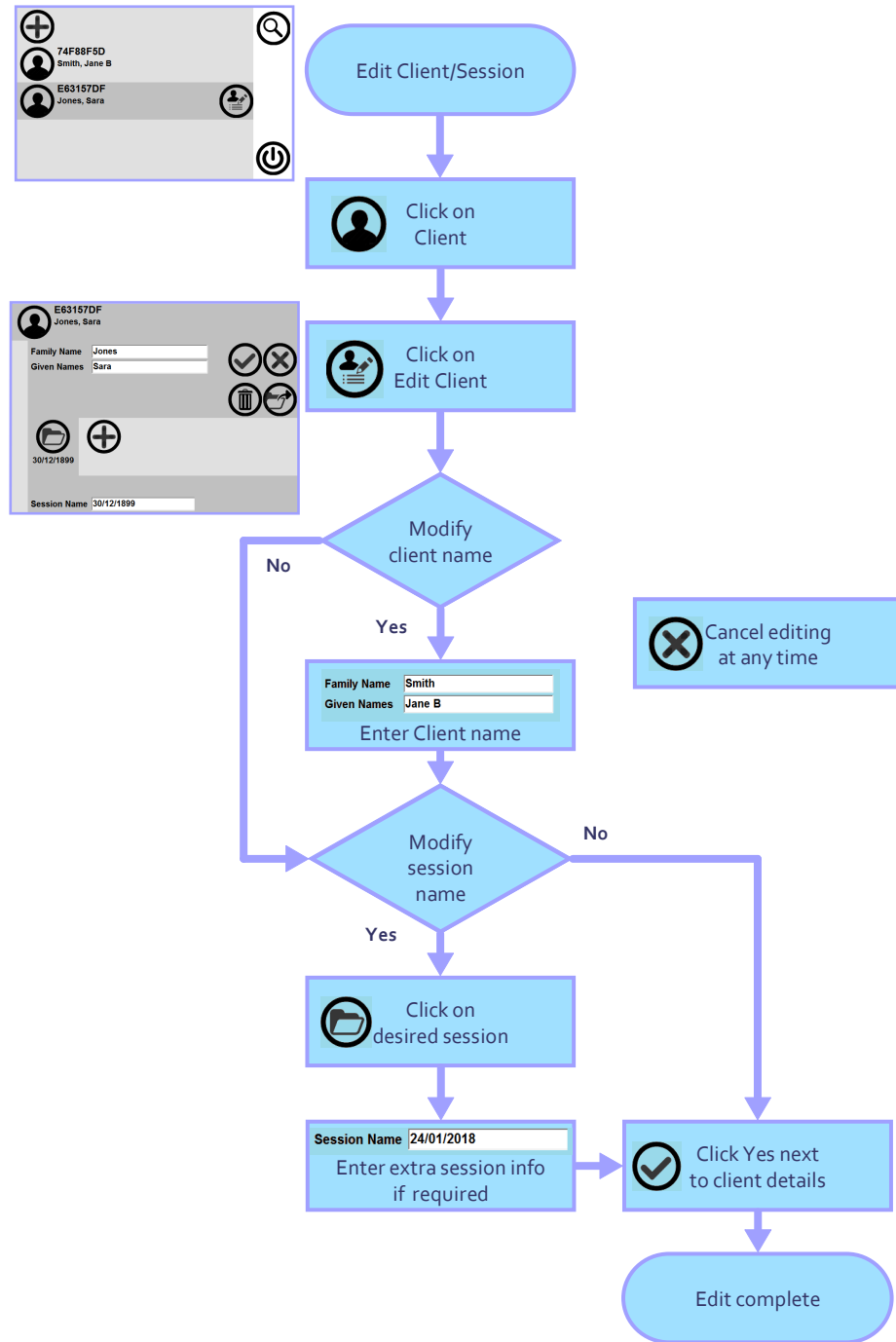
and their details typed into the client editor. The client name can be edited at any time using the 'Edit Client Details' button .

Refer to the following flowcharts to:

- Create a new client
- Open an existing client to review a past session or record a new session
- Edit the Client name or session name

NB. The date of the recording is automatically provided as the session name. It is advisable to retain the date if the session details are revised. E.g. 13/12/2011 Pre-therapy 1

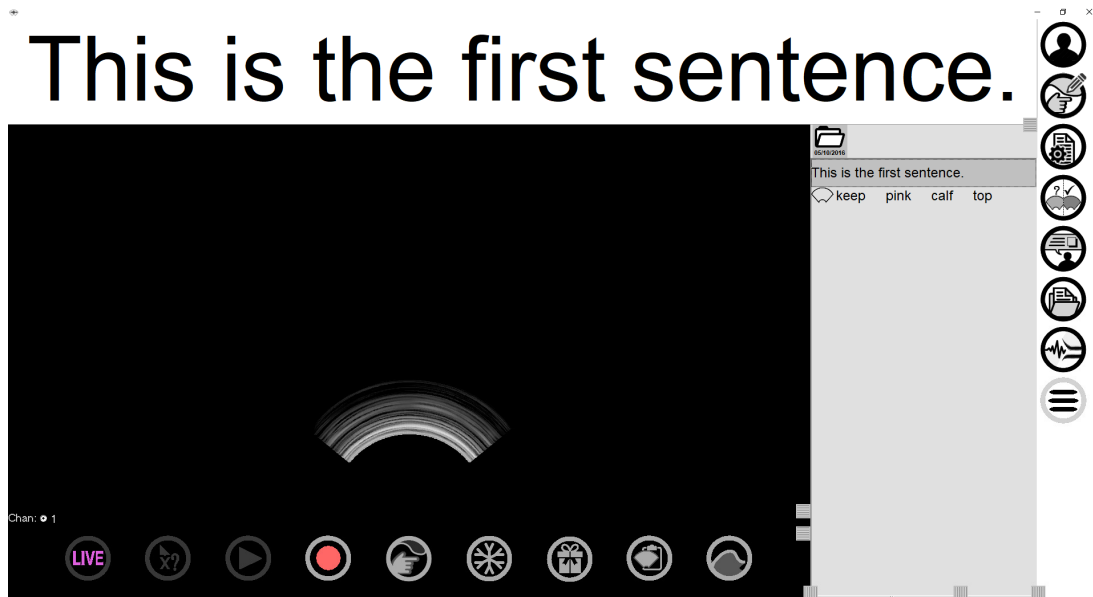




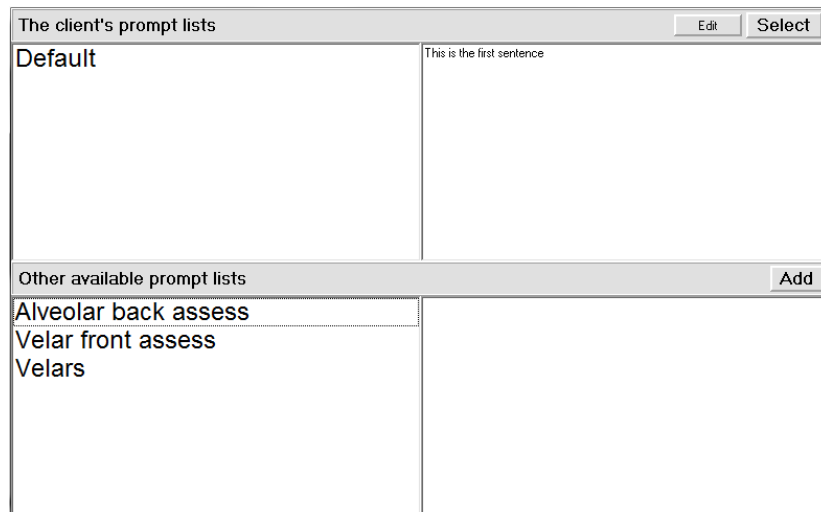
NB. All the client details and data files created in 'SonoSpeech™' are automatically saved.

