



Formant estimation in Singing Studio

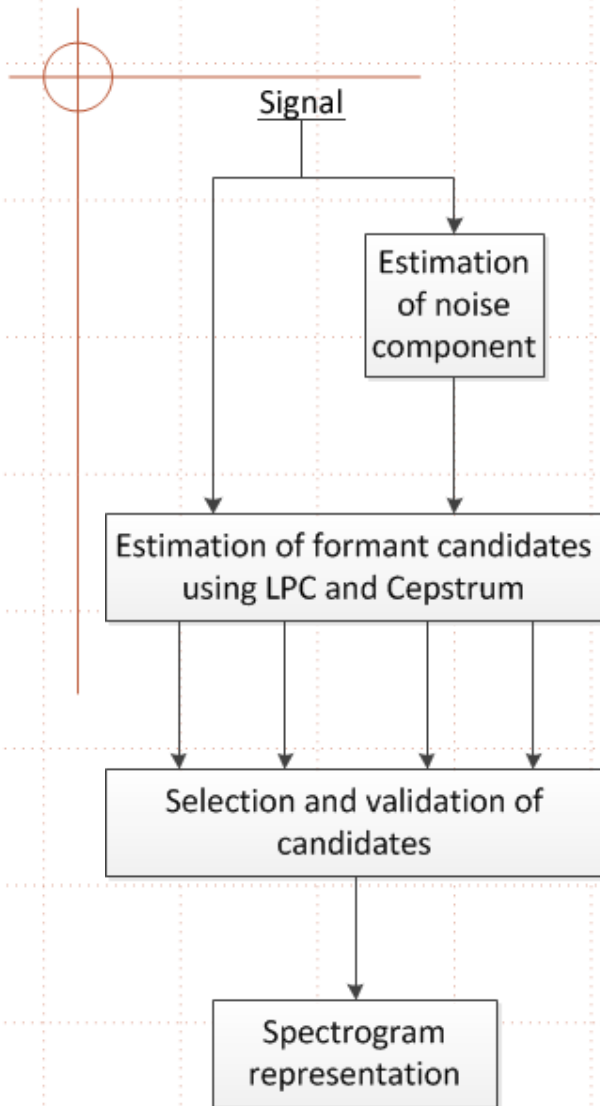
PROJECT MEETING

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January 19th, 2013

Formant estimation algorithm

