GAD Signal Processing System

GAD Group's GAD Signal Processing (GSP) signal analyser is a novel (worldwide patent pending), configurable and versatile DSP signal analysis system that provides a more intuitive representation of the sinusoidal/non-sinusoidal components in real world signals than existing techniques.

The fixed integer window size in well known and understood techniques such as STFTs compromises the precision of frequency discrimination and temporal information.

GSP presents an alternative to that compromise. GSP may be considered as a cascade of one or more filter banks that have variable non-integer window sizes at each frequency. As the filters are not constrained by integer window sizes they can be spaced arbitrarily in frequency.

Each cascade generates at its output a 3D surface that is then analysed by a variety of techniques after every input sample. The output of one such technique generates localised peaks in amplitude, frequency and time, which reduce the data size whilst retaining the core information. The resultant data may then be visualised or further analysed.

Features

- Frequency, phase and transient analysis
- Frequency tracking
- User configurable
- Logarithmic, linear or arbitrary frequency spacing.
- Localised peak detect (amplitude) or energy (integral) information
- Output allows for analysis of harmonic relationships
- Core algorithm designed for next generation parallel processors

Typical Applications

- Time-Frequency Analysis
- Medical and Biological Signal Analysis
- Condition Monitoring
- Speech and Biometrics
- Audio and Video Analysis
- Seismic Analysis

Comparative Analysis

Fig. 1 and Fig. 2 (below) show a comparative time-frequency analysis of a signal captured by a radio telescope. The output of GSP shows clearly discriminated frequencies. Phase information is also available for each frequency, but not shown.

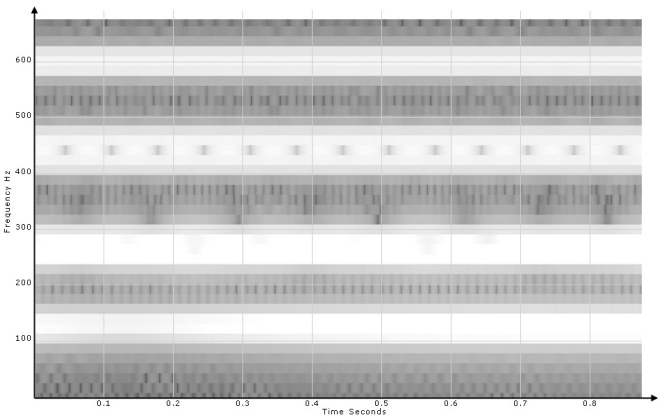

Fig. 1 STFT Time-Frequency Analysis

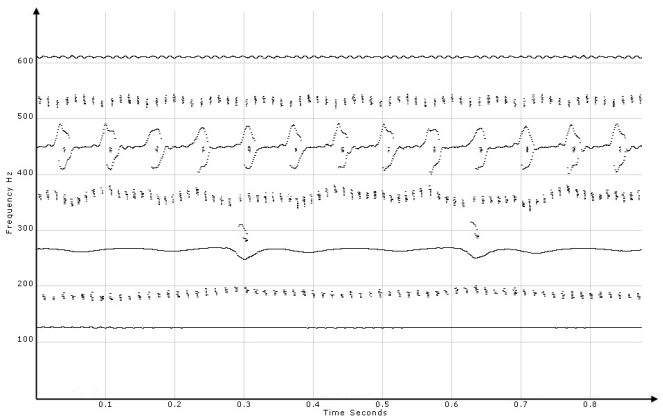

Fig.2 GSP Time-Frequency Analysis

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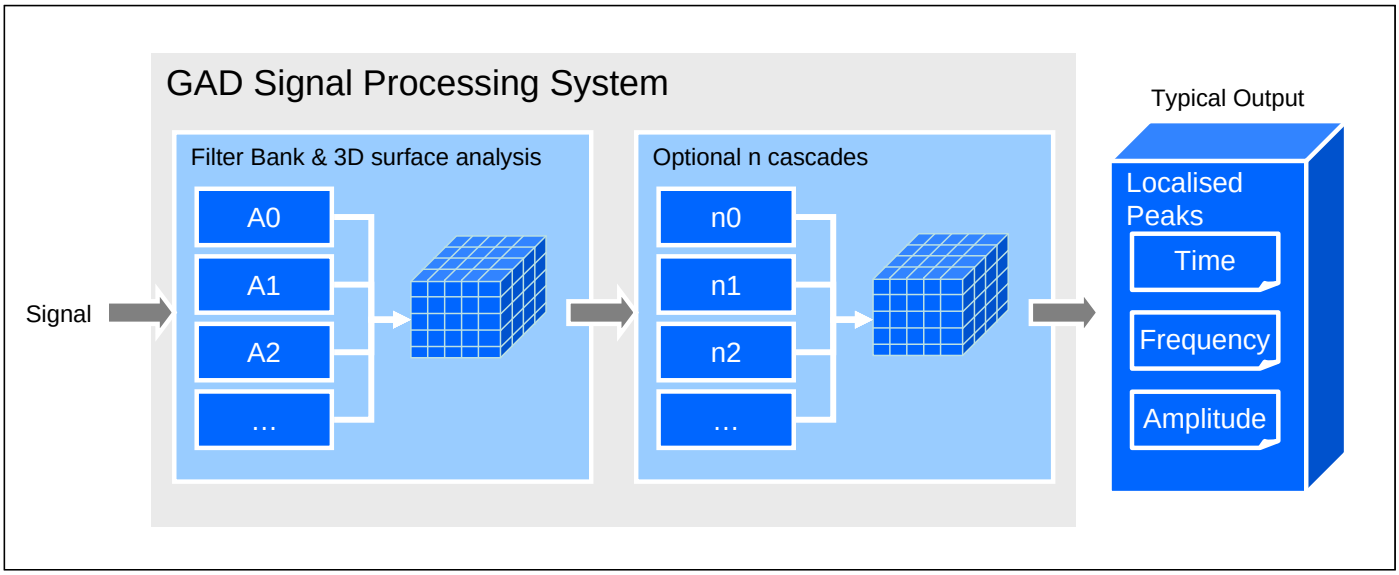
Applications

Further analysis may include (but is not limited to) locating transients, detecting new sinusoidal frequencies, anti-phasing signals, determining harmonic relationships, searching for phase coincidences that may cause resonances, finding and describing time/frequency/amplitude curves, re-constructing a representation of the signal by generating sine waves, feeding into a neural network.

Filters

The filters are based on cascades of resonant filters that may be configured with any Q value and centre frequencies up to Nyquist. They are so designed that the stable output of each filter in response to a signal of its centre frequency is the same for all Q values. The sinusoidal frequency/phase discrimination depends on the number and Q of the filters, the length of the sinusoidal signal and the sampling rate and bit precision of the input data. For sinusoidal signals stability increases exponentially with the duration of any sinusoidal component.

Parameter	Typical Offering
Filter Window Size	Variable, non-integer
Sinusoidal Signal Stability	Proportional to 1 – exp(-t/T); t = duration, T = 2*Q/w0
Outputs	Peaks with time, frequency and amplitude information
Signal Analysis Technique	Proprietary - Worldwide patent pending



Technology Licensing

GSP is now available for licensing in a variety of formats. Please contact GAD Group for more information.

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