Discrete Radon Transform

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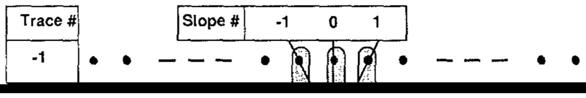
***Abstract*—This paper describes the discrete Radon transform (DRT)**

various discretizations of Radon's inversion formula. We show that DRT can be used to compute various generali-

where

$\boxed{x_{-L}(n)}$

sets of points of the lattice with a weight coefficient assigned to each point. The family of objects is constructed



This is the key observation which follows from the periodicity condition (i). (Discussion of properties of the block-circulant matrices can be found in [27], for exam-

It follows from (4.6) that if $\sigma = 1$, matrices R_m are given by

$$(R_m)_{jl} = \delta_{m,jl}.$$

[redacted]

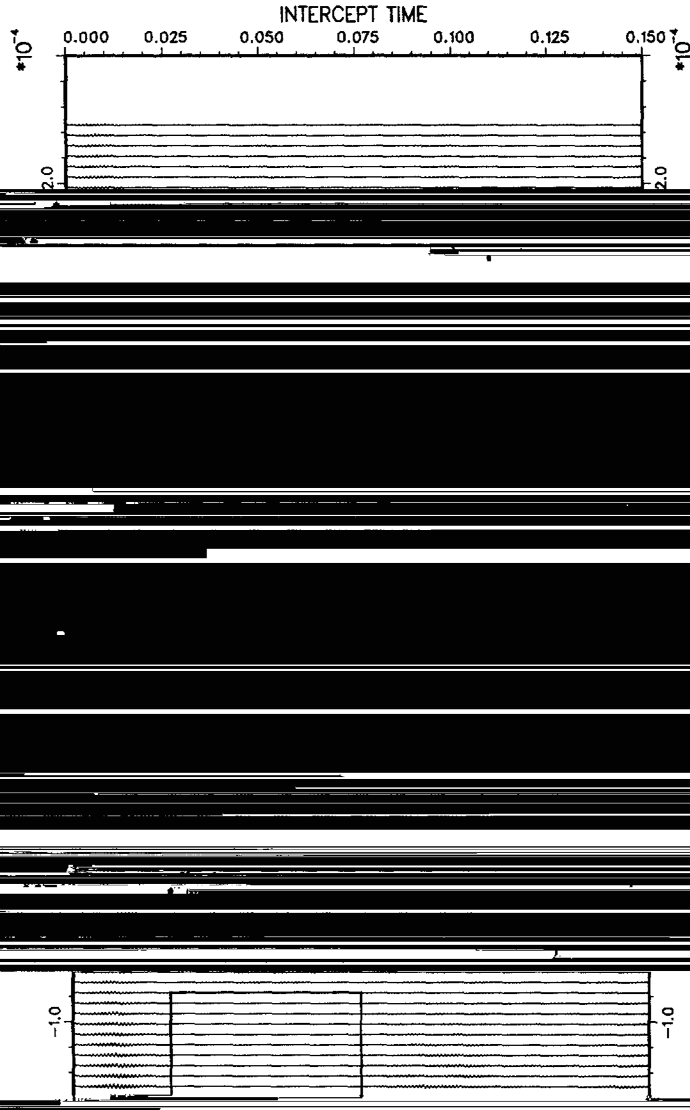
where $j = 0, \pm 1, \cdots, \pm J$. This transform reduces to the ordinary DFT for $\alpha = 1$ and $L = J$. We consider now the following problem: given α and $\hat{w}_\alpha(j)$ for $j = 0, \pm 1, \cdots, \pm J$, find $w(l)$. To solve this problem, we ap-

[redacted]

$= N/k_0(2J + 1)$, where $k_{\min} \leq k_0 \leq k_{\max}$), estimates of [redacted]

Inversion formula (6.1) also implies the discrete Par- [redacted]

One can see now that the expression in (4.8) is a discrete analog of the kernel in the inner integral in (7.2). If we



mask and the approximate inversion was a problem in using the tau-P representation for the velocity filtering.

Appendix

Lemma 1 and Lemma 2 are essentially similar. Their proof is elementary. We use the notation of Lemma 1.

$$\hat{z}(k) = \sum_{m=-2M} H_m \sum_{n=0} x(n+m)\, e^{2\pi i(nk/N)},$$

or