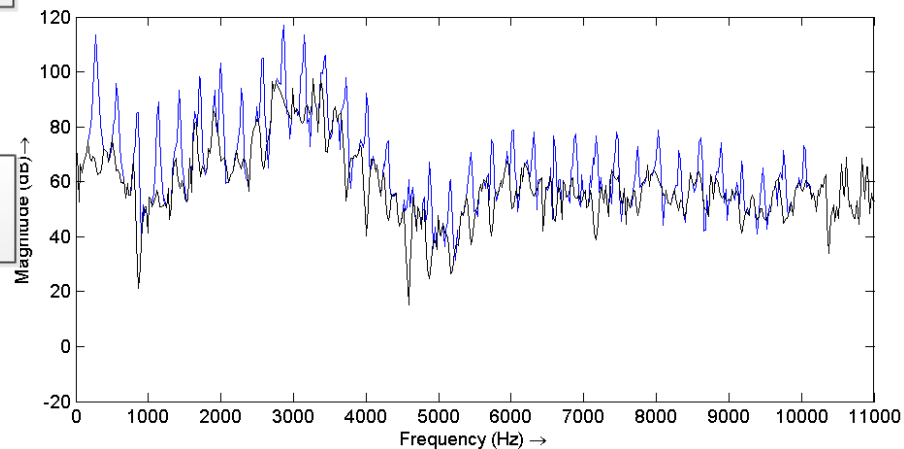
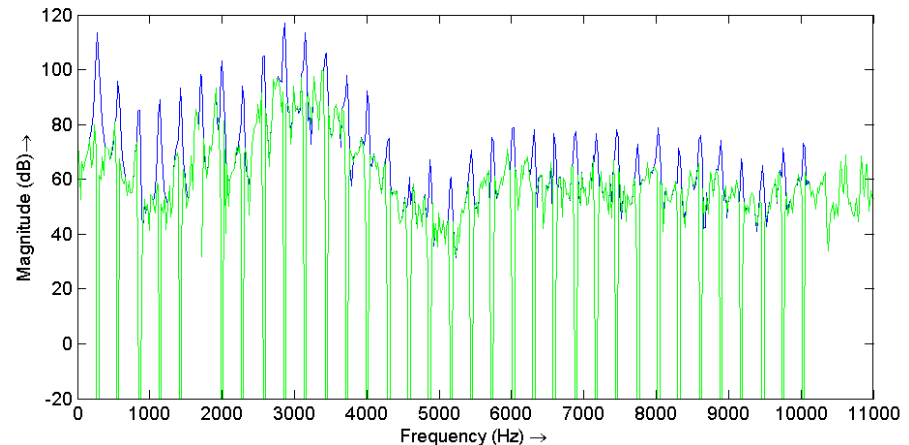
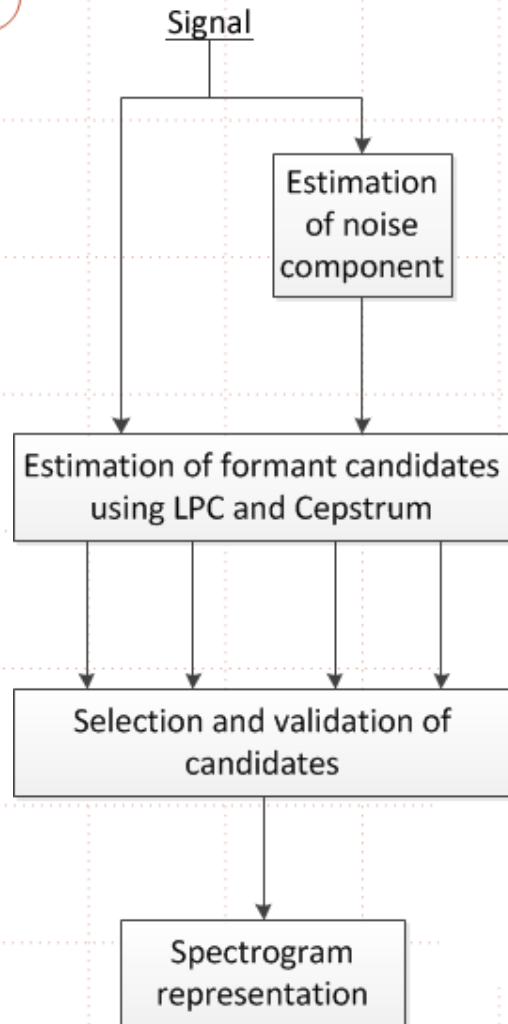


Features:

- Analysis window : 1024 samples, 75% overlap, sine window.
- Sampling frequency: 22050 Hz.