Loading a wordlist

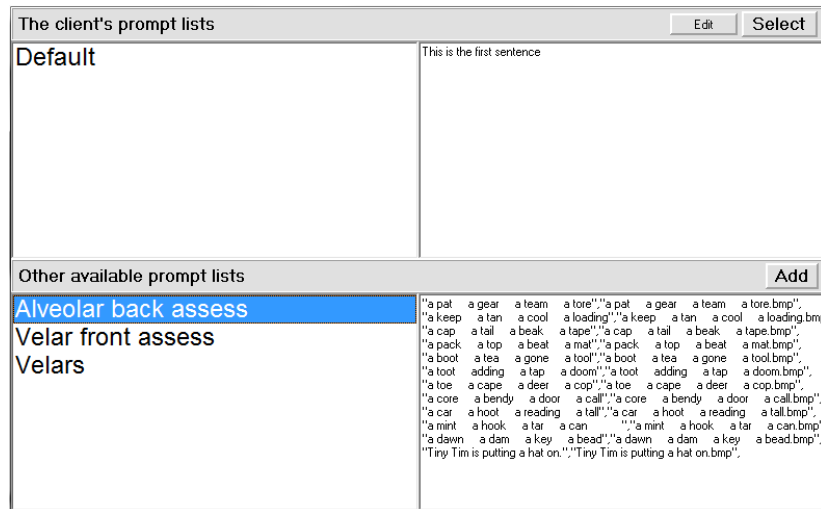
To record a client, an appropriate wordlist should be loaded.



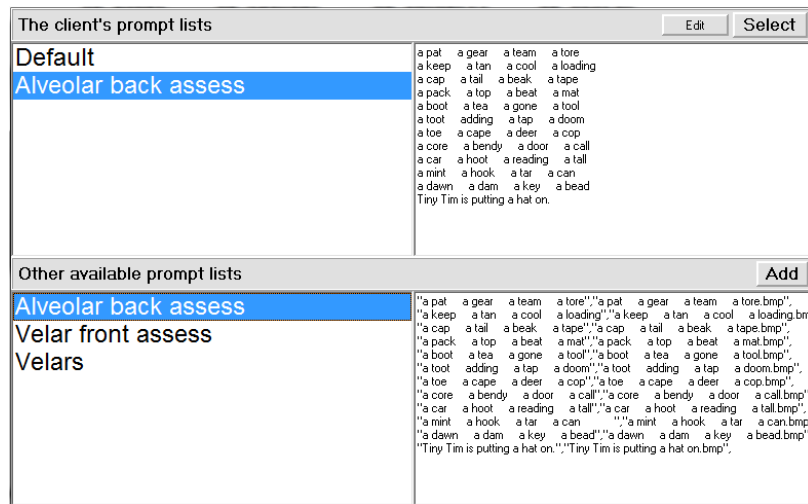
Click the Edit/Load prompts icon to open the wordlist dialogue.



If the desired wordlist is not in the top left panel click on one of the available word lists in the bottom left panel and click **Add**



Then select the wordlist in the top left panel and click Select





The wordlist editor will disappear, and the selected wordlist will be available to start recording.

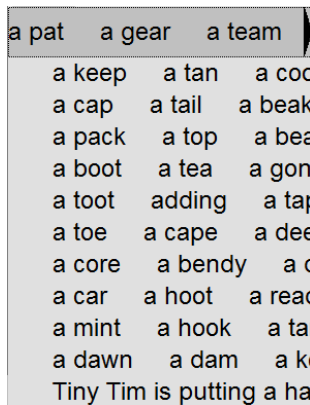





Recording a wordlist

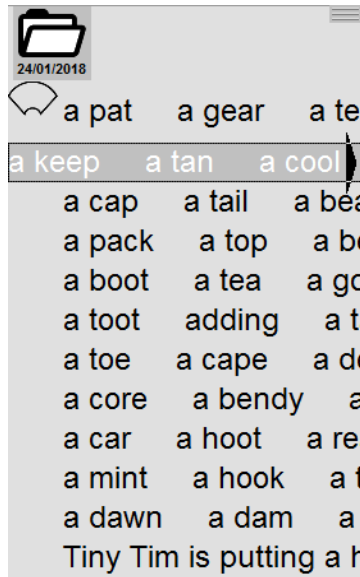
Making a recording is easy. Configure the display so that the word list is visible on the right

side (click ) and the prompt screen is visible at the top (click ).

Select the prompt that you want the client to read by clicking on the appropriate line in the list of prompts.






Once the correct prompt is showing click record  to start recording and stop  to stop recording. There is nothing else to do. The recording is automatically saved and then displayed as an  icon at the start of the line in the prompt list.







NB. Start with the first prompt in the list and the application will automatically move on to the next prompt after stopping the recording.

Playing back a recording

Recordings can be reviewed by clicking on the  icon next to the prompt to load that recording. The icon turns white  to indicate that it is selected. The recording can then be played by clicking the play  button.


Playing back more slowly

Click the  button once to change the icon to  and set playback speed to half. Click a second time to change the icon to  and set playback speed to a quarter. Click a third time to reset back to normal playback speed (icon resets to ).



After setting the playback speed simply click the play button to play back at the selected speed.

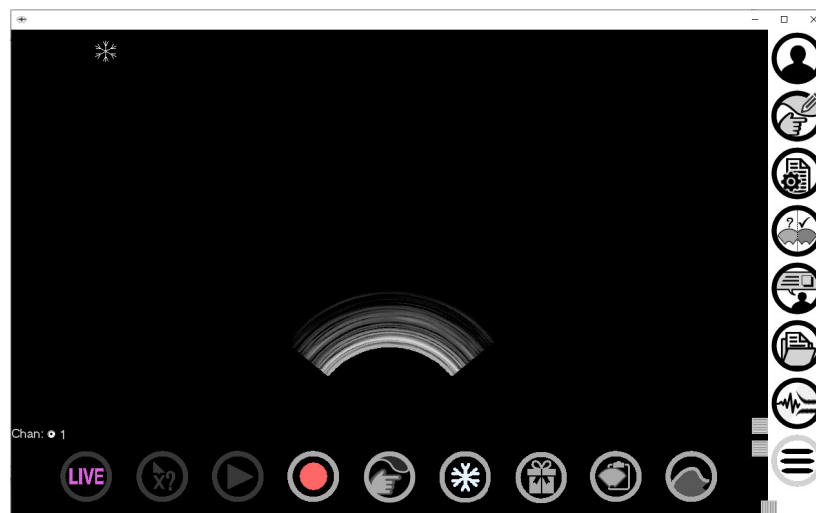
Using the live feedback display (freezing)

When a client is loaded and if the ultrasound hardware is connected then the ultrasound

display will show a live image when the probe is in position. The live button  will be light grey to indicate the display image is live. If the ultrasound is disconnected then the image should appear shortly after connecting.


NB. It is OK to connect the system or change probes while SonoSpeech is running.

To freeze the image, click the freeze  button. The button will turn light grey and a freeze symbol will appear at the top left corner of the ultrasound image. 




Click the freeze  button to unfreeze the display.

If a recording is loaded, the display will not respond to the probe and the live image button

will be black  rather than light grey. To return to a live image display simply click the Live button.

Playing a reward animation

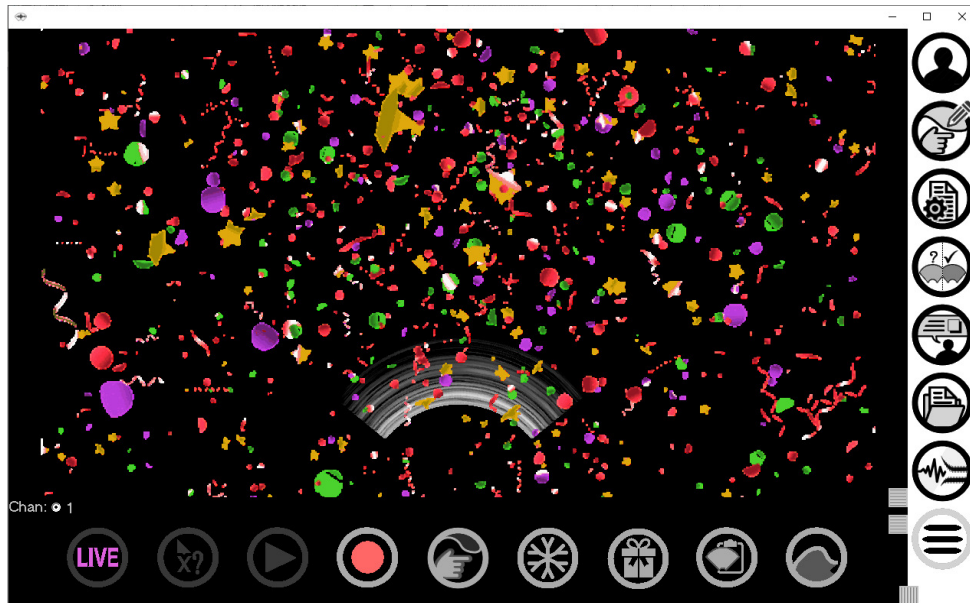
Click the reward  button to start playing an animated gif on top of the ultrasound display.



