SIGNAL TRACK SEARCH (STS)

A ROBUST DETECTOR OF QUASIPERIODIC BURSTS

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ALGORITHM

1. Construct time-frequency map of time series data. The Wigner Ville is found to have good localization properties:

$$\rho(t, f) = \int_{-\infty}^{\infty} h\left(t - \tau/2\right) h\left(t + \tau/2\right) e^{i2\pi\tau f}.$$

2. Use a curve Tracking algorithm to detect curvilinear structures in the map. Steger's Algorithm is found suitable for this.

3. Use a suitable statistic based on curve properties such as the length of the curve found as a threshold.

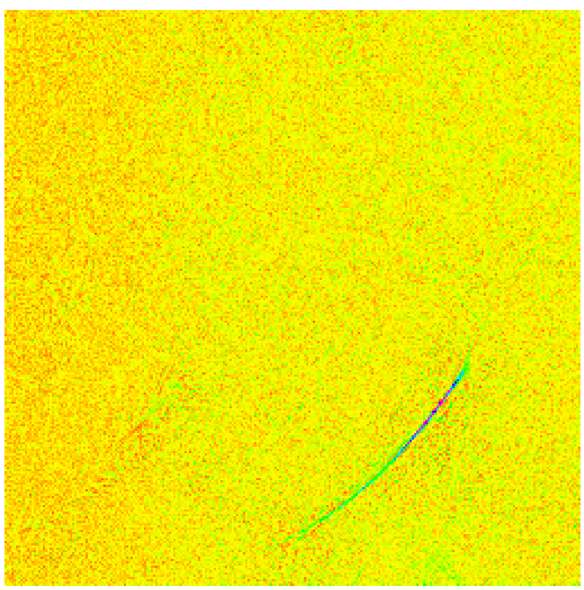

Figure 1: The figure depicts a Wigner-Ville map of white Gaussian noise and a quasiperiodic burst. The X-axis represents time and the interval is 0.0 to 0.416 seconds and the Y-axis represents time in the interval 0.0 to 2500 Hz.

LIGO-G000220-00-D

THINGS DONE SO FAR

1. Testing of Algorithm for detection of binary merger signals in simulated LIGO I noise. The results are encouraging.
   W G. Anderson and R.B., Phys. Rev. D., **D60**,102001,(1999)
2. Time frequency map generation routines in LAL format: Routines for Wigner Ville, Spectrogram and Reassigned Spectrogram. (Eric)
3. Steger's Algorithm coded to LAL format. (Bala)
4. A single user and an MPI version of the implementation of STS algorithm for the case of White Gaussian noise to LAL format (Bala).

THINGS TO BE DONE

1. Fix the various parameters in the Algorithm. (white Gaussian Noise may be used for this purpose):

   σ The width of curves to search for.

   high The upper threshold for the second derivative.

   low The lower threshold for the second derivative.
2. Analyse LIGO engineering run data to study the feasibility of using STS algorithm when the noise is non-Gaussian and is contaminated by several narrowband contaminants.