

# New Discrete Time-Frequency Unitary Wigner-Ville distribution

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Supernova Core Collapse, Collision of two stars etc.

⇒ Gravity Wave Burst of Unknown Shape

Developing Robust and nearly-optimal Time-Frequency(TF) based detection algorithm

⇒ Optimality demands Time-Frequency Distribution to be Unitary

$$[\text{Unitarity} \rightarrow \int_{-\infty}^{+\infty} W_x(t, f) W_y(t, f) dt df = \left| \int_{-\infty}^{+\infty} x(t) y^*(t) dt \right|^2 ]$$

Our Proposal of Discrete Time-Frequency Wigner-Ville :

$$w_x(\mathbf{n}, \mathbf{m}) \equiv t_s \sum_{k=-k_n}^{k_n} x(\lfloor \mathbf{n} + \mathbf{k}/2 \rfloor) x^*(\lfloor \mathbf{n} - \mathbf{k}/2 \rfloor) e^{-2\pi i \mathbf{m} \mathbf{k} / (2N)}; \quad k_n \equiv \min\{2n, 2N - 1 - 2n\}$$