Click the reward button to stop playing the animated gif

A random gif is played each time.

A number of animated gifs with transparent backgrounds are stored in the C:\SonoSpeech\GIFS\ folder. Gifs in this folder can be deleted or new transparent animated gifs can be added by the clinician as judged appropriate.




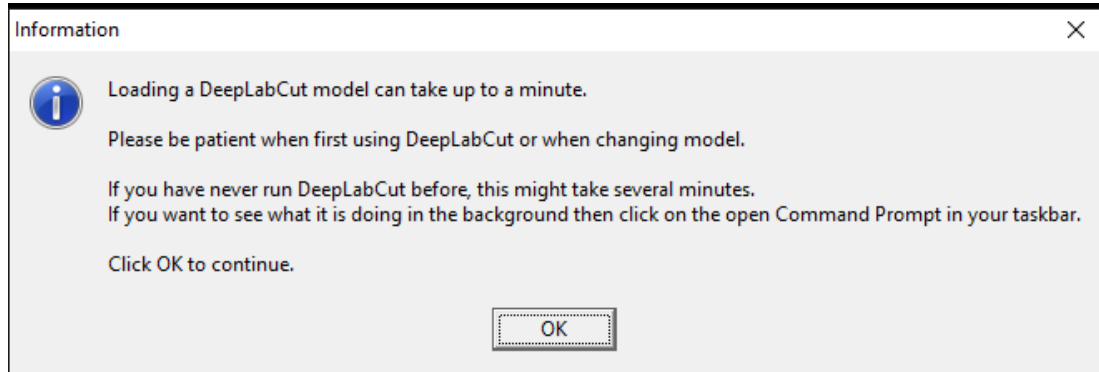
Viewing tongue contour

By default the display will look like this (markers optional).

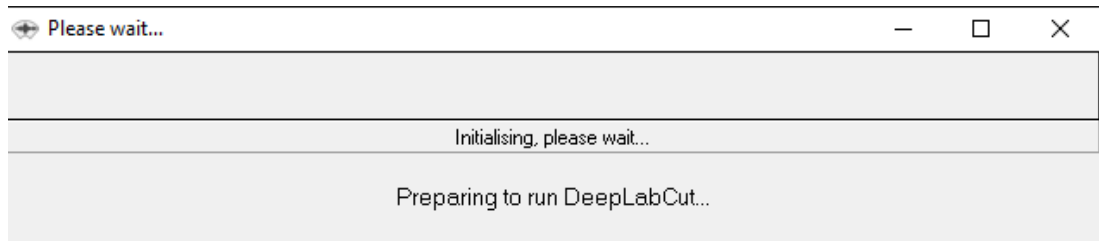




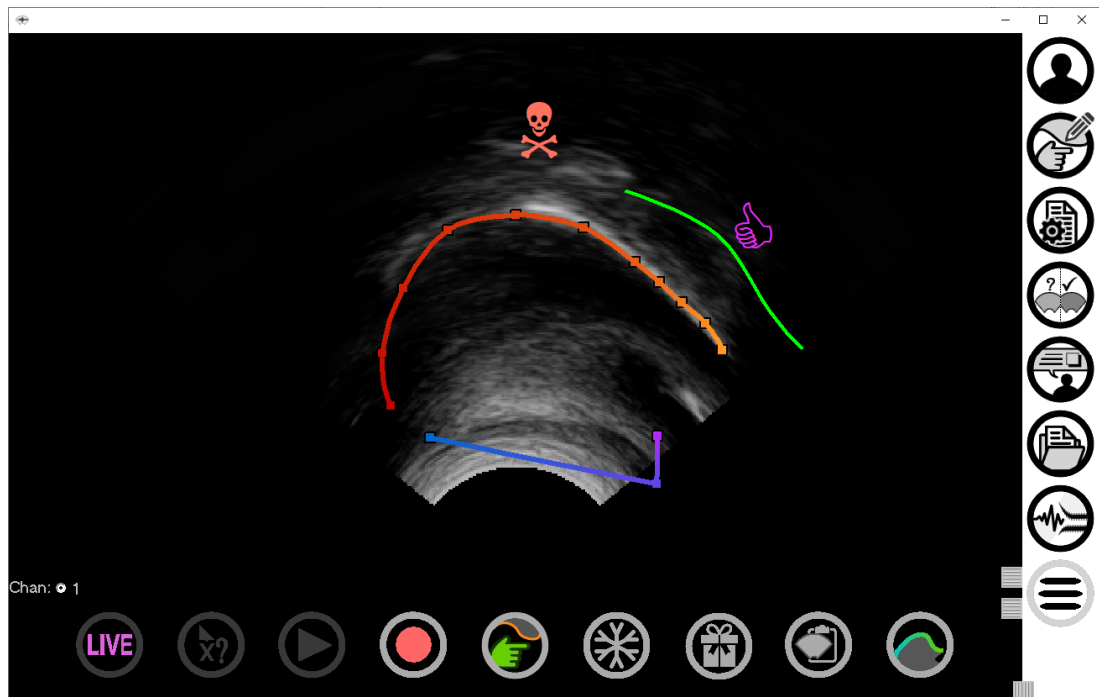
The first time you click on the  a message will warn you that the models are about to load. Click **OK**



A progress bar will then appear.



The tongue contour will then appear superimposed on the ultrasound image.





Click the button to show only the tongue contour without the ultrasound



Click the button a third time to revert to only the ultrasound image.

ULTRASOUND DISPLAY OVERLAYS

Creating a palate trace automatically

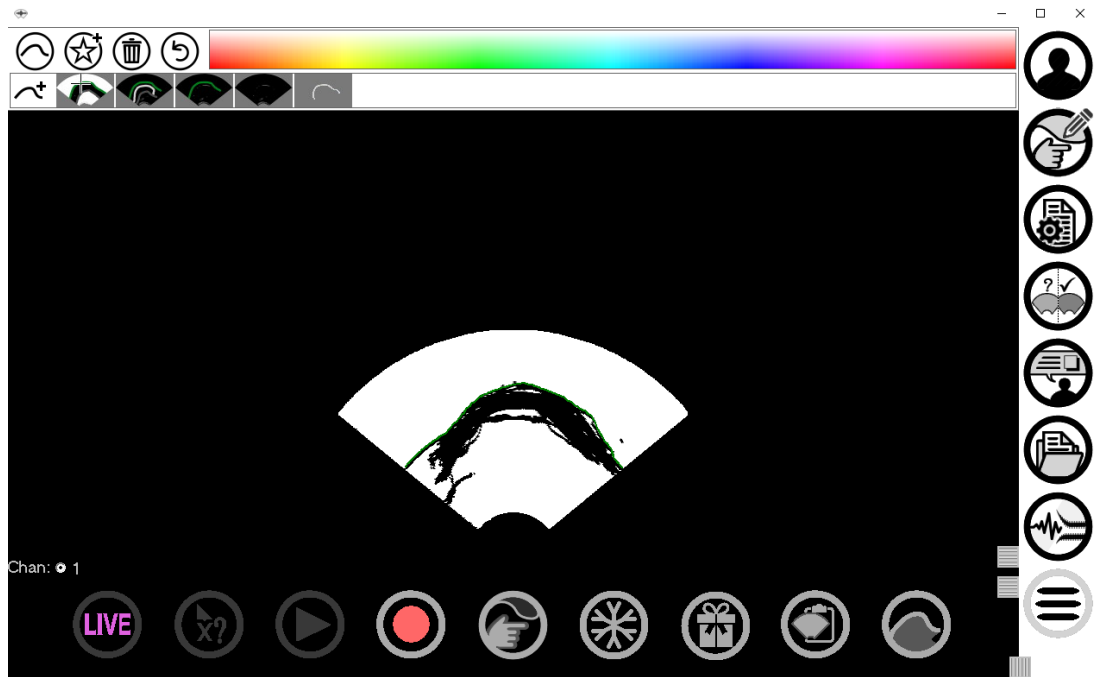


To add or delete markers and palate traces, click the marker editor button. The marker editor dialogue will appear as a strip across the top of the ultrasound display.



Click the palate button in the marker dialogue to add a palate.

1. Click the button to start creating a palate outline automatically. You can do this with live ultrasound input or from one or more recordings or both.