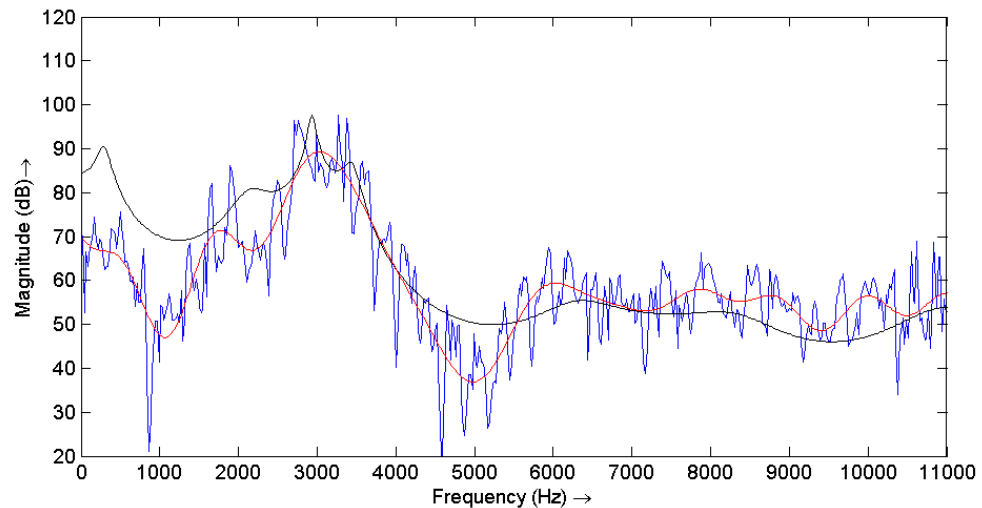
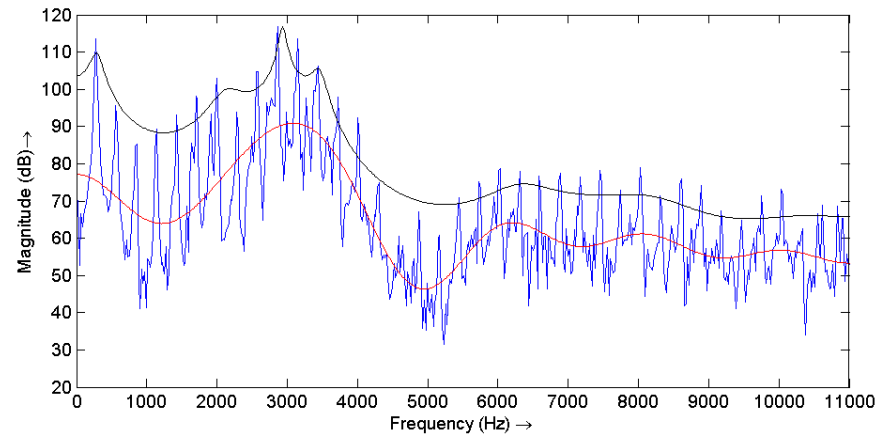
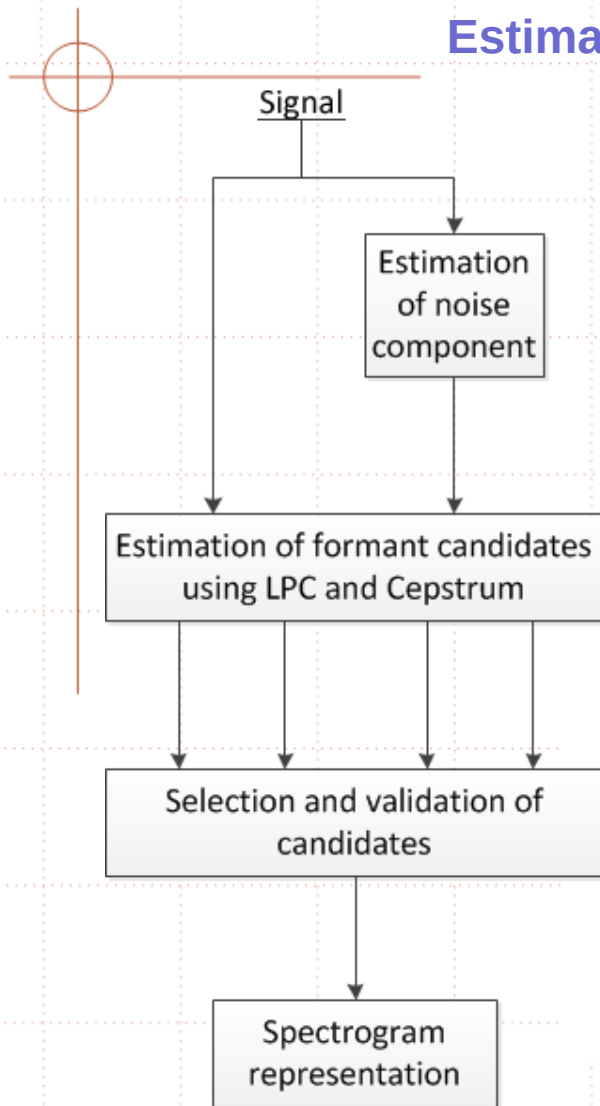
Formant estimation algorithm

Estimation of noise component:



Formant estimation algorithm

Estimation of formant candidates using LPC and Cepstrum:



