

The purpose of this workshop is to demonstrate how to create a continuum (of  $n$  steps) between two endpoint audio files using TANDEM-STRAIGHT<sup>1,2</sup>. Examples of applications of this program include stimuli creation for both discrimination and identification tasks in perception experiments.

The two audio files used in this demonstration are ‘fat.wav’ (Audio File ‘A’) and ‘vat.wav’ (Audio File ‘B’)<sup>3</sup>.

### Prepare Audio File ‘A’

1. Open “Morphing Menu” Application
2. Click ‘Load Waveform A’ in ‘Speaker A’ box and open Audio File A (fat.wav)

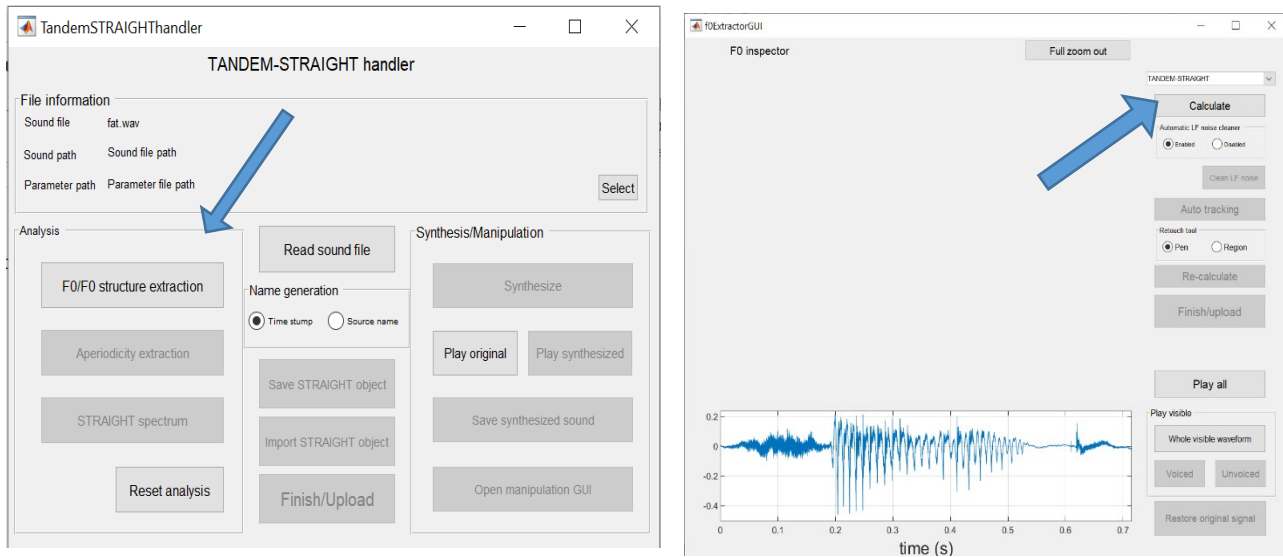


<sup>1</sup> Kawahara, H., Morise, M., Takahashi, T., Nisimura, R., Irino, T., & Banno, H. (2008). TANDEM-STRAIGHT: A temporally stable power spectral representation for periodic signals and applications to interference-free spectrum, F0, and aperiodicity estimation. In 2008 IEEE International Conference on Acoustics, Speech and Signal Processing, 3933-3936. IEEE.