2. Ask the client to say one or more sentences containing phonemes which utilise the maximum amount of articulatory working space. For example:

“Three young girls wore wool coats and boots in the car”

“Gavin is going to be a king when he gets older”

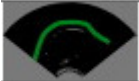
“The wizard is waving a golden wand made of wood”


“ Olga can see a ball of wool on the kitchen table.”

The posterior region will gradually increase as the client moves their tongue. It is important to get them to say a range of sounds including close-front and open-back vowels; alveolar, palatal and velar consonants; and perhaps a dark l as in ‘ball’. The **green** line is the automatic palate trace. It works by finding the upper edge of the black region.


Tip: You can draw white pixels by clicking and dragging on the display. You can draw black pixels by holding down the <ctrl> key while clicking and dragging on the display.

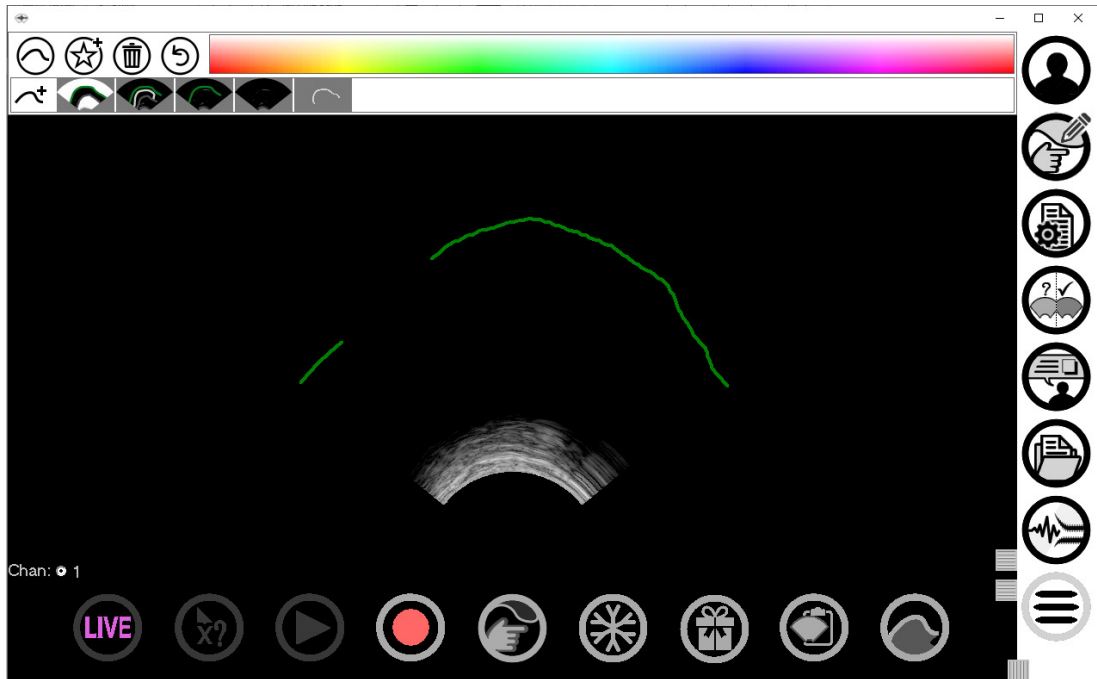
3. When you are happy with the **green** palate trace, save the palate trace by clicking

the  button.

4. To hide the automatic palate trace, click the  button.

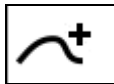


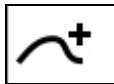
The  button shows a moving estimate of the tongue contour as well as the palate. This should be ignored as it is superseded by the new tongue estimation option.

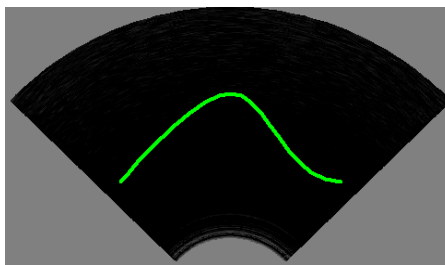


The above image with the green palate trace shows the tongue body raised for a velar consonant.

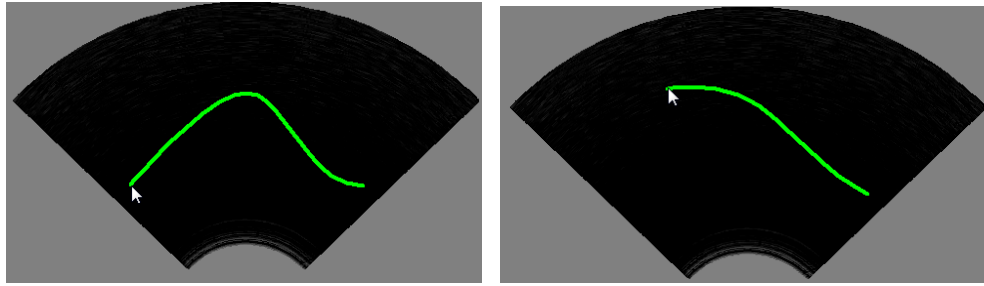
Creating a palate trace manually



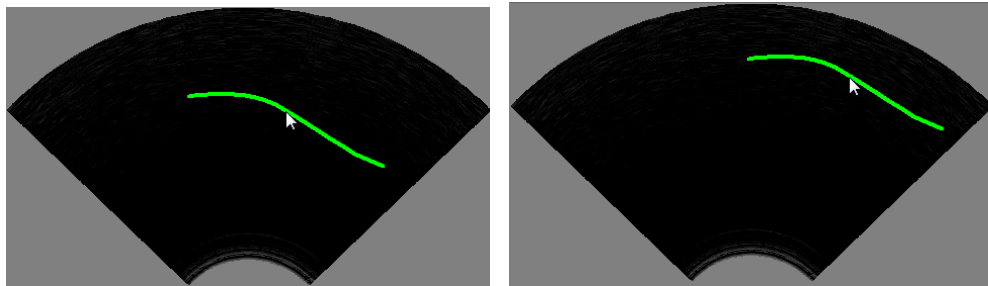
Click the  button to add a palate that can be moved and adjusted manually.



Click and drag the ends and the middle of the palate curve in order to change the shape.

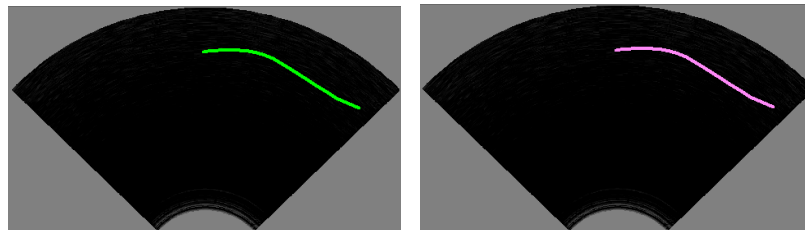


Right-click and drag to move the palate without changing the shape. Tap and hold then drag on a touch screen.

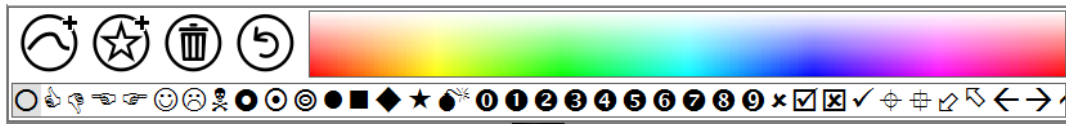



Change palate or marker colour

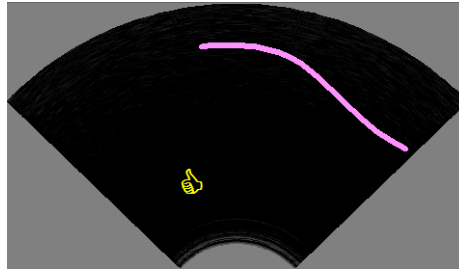
To change the colour of a palate or marker, select the palate or marker and then click on the colour chart.



Creating a marker

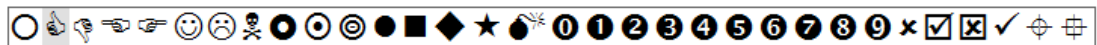


Click the add marker button  in the marker dialogue to add a marker symbol.