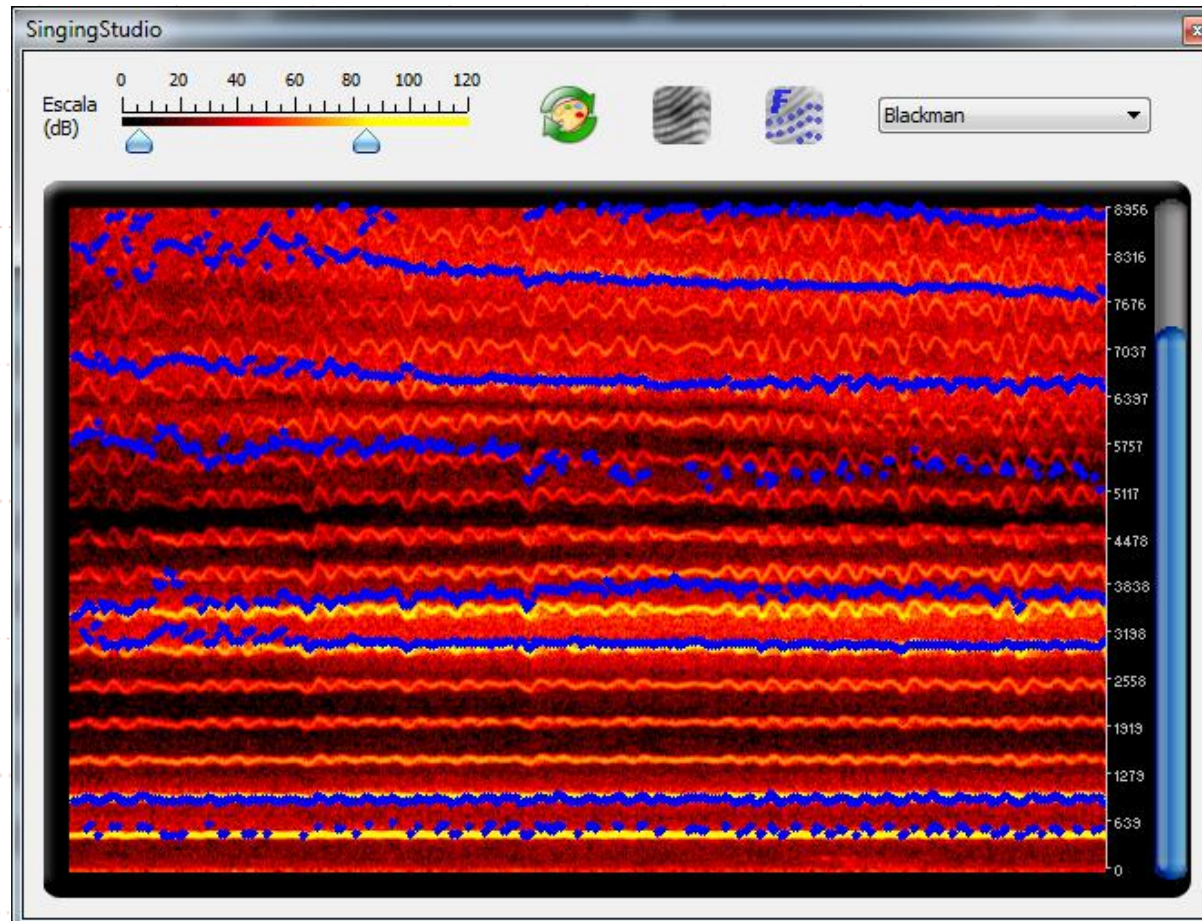
Formant estimation algorithm

Some difficulties:

- The existence of vibrato makes hard the noise estimation
- The closeness between two or more formants
- Finding a rule for the selection and validation the candidates

Formant estimation algorithm

In SingingStudio:





***Vibrato* analysis in Singing Studio**

PROJECT MEETING

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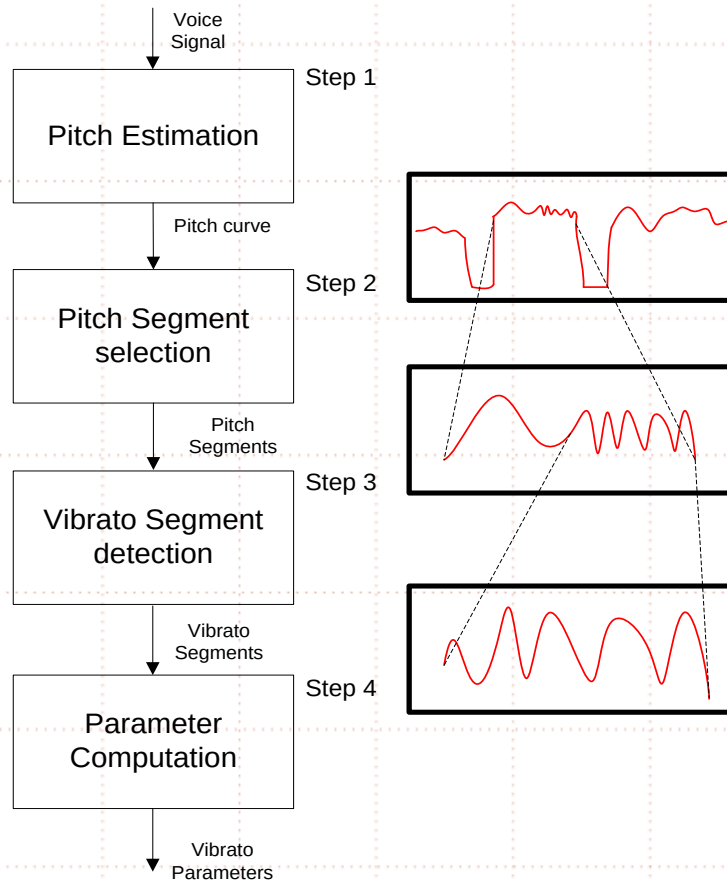
January 19th, 2013

Introduction

- *Context and Objectives*
 - Singing analysis and bio-feedback applied to singing training/teaching
 - Acoustic *vibrato* parameterization
 - Robust
 - Descriptive
 - Objective
 - Physiological meaning
 - Automatic *vibrato* detection
 - Visual interface of *vibrato* analysis