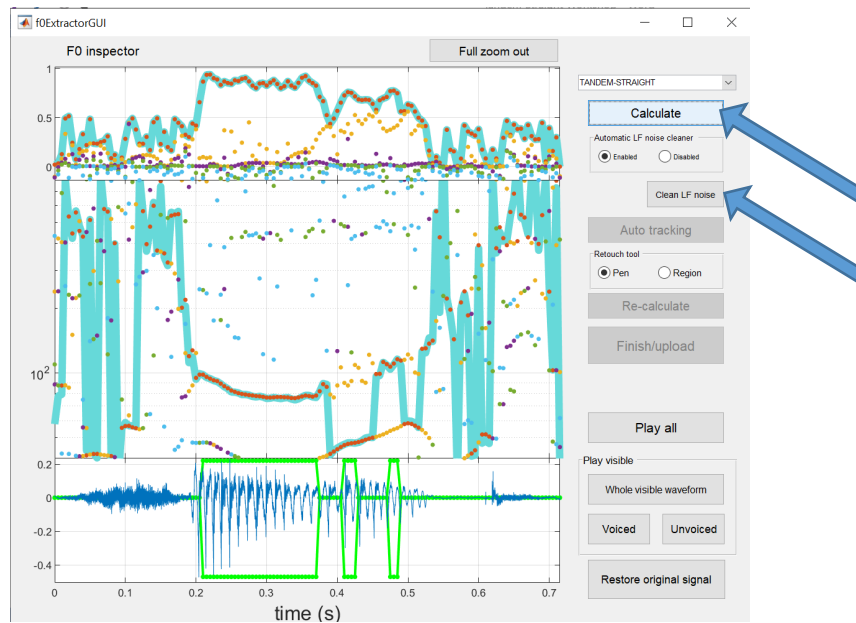
<sup>2</sup> I would like to thank Kaile Zhang from the Hong Kong Polytechnic University for her assistance in using this program.

<sup>3</sup> Armstrong, E. “Introducing the IPA”. Voice and Speech Source, [www.yorku.ca/earmstro/introducing\\_the\\_ipa/](http://www.yorku.ca/earmstro/introducing_the_ipa/).

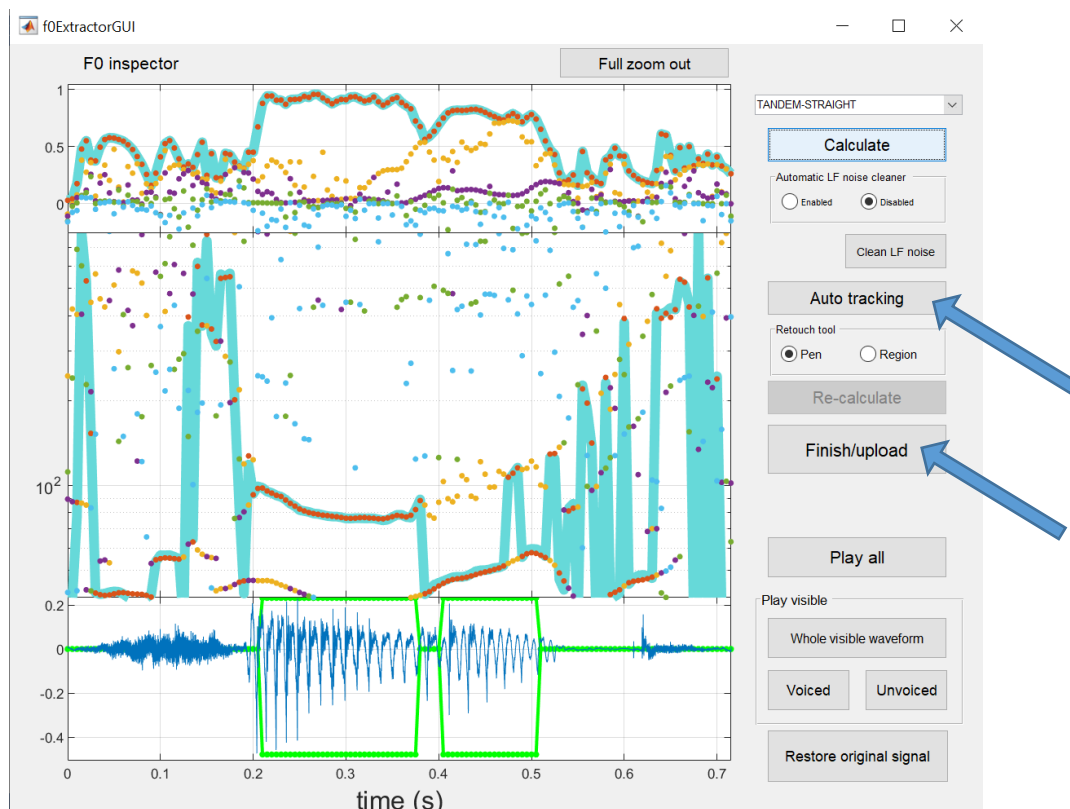
- Click 'Analyze' under 'Speaker A'. A new window called 'TandemSTRAIGHTHandler' will open.
- Click 'F0/F0 structure extraction'. A new window called 'f0ExtractorGUI' will open. Click 'Calculate'.