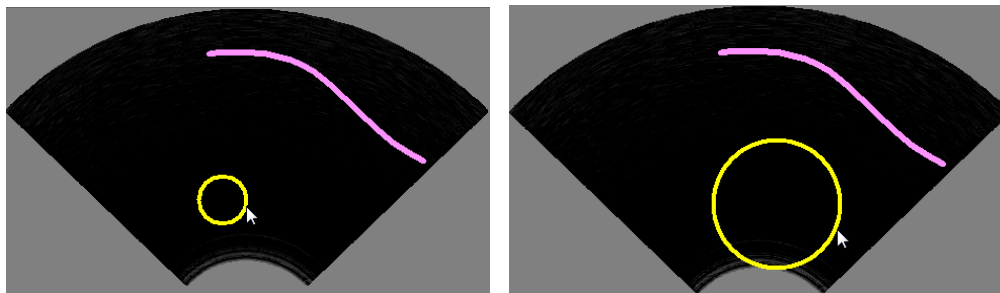


Click and drag to move the marker to the desired location.

To change symbol, select the marker and click on the desired symbol in the marker dialogue.



The circle symbol (first symbol in dialogue) is special. The radius of the circle can be changed. **Click and drag** the edge of the circle to change the radius and move it.



Selecting a palate or marker

To select a marker to change its colour or symbol, click on it first then change the colour or symbol.

Deleting a palate or marker

To delete a palate or marker, select it and click the delete button



in the edit markers dialogue.

Saving a palate or marker (= closing the editor)

Click the marker editor button




to close the dialogue and save the changes.


NB. A unique set of markers is saved for each client.

lab Cancelling (undoing) changes to palate or markers

While in the editor it is possible to cancel all of the changes made during the current edit

(i.e. before closing the editor). To cancel click the undo  button.

lab Hiding/showing markers

Click the marker hide  button below the ultrasound display to hide the palate and

markers. Click the marker show  button to show the palate and markers.

NB. If the hide/show button looks like this  then the markers are active and if no markers are visible it is because they have not been created for that client.

USING EXEMPLARS

lab Show/hide the exemplar window


Exemplars are models of target articulations produced by typically developing children or correct attempts previously recorded from a client. The exemplar window can be shown

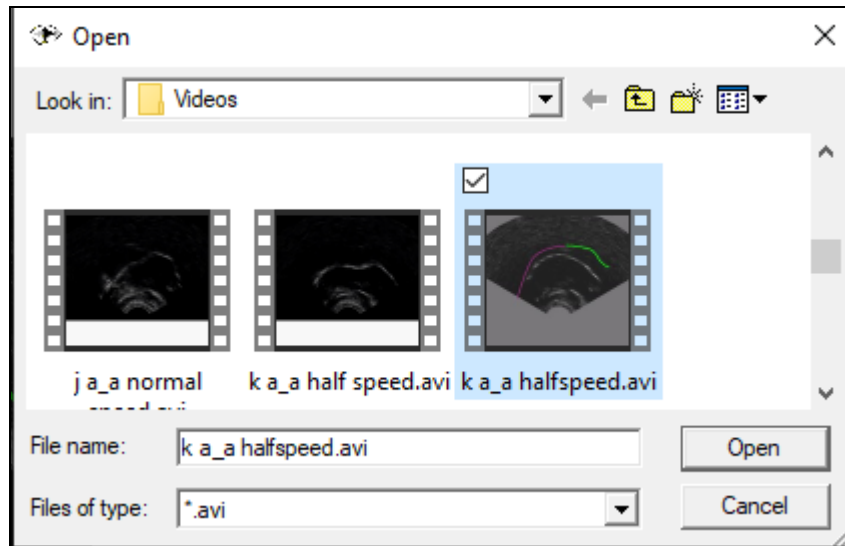
and hidden using the exemplar  button on the right side of the application. The exemplar window has two parts:

- A window for playing videos of typical productions.
- Or snapshots of best attempts by the current client.

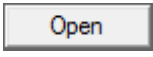


Loading and playing an exemplar video

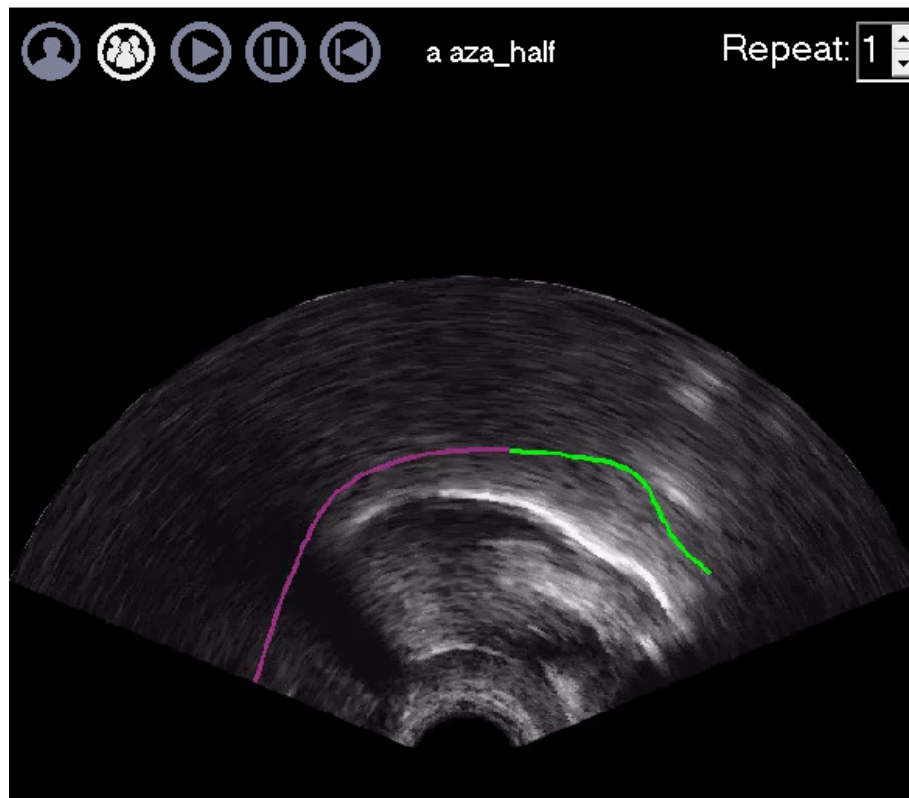
Click the  button to select a video from the selection of typical speech videos.



Exemplar videos are stored in the C:\SonoSpeech\Videos\ folder. New exemplar videos can be added there.


Select the desired exemplar video and click .

The selected video will appear in the window.

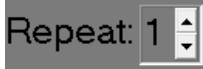


Click the play  button to play


Click the pause  button to pause.

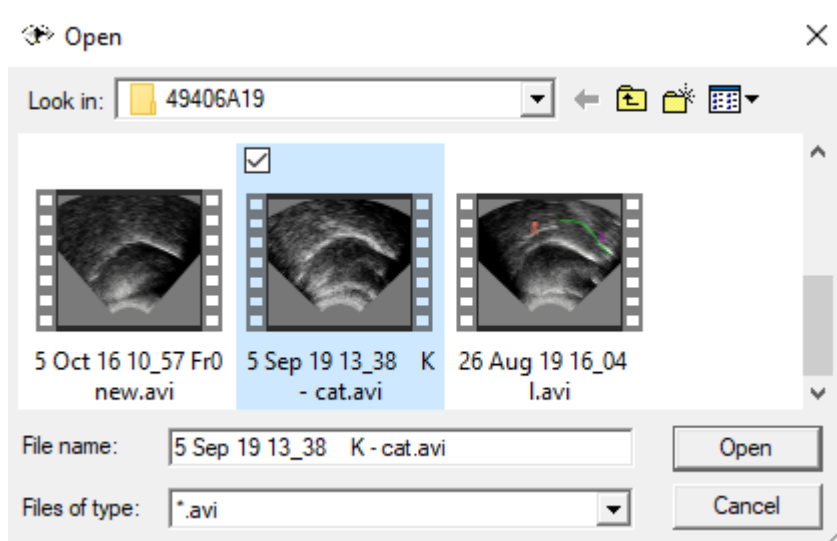
Click the rewind  button to rewind to start of video.

NB. With short exemplar videos it is usually only necessary to use the play button.

Use the  option to automatically play up to 4 times with one click of the play button.