Method

• Analysis Algorithm

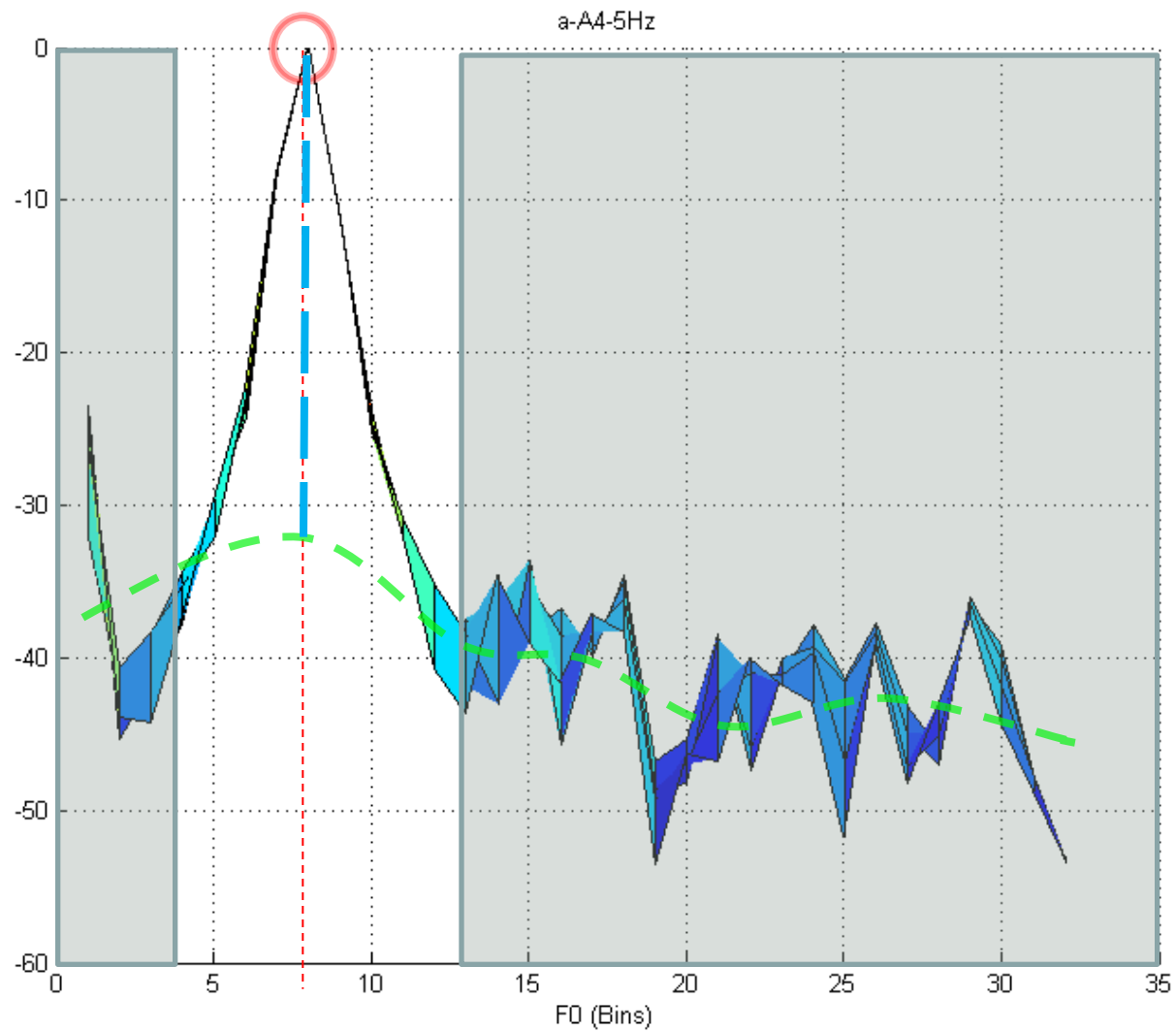


-Spectral based methods

-Frame based

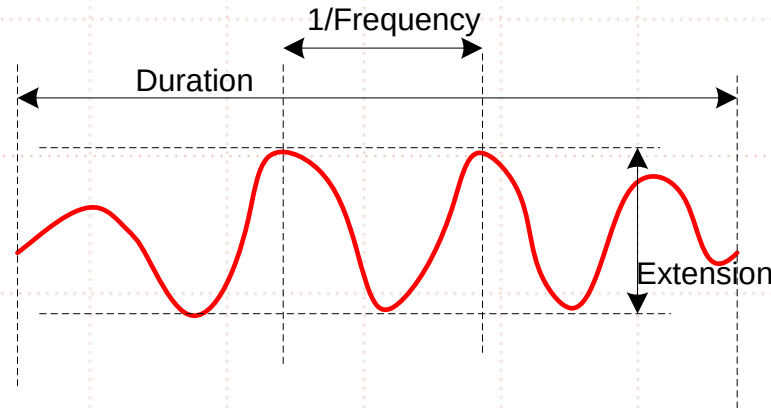
- FFT interpolation (accurate F0 estimation)

