

A Pure Data toolkit for real-time synthesis of ATS spectral data

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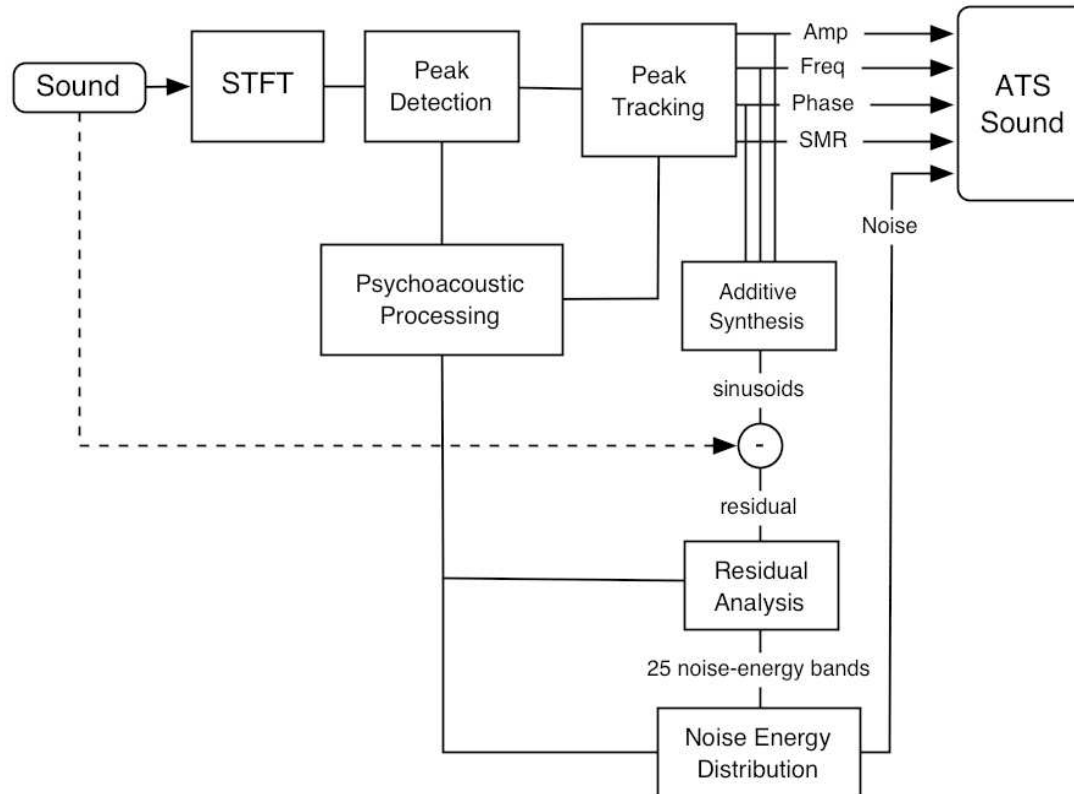
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de Quilmes**

Argentina

The ATS technique (Analysis-Transformation-Synthesys)

- **The PARSHL program (Julius Orion Smith)
(peak detecting and tracking)**
- **The SMS Technique (Xavier Serra)
(deterministic-plus-stochastic model)**
- **The ATS technique (Juan Pampin)
(Psycho-acoustic data)**

ATS analysis flow diagram



ATS analysys Parameters

Analysis Parameters

Start(secs.)	0,0000	Track length(frames)	3
Duration(secs.)	0,0000	Min. Seg. length(frames)	3
Lowest Freq.(Hz.)	20,0000	Min. Gap length(frames)	3
Highest Freq.(Hz.)	20000,0000	SMR threshold(dB SPL)	30,0000
Frequency Deviation(Ratio)	0,1000	Min. Seg. SMR(dB SPL)	60,0000
Number of Cycles of Lowest Frequency to fit in Analysis Window	4,0000	Last peak contribution	0,0000
Hop size(ratio of Window size)	0,2500	SMR contribution	0,5000
Amplitude threshold (dB)	-60,0000	ATS output file type	type4 <input type="checkbox"/>
Window Type	Blackman-Harris <input type="checkbox"/>		

