

# The modern phonetogram

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## Introduction

The phonetogram is the visualization of the estimated limits of a person's voice in fundamental frequency ( $f_0$ ) on the ordinate and voice intensity (IL) level on the abscissa. The goal of this study is to determine the intersystem reliability between the lingWAVES system (WEVOSYS) and the new Praat plugin Vox Phonetography (Nijkamp, 2018).

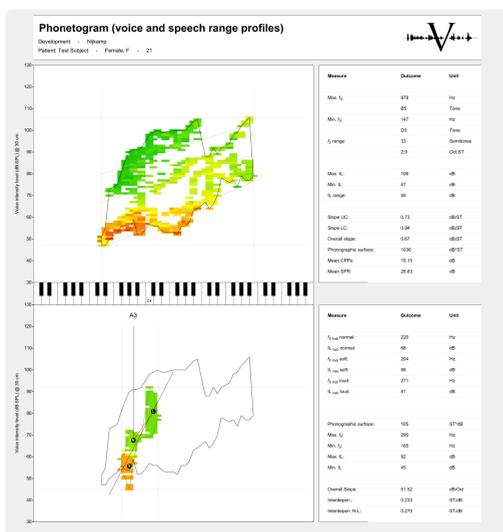


Figure 1: Example phonetogram made with the Praat (P. Boersma, 2002) based Vox Phonetography. Features of Vox include complete playback of all recordings, Cepstral Peak Prominence analysis, speaking voice CPPs and  $f_0$ /IL interdependency measurements.

## Methods

Phonetograms were made simultaneously with both systems for 25 dysphonic and 25 normophonic persons. Variables compared were: min. and max.  $f_0$  and IL variables for the voice and speech range profiles and habitual  $f_0$  and IL of soft, normal and loud speaking voices. The systems were considered to agree if for a variable 95% of the intersystem differences (Bland & Altman, 1999) did not spread more than 2 coordinates and the correlation was strong ( $r > 0.8$ ).

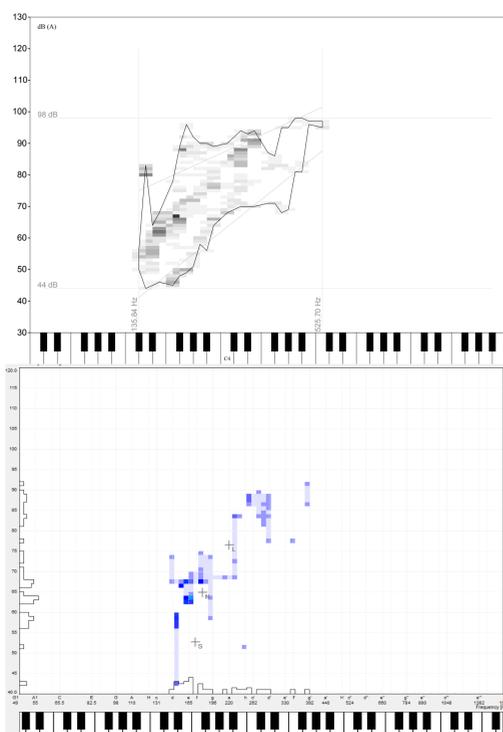


Figure 2: For one case, the Lingwaves system (bottom figure) found the maximum  $f_0$  on F#4, Vox (top) found it on C5. The difference for this variable is 6 semitones.

## Results

Most outputs of the systems correlated strongly ( $r > 0.8$ ), but the 95% limits of agreement were too large for all variables; **meaning none of the variables showed adequate agreement between both systems**. Figure 2 shows the 95% limits of agreement for the variable ' $f_0$  range in semitones' as an example.

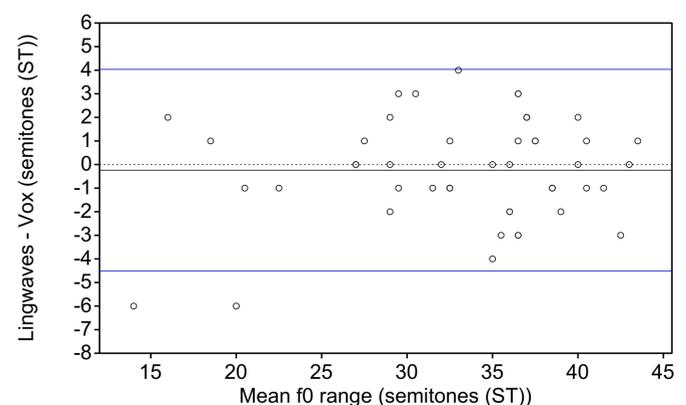


Figure 3: Bland & Altman plot for the variable ' $f_0$  range in semitones'. The middle black line represents the mean difference between the systems (-0.24 ST), the upper and lower blue lines indicating  $\pm 1.96$  SD (8.55 ST). This means that 95% of the differences between the systems range 8.55 semitones for this variable.

## Conclusion

Results indicate large variability and poor intersystem reliability between the two phonetography systems. It was concluded that the lingWAVES and Vox Phonetography systems cannot be used interchangeably.

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