Method



Method

- *Vibrato* parameters

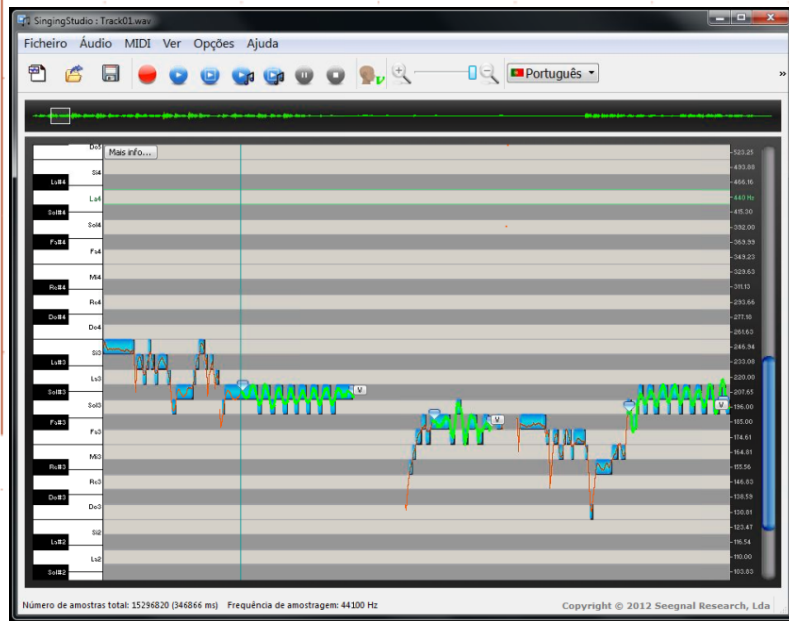


- *Vibrato percentage*: Ratio of *vibrato* duration and the entire theme duration
- *Mean Duration*: Mean duration of all segments.
- *Mean frequency*: Mean frequency of all segments.
- *Mean extension*: Mean extension of all segments.
- *Sinusoidal Purity*: Measure the regularity of *vibrato* (similarity to sinusoidal waveform)

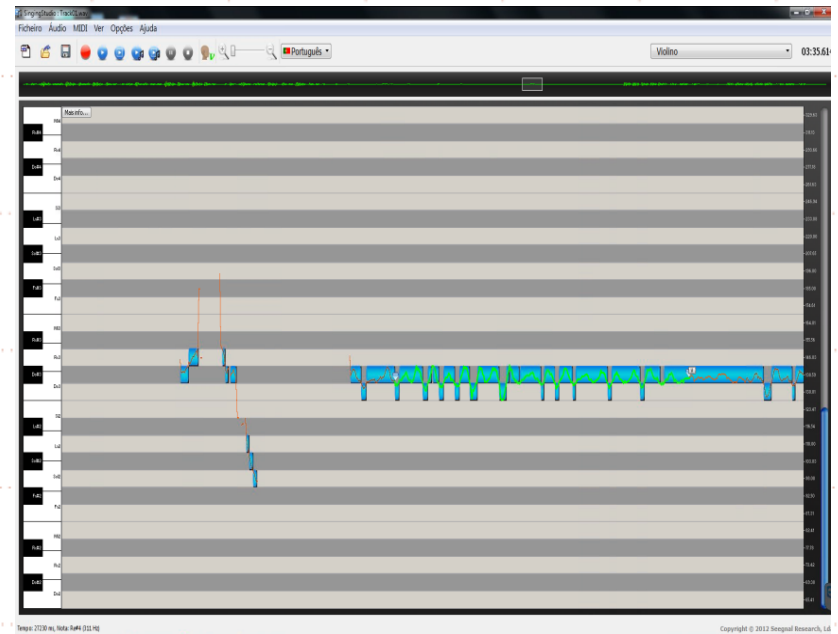
Results

- Automatic detection of *vibrato* segments

Vibrato detection 1



Vibrato detection 2



Additional features:

- Manual adjustment of vibrato segments

Results

• Qualitative and Quantitative Evaluation

Regular vibrato



Duração (ms) 2629.00
Pureza Sinu. (%) 95.08

Irregular vibrato

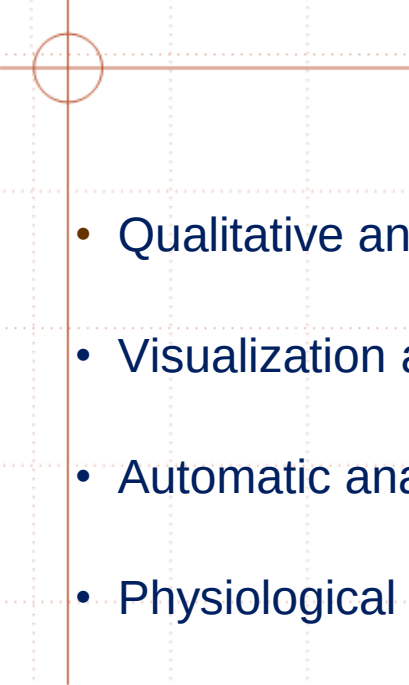


Duração (ms) 1727.00
Pureza Sinu. (%) 68.46

Observation:

- Qualitative evaluation: “Good vibrato”, “Bad vibrato”

Conclusion

- 
- Qualitative and Quantitative evaluation of vibrato.
 - Visualization and bio-feedback.
 - Automatic analysis.
 - Physiological interpretation.
 - Interactive interface.



Truly grateful!