

Strabon

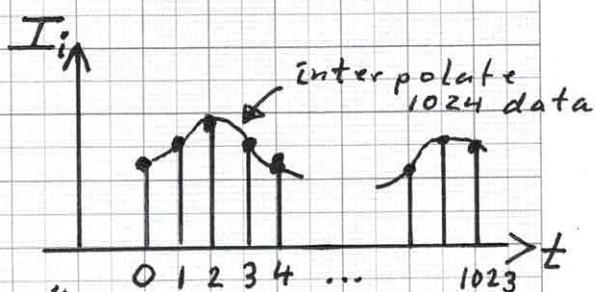
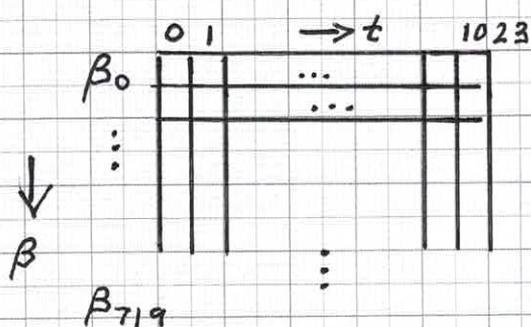
■ Reconstruction - Continuous Viewpoint

I) Continuous Sinogram

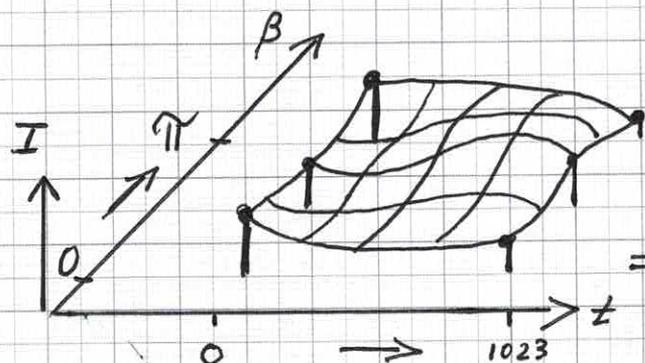
→ How to "INTERPOLATE INTELLIGENTLY"?

- Recorded imaging / projection data:

data for one β_i :



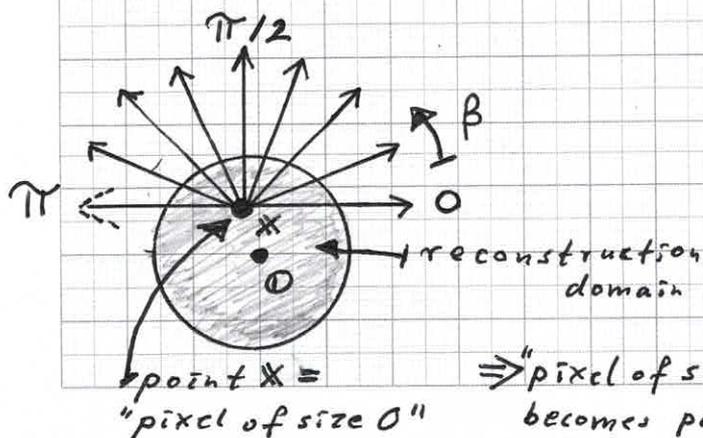
Construct interpolation function $I_i = I(\beta_i, t)$
 (possibly having discontinuities!)



⇒ Construct continuous / piecewise-continuous function $I = I(\beta, t)$,
 $\beta \in [0, \pi]$, $t \in [0, 1024]$

⇒ FIRST: DETECT DISCONTINUITIES IN DATA

• SECOND: PRESERVE THESE DISCONTINUITIES IN $I(\beta, t)$



⇒ "pixel of size ϵ " becomes point X!

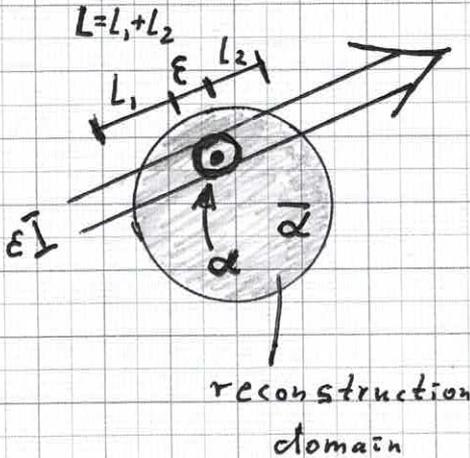
⇒ $I(\beta, t)$ must enable "reconstruction at the limit" for $\epsilon \rightarrow 0$!

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■ Reconstruction - Continuous Viewpoint (cont'd.)

II) Continuous angle β , pixel of size $\epsilon > 0$

(see previous pages for notation)



⇒ System:

$$\epsilon \alpha + L_0 \bar{\alpha} = I_0 \quad (\beta_0)$$

⋮

$$\epsilon \alpha + L_{719} \bar{\alpha} = I_{719} \quad (\beta_{719})$$

⇓ SUMMING UP / INTEGRATING
(CONTINUOUS VIEW):

$$\int_{\beta=0}^{\pi} (\epsilon \alpha + L(\beta) \bar{\alpha}) d\beta = \int_{\beta=0}^{\pi} I(\beta) d\beta$$

III) "Pixel of size 0" ($\epsilon = 0$)

System ($\epsilon = 0$):

$$\left. \begin{aligned} L_0 \bar{\alpha} &= I_0 \\ &\vdots \\ L_{719} \bar{\alpha} &= I_{719} \end{aligned} \right\} \Rightarrow$$

$$\bar{\alpha} \sum_{i=0}^{719} L_i = \sum_{i=0}^{719} I_i$$

$$\Rightarrow \bar{\alpha} = \frac{\sum_{i=0}^{719} I_i}{\sum_{i=0}^{719} L_i}$$

⇓ CONTINUOUS VIEW:

$$\bar{\alpha} = \frac{\int_{\beta=0}^{\pi} I(\beta) d\beta}{\int_{\beta=0}^{\pi} L(\beta) d\beta}$$

?? = α ←

α = "POINT DENSITY"?
(Dirac's delta function?)

IV) CONSTRUCTION OF $I(\beta, t)$ = OPTIMIZATION PROBLEM:

→ Optimally define set of BASIS FUNCTIONS & compute BEST APPROXIMATION that preserves DISCONTINUITIES!