Loading an exemplar image snapshot from the current client

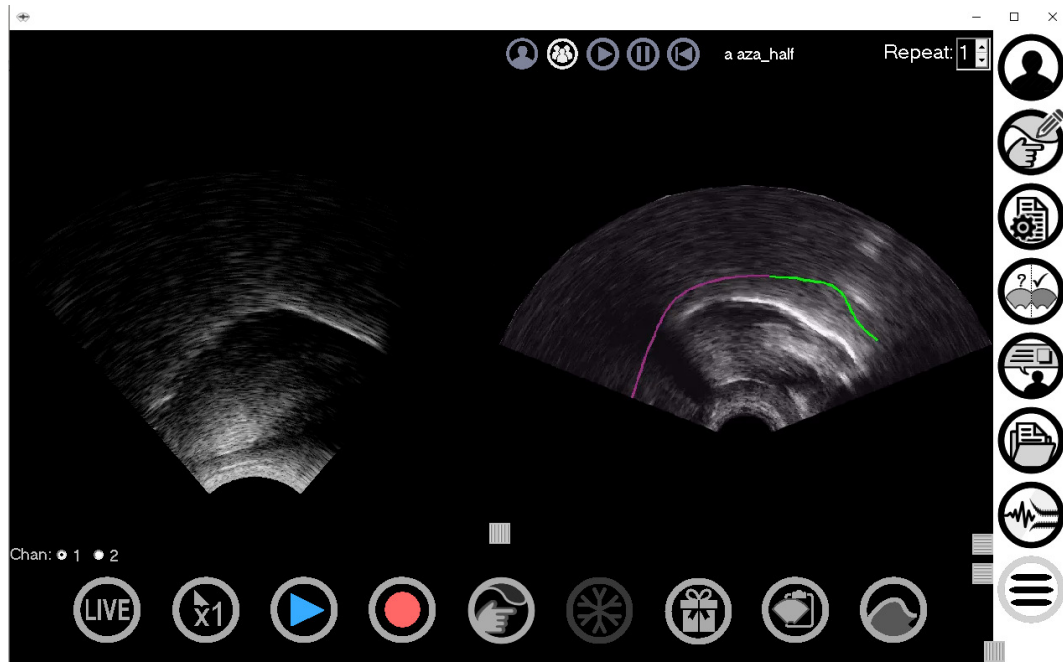
Click the  button to select one of the snapshots previously saved for this client.



This loads a previously saved image into the exemplar window. See Copy/Save Image section below for how to save an ultrasound image snapshot.


If no snapshots have been saved for the current client then the message

No exemplars found for this client. will appear. See Copy/Save Image section below for how to save an ultrasound image snapshot of the current client.



Copy/save an ultrasound snapshot



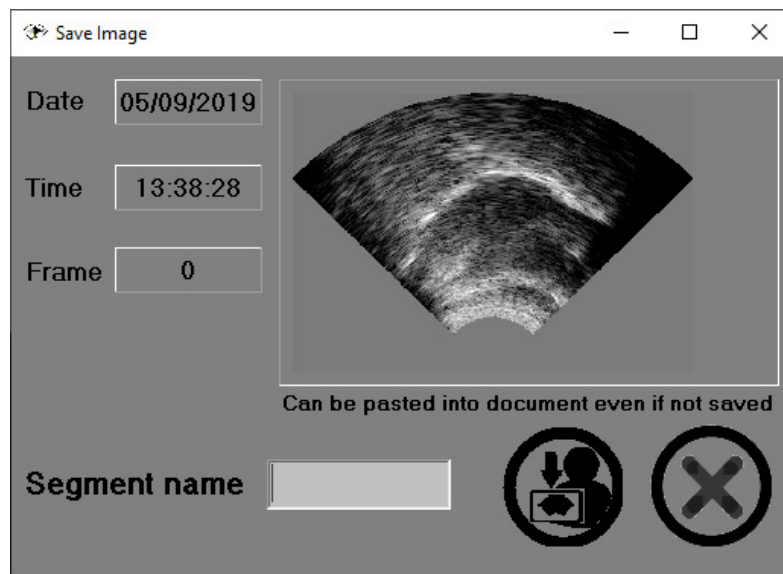
Click the  button to copy the ultrasound image from the display to the clipboard.

Note: It is not necessary to freeze the display.

Note: An image can be copied **from the live input** or **from a recording**.


Note: If an overlay marker or palate is visible in the live display then it will be represented in the snapshot.

A dialogue will appear when you click the Copy/Save button.




The dialogue shows the image that has been **copied to the clipboard**.



Click  to exit the dialogue without saving. After exiting, the image is still in the clipboard and can be pasted into a word document for printing and giving to clients.



Click  to save the image. It will be saved in the folder of the current client. It will be given a name indicating the **time** and **date** on which it was captured and with an **identifying text** indicating the segment. E.g.


Segment name

This snapshot can then be loaded as an exemplar. See previous section “ Loading an exemplar image from the current client”

THE SPECTROGRAM WINDOW

Show/hide the spectrogram window



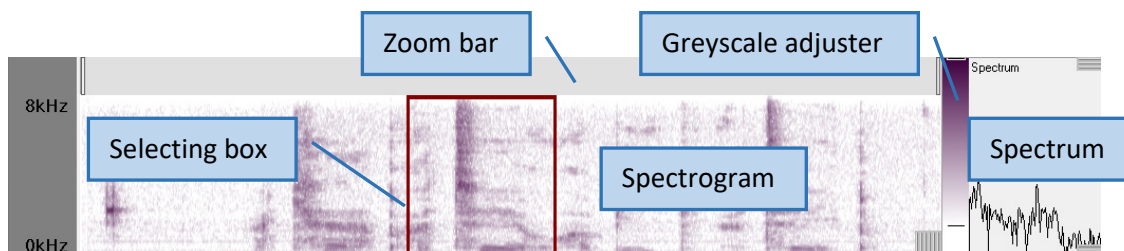
The spectrogram window can be shown and hidden using the spectrogram  button on the right side of the application. The spectrogram window has one main function:

- Find and select part of a recording (e.g. a single word from a set of 4) so that it can be saved as a client’s best attempt.

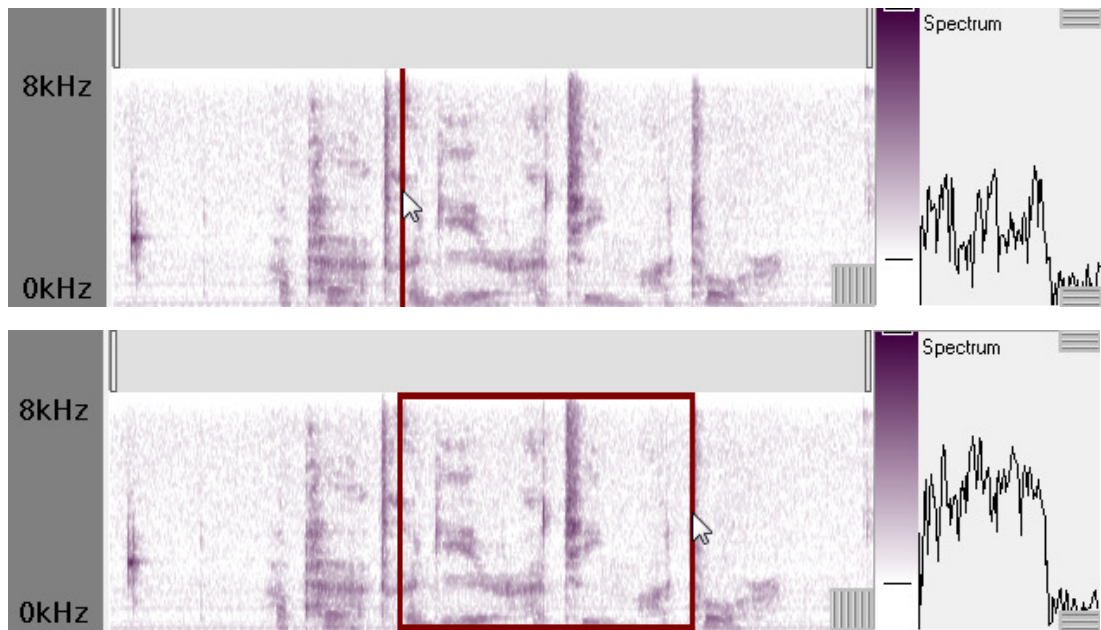
Selecting a region of the recording

The spectrogram window has:

- A spectrogram
- A zoom bar
- A selection box
- A spectrum
- A greyscale adjuster



Double-click on the spectrogram at the startpoint of the region to be selected and drag horizontally to the endpoint. This will create a red rectangle defining the selected region.