Load Parameters Save Parameters Set Default Values

Set input Soundfile

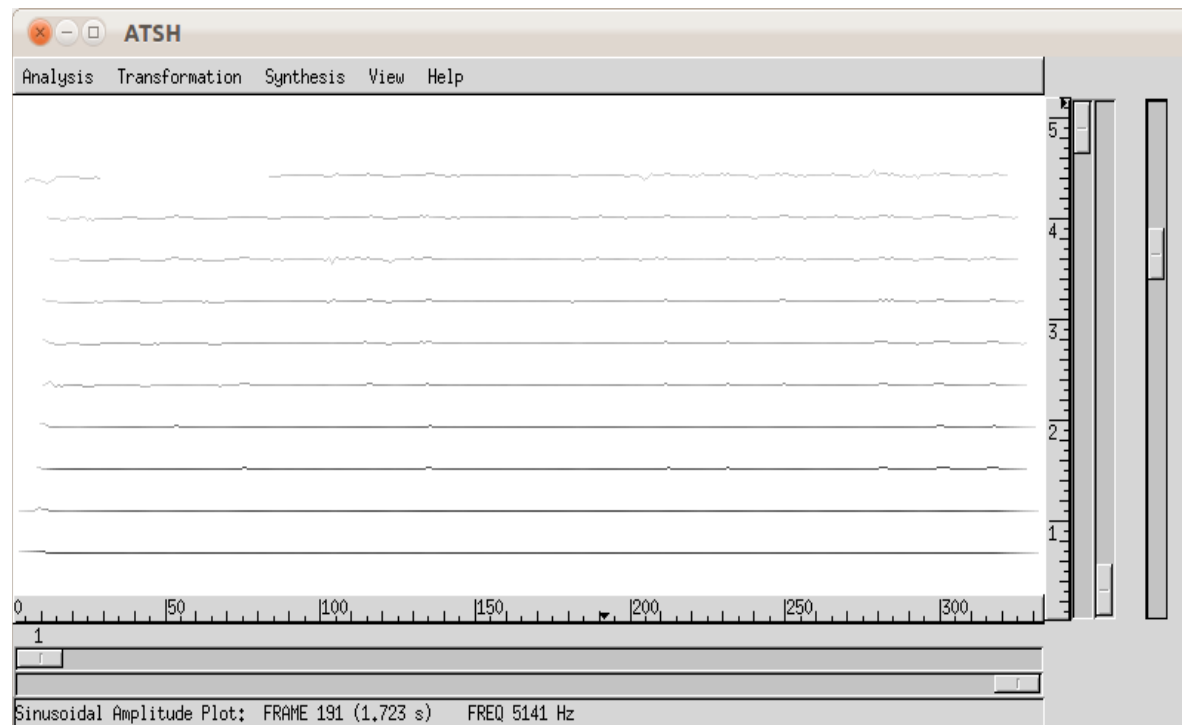
Set output ATS file

Set Residual Output

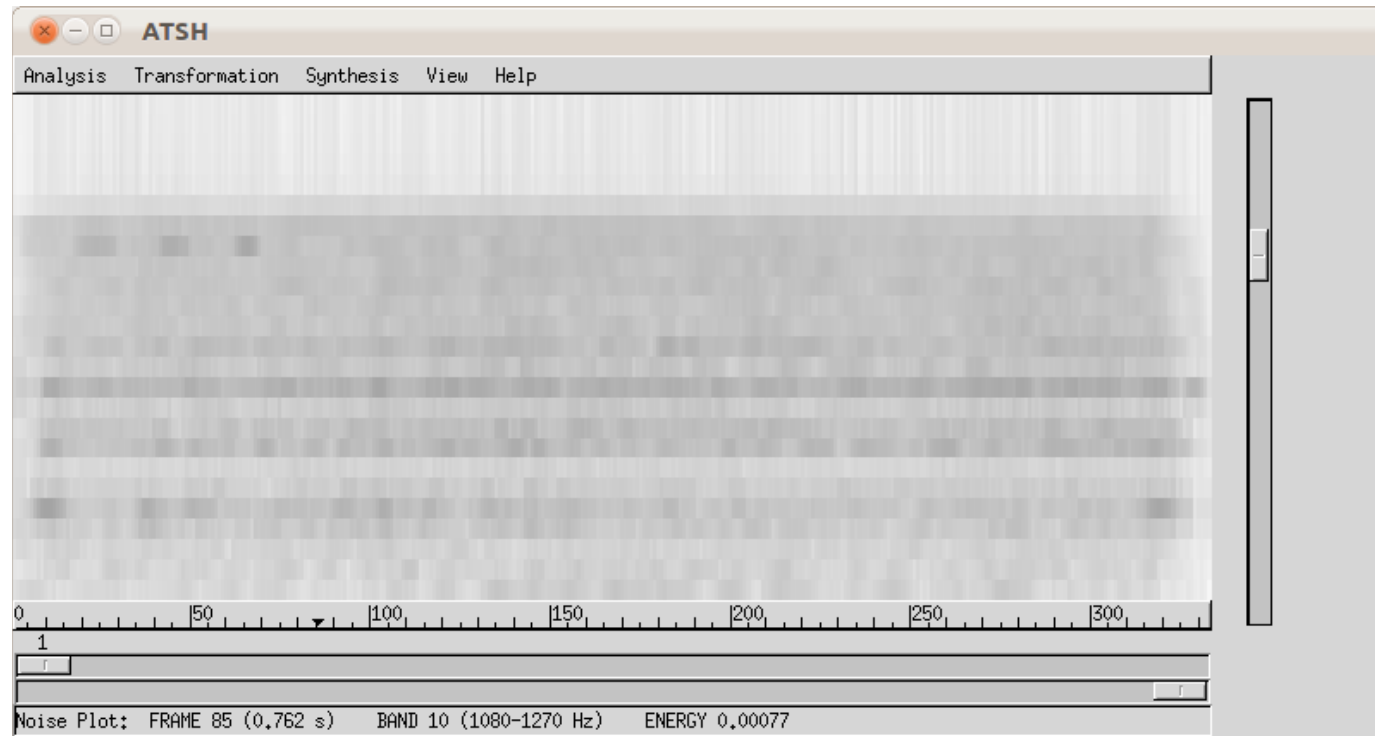
Do Analysis Forget It

ATS Data representation

1-Deterministic: sinusoidal trajectories (amplitude, frequency, phase)



2-Residual: energy values in each one of the 25 critical bands.

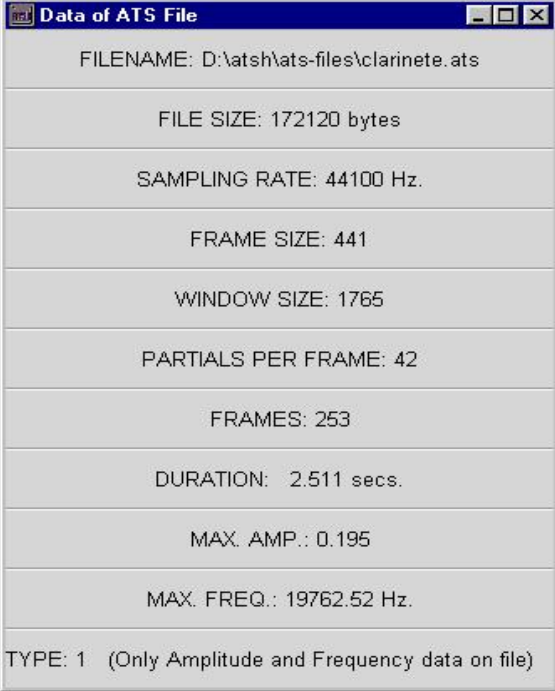


ATS file binary format

Data is stored as double floats in the host's byte order.

ATS-HEADER:

ats-magic-number
sampling-rate (samples/sec)
frame-size (samples)
window-size (samples)
partials (number of partials)
frames (number of frames)
ampmax (max. amplitude)
frqmax (max. frequency)
dur (duration in sec.)
type (frame type, see below)



A screenshot of a window titled "Data of ATS File" showing the following metadata:

FILENAME: D:\atsh\ats-files\clarinete.ats
FILE SIZE: 172120 bytes
SAMPLING RATE: 44100 Hz.
FRAME SIZE: 441
WINDOW SIZE: 1765
PARTIALS PER FRAME: 42
FRAMES: 253
DURATION: 2.511 secs.
MAX. AMP.: 0.195
MAX. FREQ.: 19762.52 Hz.
TYPE: 1 (Only Amplitude and Frequency data on file)