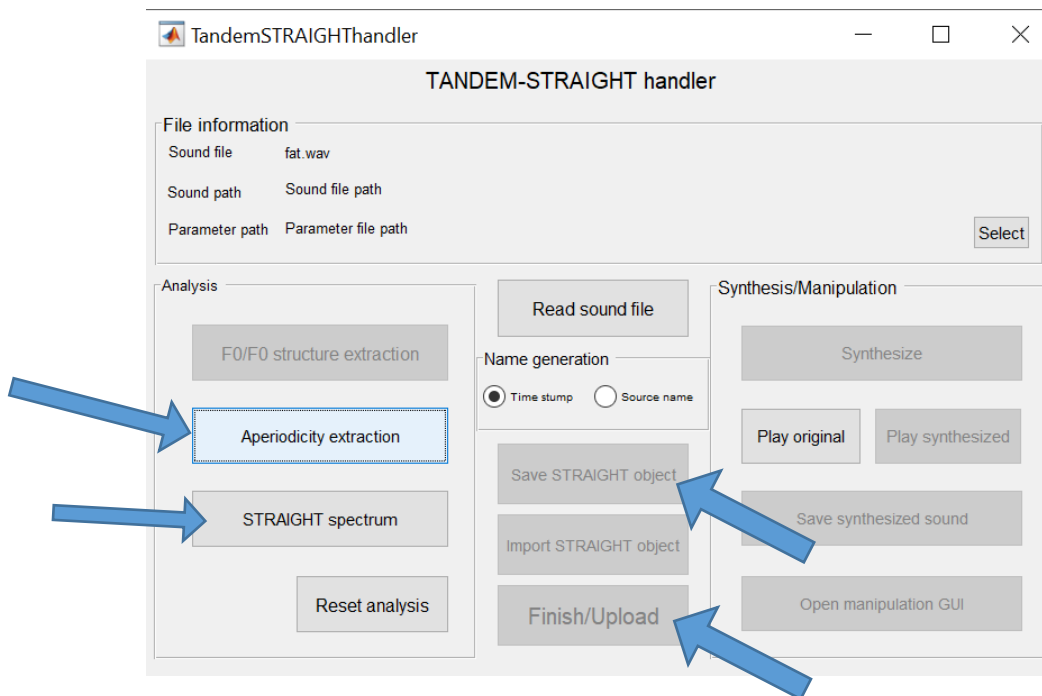
- Click 'Clean LF Noise' to clean low frequency noise, then click 'Calculate' again.



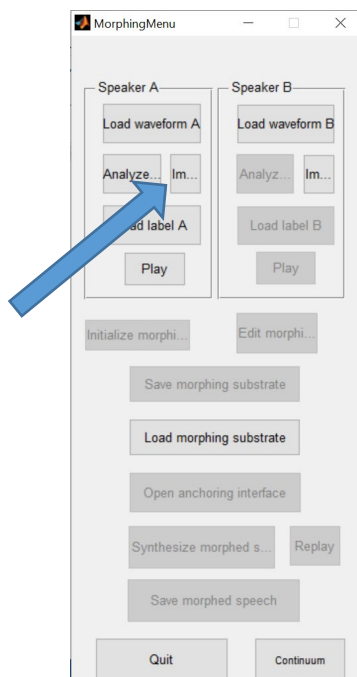
- Click 'Auto tracking' to track pitch, then click 'Finish/upload'.



7. In 'TandemSTRAIGHThandler' window, click 'Aperiodicity extraction', then click 'STRAIGHT spectrum', then click 'Save STRAIGHT object'. The object will save as a '.mat' file in the folder that contains the Morphing Menu application (unless otherwise specified). Then click 'Finish/Upload'.



8. In 'MorphingMenu' window under 'Speaker A' box, click 'Im...' (Import) and select the '.mat' file that was saved in Step 7.