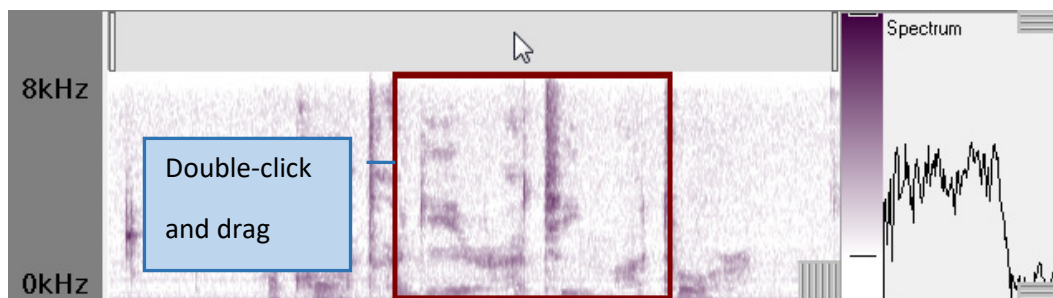


Click the play button to listen to the selected region.

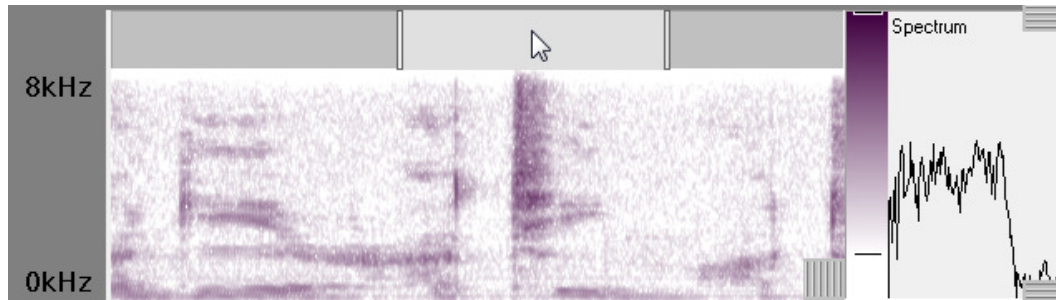
Tip. Select a wider region that should contain the word. Then zoom in to make it easier to select the word more accurately.

Zooming in

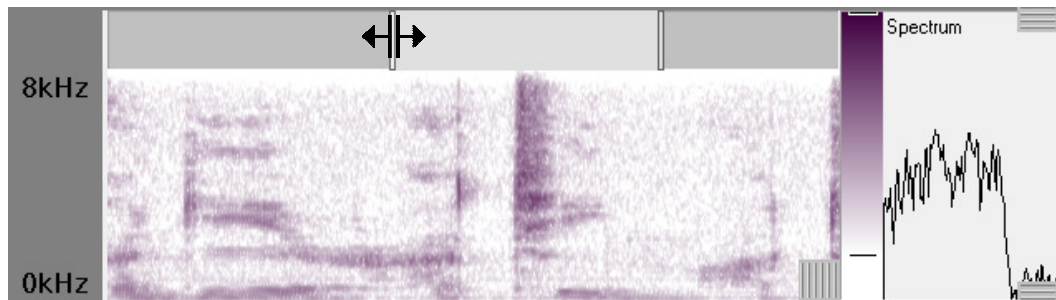
Select a region then double-click on the zoombar above the selected region.



Cursors on the zoombar will move to indicate the zoomed region and the spectrogram will show only the zoomed region.




It is also possible to click and drag each cursor to adjust the zoomed region.



SETTINGS

Show the settings buttons



Click the Extra  button at the bottom right of the application to reveal an extra set of buttons. Click again to hide the extra buttons. The extra buttons are:



Ultrasound display settings




General settings

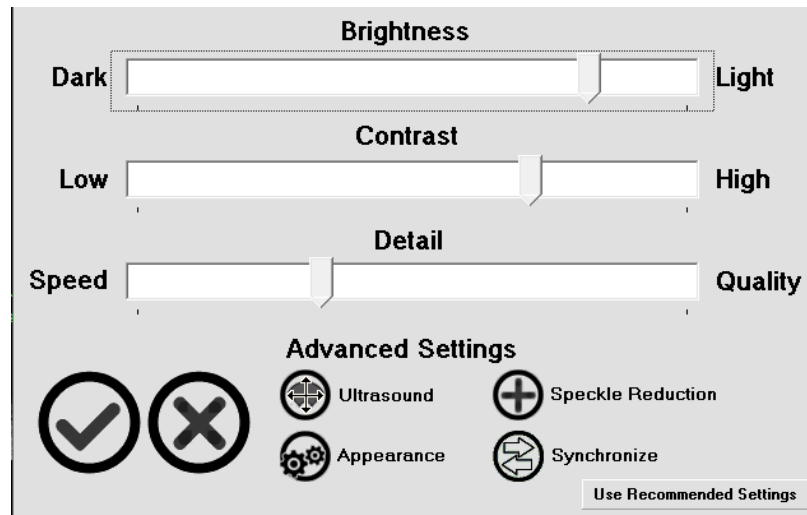


Audio Settings

Set ultrasound brightness and contrast



Click on the ultrasound settings  button.



Use sliders to control brightness and contrast.

Brightness is typically set between ½ and full scale. This controls the ultrasound gain.

Contrast is typically set between ½ and ¾ full scale. This controls the ultrasound dynamic range

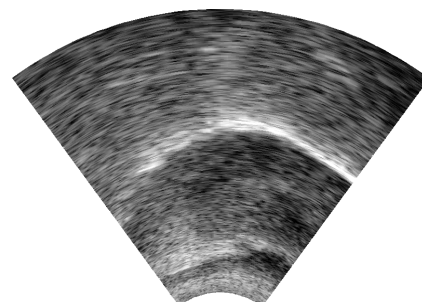
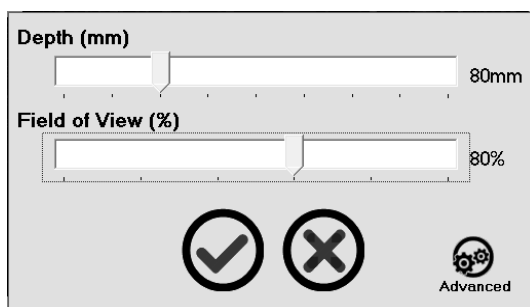
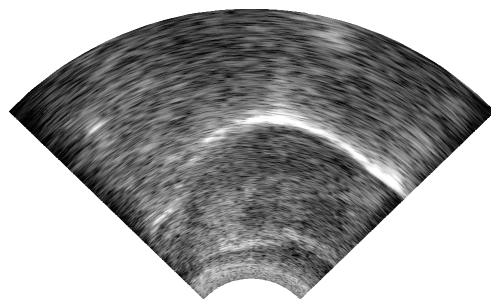
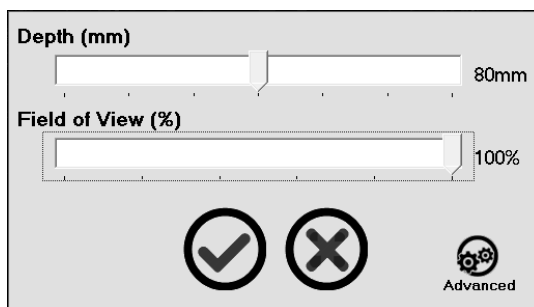
Speed is typically set to 0 or 1/3. It controls the line density. Position 0= 81fps position 1 = 40fps position 2 = 20fps.