ATS binary file types

**(1) No phase or noise information present.
(Amplitude, Frequency)**

**(2) With phase information but no noise.
(Amplitude, Frequency, Phase)**

**(3) With noise information but no phase.
(Amplitude, Frequency, Noise)**

**(4) Both phase and noise information present.
(Amplitude, Frequency, Phase, Noise)**

Applications that perform ATS Analysis

ATS – CLM (Juan Pampin)

(for Common Lisp Music)

ATSA (Pampin, Di Liscia, Moss)

(Command-line application)

Csound Package command-line utility ATSANAL

(ported from ATSA by Itzvan Varga)

ATSH (by Di Liscia, Pampin, Moss)

(GUI application using GTK)

ATS Synthesis

Three main cases

A-Deterministic.

- a.1 Oscillator bank synthesis.
- a.2 IFFT synthesis.
- a.3 Subtractive synthesis (hybridation).

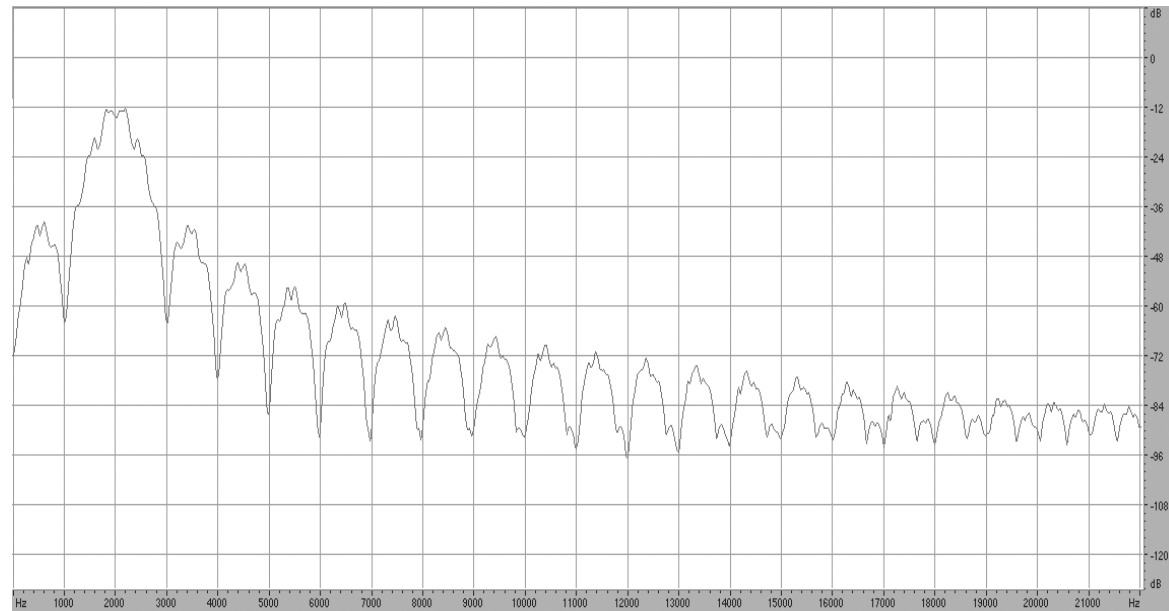
B-Residual.

- b.1 Subtractive synthesis (bank of band-pass filters).
- b.2 Interpolated noise (bank of *randi* Units).

C-Deterministic plus residual.

- .*Randi* units Modulated by sinusoidal components.
(needs previous computation of noise energy for each partial)

***Randi* units Modulated by sinusoidal components**



$$output_n = \sum_{k=0}^{par-1} (a_k \sin(2\pi f_k n/R) + r_k \sin(2\pi f_k n/R) randi(f_k s))$$

PD-ATS

1-The *atsread* external (Alex Norman and Pablo Di Liscia)

2-The *oscbank~* external (by Richie Eakin).

3-The *ats_noisy~* external (by Pablo Di Liscia).

4-The *ats_sinnoi~* external (by Richie Eakin and Pablo Di Liscia)

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Juan Pampin

Alex Norman

Richie Eakin