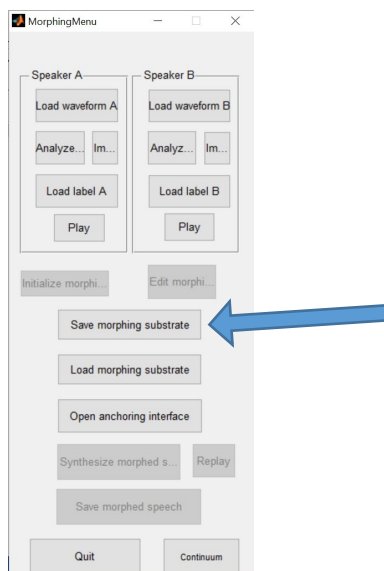


### Prepare Audio File 'B'

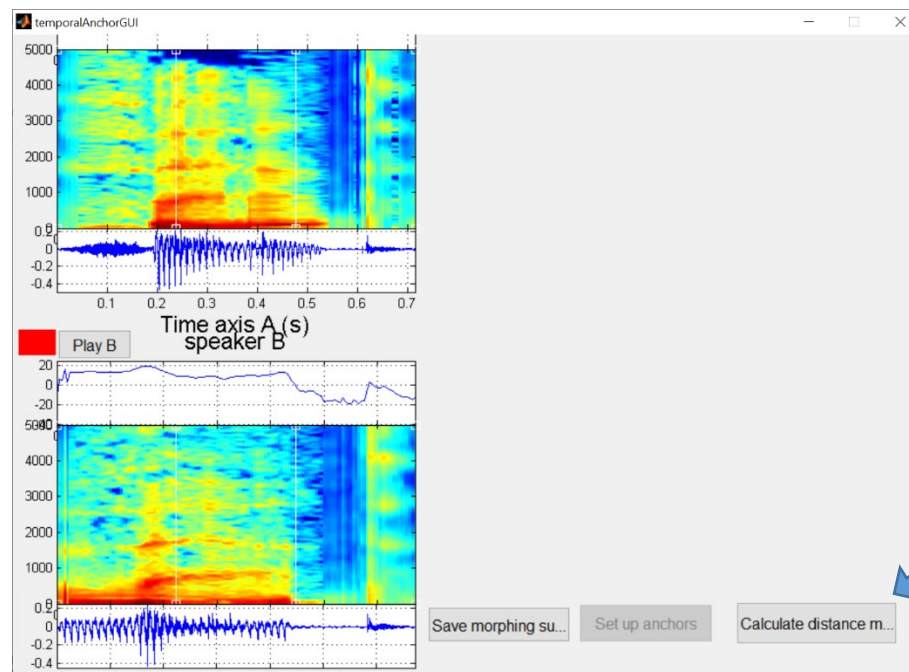
9. Repeat Steps 2-8, this time using Audio File 'B' (vat.wav) and using buttons in the 'Speaker B' box.

### Create Anchored Morphing Substrate

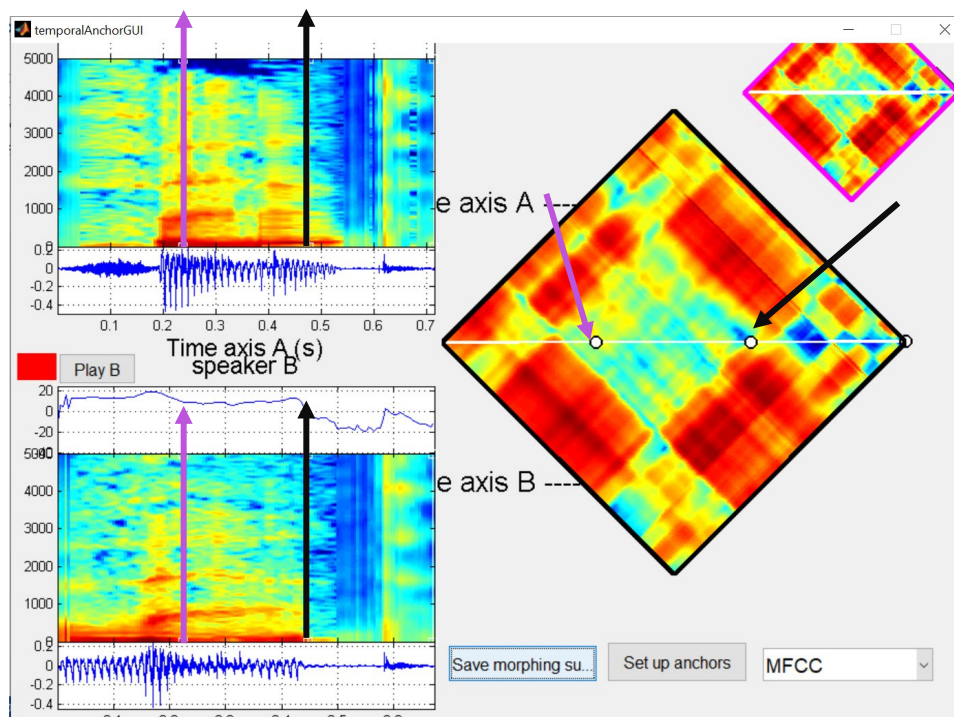
10. Click 'Save morphing substrate' in the 'MorphingMenu' window and save the morphing file.