Change ultrasound depth and field of view

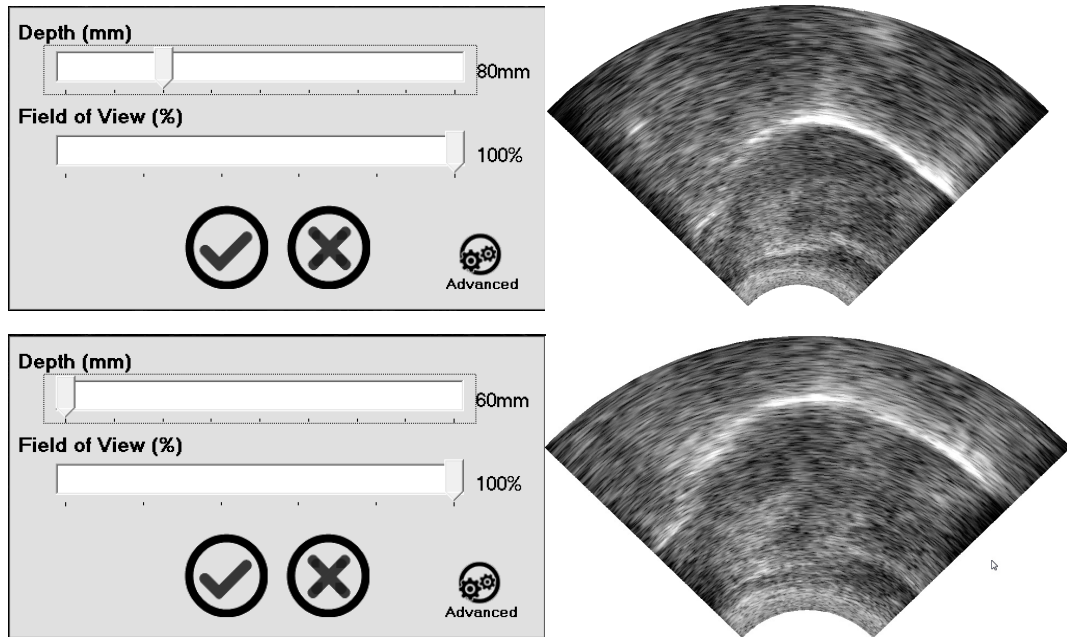


Click the depth  button to show the depth and field of view dialogue.

Field of view narrows or widens the angular extent of the image.




Depth alters the maximum displayed depth

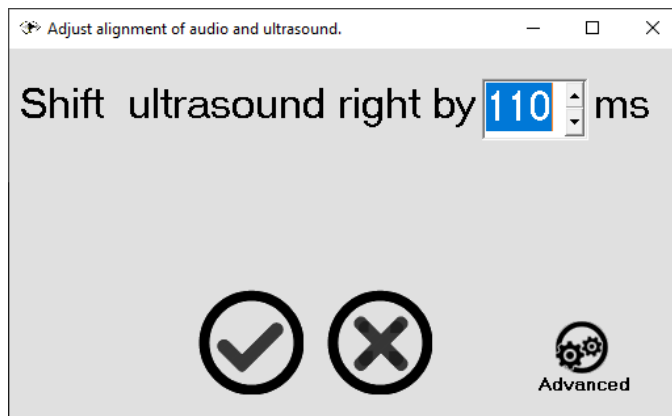


Tip. Recommend Depth 80 and Field of view 100%

Synchronise the audio and ultrasound



Click the  button to alter the timing between the speech audio and the ultrasound.



The above dialogue appears. Every laptop soundcard may have a different lag time between the microphone signal going in and the sound being digitised and stored on the computer. So this value should be set to the correct value for your soundcard so that the ultrasound and the audio are aligned properly. The lag can be zero but is more typically in the range 40-140ms.

The **Shift** setting will only affect new recordings. Previously made recordings will not be affected.

Speckle Reduction



This gives the ultrasound image a smoother appearance. If recordings are made with this setting on then the recordings will also have this smoothed appearance and it cannot be removed.

Advanced settings



Advanced

There is no need to change the advanced settings.

General settings



There is no need to change the general settings.

Audio settings



There is no need to change the audio settings.

5 TROUBLESHOOTING

Question: I am clicking on the record button and nothing happens.




Answer: Make sure you have clicked on one of the prompts in the promptlist to select it.

e.g. click on the line that says "This is a sentence"



Question: How do I view and playback a recording?

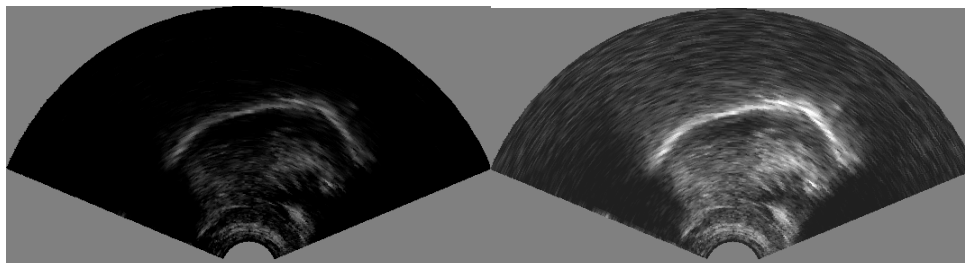
Answer:

Click on one of the small  images next to a prompt in the promptlist. It should turn into a white-filled symbol  to indicate that the recording is loaded. Then click the  button to playback.

Question: The image is really dark and I can't make out the tongue shape.

Answer:

Firstly always ensure there is some gel on the probe. You don't need a huge amount. Secondly it is possible to use the "brightness and contrast" controls to make the image clearer. See section on page 34. See how the image looks before and after adjusting the brightness/contrast below.



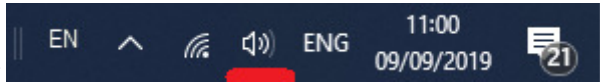
Question: I can't hear anything/no audio

Answer:

Audio should play through the default laptop speakers when you click the play button. If you can't hear anything, firstly ensure you have a recording selected (see section "Playing back a recording"). If the ultrasound plays but there is no sound



when you click the button then check that the laptop playback volume is set to a reasonable level and not muted. To do this, click on the speaker symbol in



the Windows taskbar. This can usually be found in the bottom right corner of your screen. If you still cannot hear anything, make sure that audio was recorded at the time of recording. To check



this, open the spectrogram window with the button and verify that the spectrogram contains speech-like features. (See section "The spectrogram window" to see an example of what speech should look like.

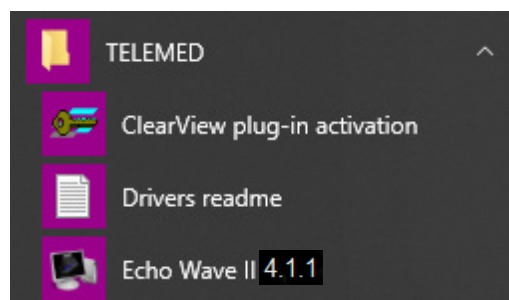
Question: I am getting "Range check error" / "access violation error". What do these errors mean?

Answer: These are errors that arise due to a fault in the software that the software developer has not predicted. Please take note of the last thing you tried to do before the error appeared and contact Articulate Instruments to report the fault.

Question: I have started running SonoSpeech but I see no ultrasound image at all.

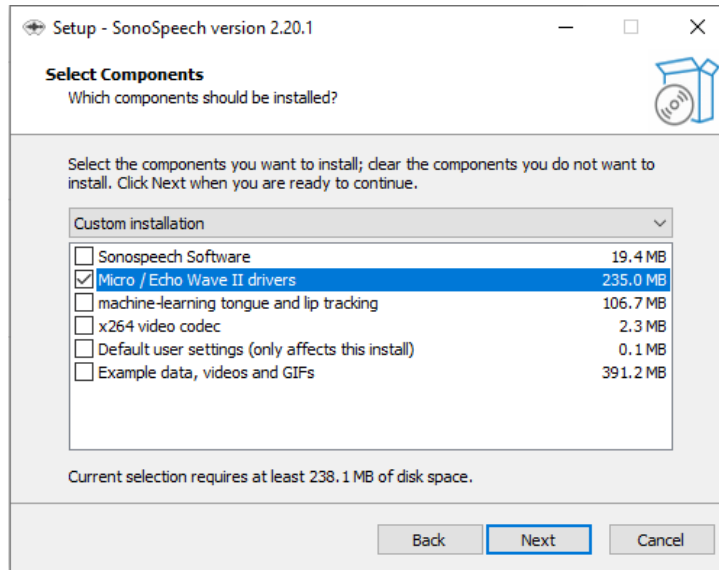
Answer:

Make sure the USB cable from the ultrasound is fully plugged-in at both ends. Make sure that the probe connector is firmly connected to the ultrasound scanner. If no image appears after these checks are complete and this is the first time you have tried to run SonoSpeech, try running the EchoWave II software. You will find this in the Windows start menu under the Telemed folder



If when running the Echowave II software it does not show a live ultrasound display either then it is likely that the drivers have not been installed properly. The drivers should have been installed during the SonoSpeech installation process. Run the SonoSpeech installation again and make sure the checkbox "Select to install EchoB or SonoSpeech drivers" is checked. You may need assistance from

your IT department if you are having trouble installing the drivers. Special user permissions may be required.



If Echowave II shows a live ultrasound image then close that application and run SonoSpeech again to see if the image appears. If not, then contact Articulate Instruments.

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