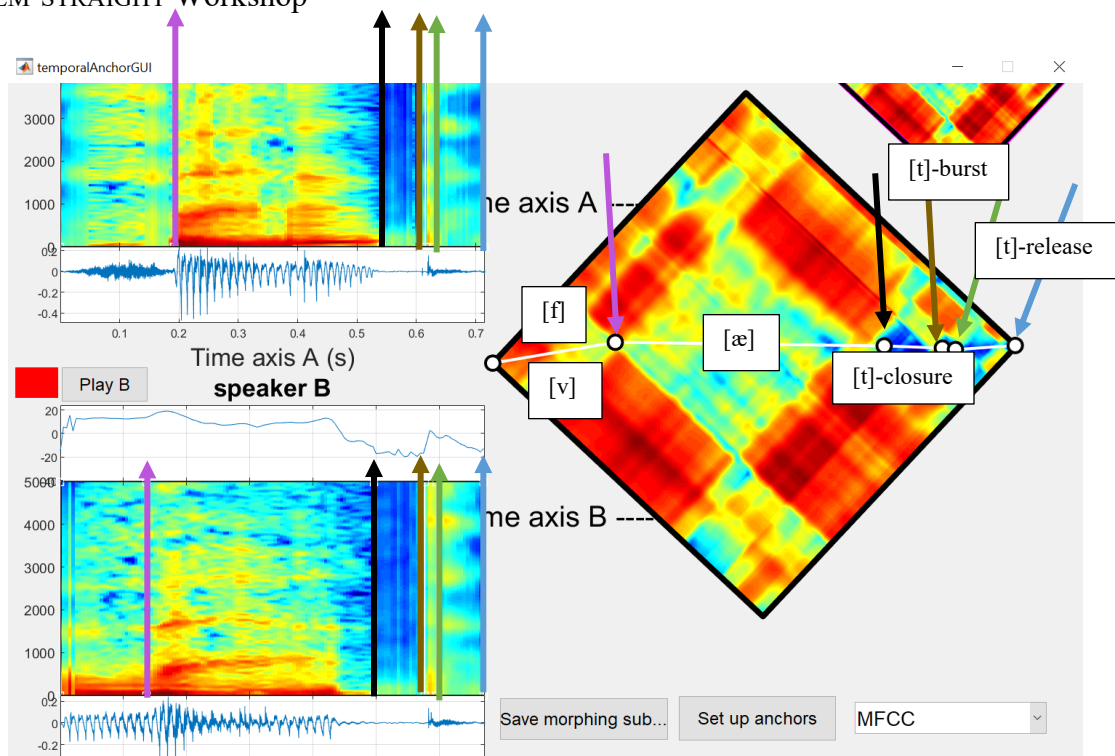


11. Click 'Open anchoring interface' and a new window called 'temporalAnchorGUI' will open.
12. In the 'temporalAnchorGUI' window, click 'Calculate distance m...' (Calculate distance matrix).



13. Click and drag white nodes onto the intersecting phone boundaries. Put anchors in area of least difference (bluer areas) to match phone boundaries in each word.

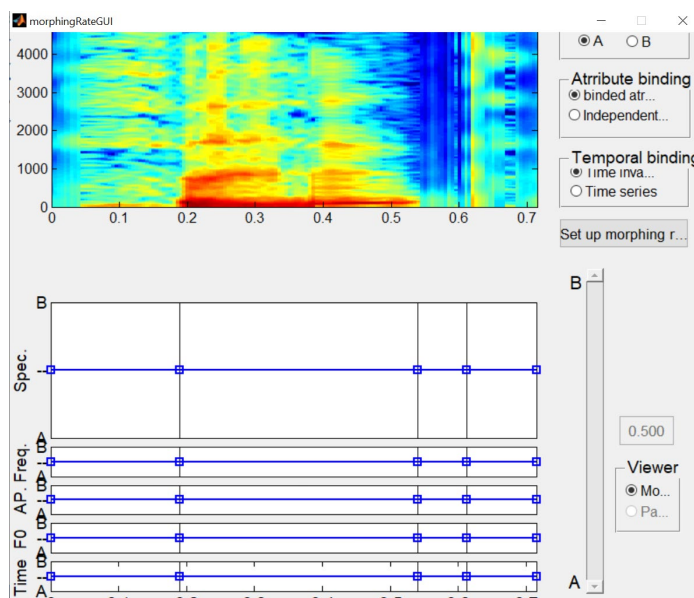




14. Click 'Save morphing substrate' in the 'temporalAnchorGUI' window. This file will save in the folder that contains the 'MorphingMenu' application.

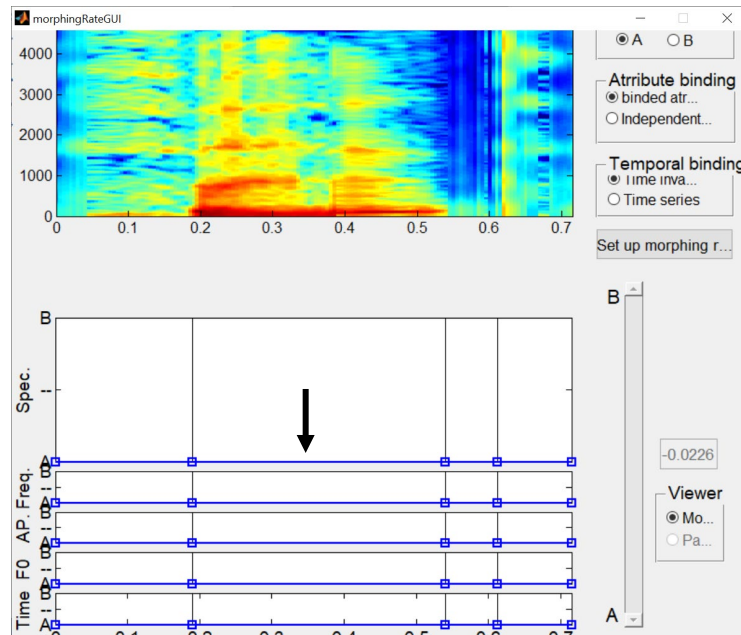
### Create New Endpoint 'A'

15. In the 'MorphingMenu' window, click 'Open morphing substrate' and load the anchored file that was saved in Step 14. (If you click 'Synthesize morphed speech', a sound file will play that is essentially an overlay of the two audio files).
16. Click 'Edit morph...' (Edit morphing substrate). A new window will open called 'morphingRateGUI'.





17. Drag the blue bar with the y-axes labeled ‘Spec.’ down towards the ‘A’ end of the axis.



18. In ‘MorphingMenu’ window, click ‘Save Morphing Substrate’ and save as endpoint ‘A’.

### Create New Endpoint ‘B’

19. Repeat Steps 15-18, this time dragging blue bar up to B end of y-axis, and saving the file as endpoint ‘B’.

### Generate Continuum

20. In the ‘MorphingMenu’ window, click ‘Continuum’ and alter field ‘Target Directory under’ to edit the name of the folder that the continuum files will be saved in. Alter field ‘File name root of’ to change root name of continuum files (ie. ‘stimulus’ yields ‘stimulus001.wav’, ‘stimulus002.wav’, etc.), and enter desired number of steps in the continuum. A window will open, first asking for the A-morph file to be opened (saved in Step 18) and then asking for the B-morph file to be opened (saved after Step 19). The desired number of step files will be saved in the folder and played in succession.