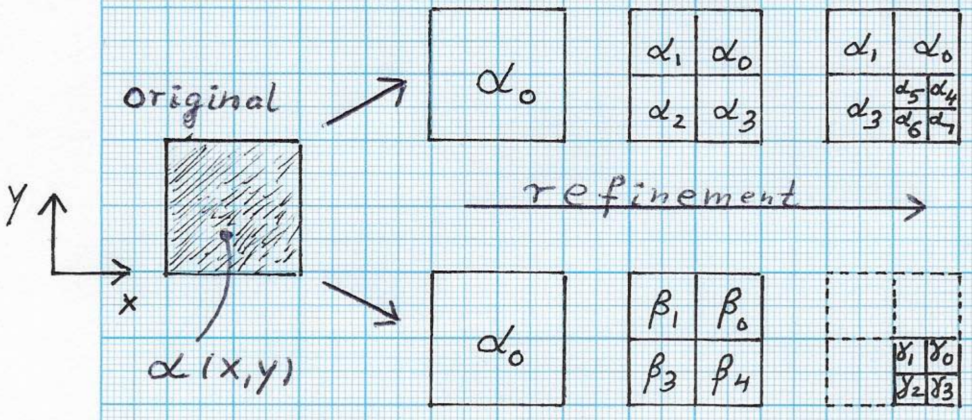
Stratovan

AMR RECONSTRUCTION AND LOCALIZATION – Cont'd.

→ "Simple" refinement with BOX functions



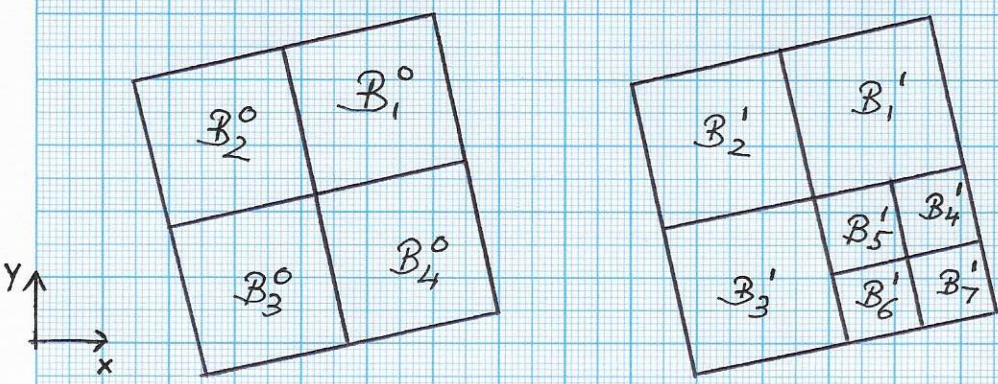
i) Values α_i computed repeatedly for each mesh (1, 4, 7 values)

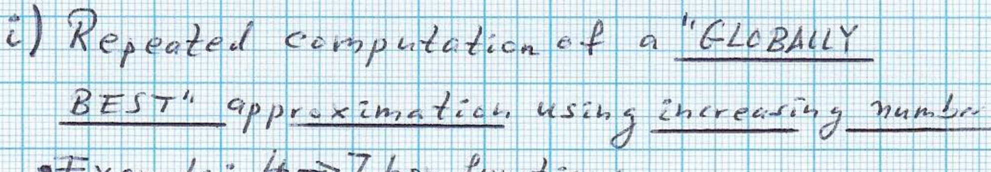
ii) "Offset" values β_i and γ_j computed locally in regions with larger residuals

i) Repeated computation of a "GLOBALLY BEST" approximation using increasing number of box functions

- Example: 4 → 7 box functions

→ principle:
- determine boxes to be subdivided
- determine new resulting inner products for linear system to be solved





- "projections of 4 Boxes"
- "projections of 7 Boxes after refinement"

- **COMPUTE REFINED APPROXIMATION VIA "UPDATE" SCHEME**×

⇒ Must compute coefficients after each refinement step for ALL box basis functions!

(see GOLUB, VAN LOAN: "Matrix Computations")

×efficient!

AMR RECONSTRUCTION AND LOCALIZATION – Cont'd.

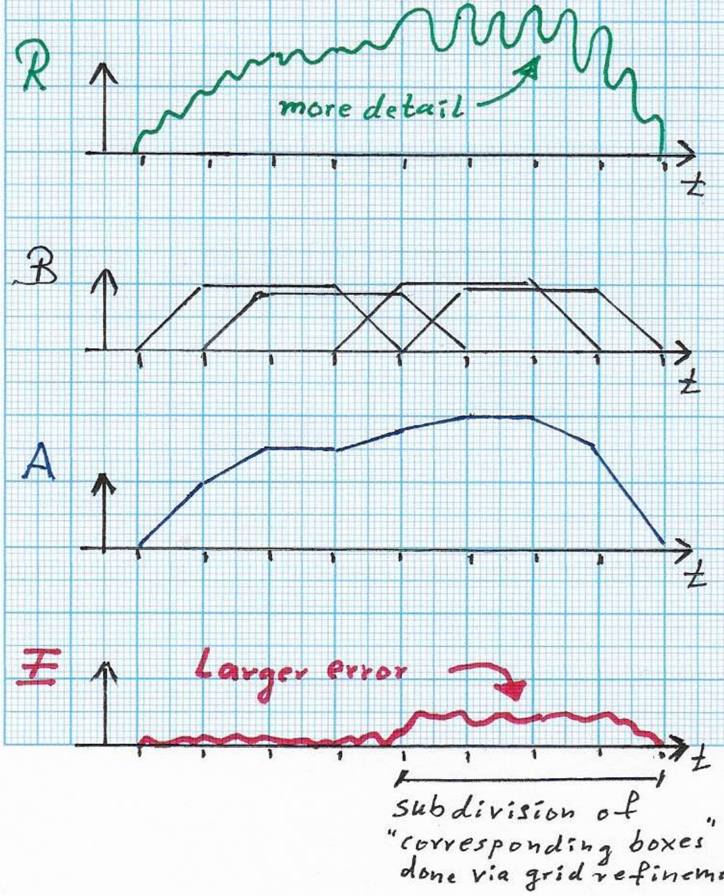
⇒ one computes / stores a sequence of increasingly refined and improved BEST approximations of the density function $\alpha(x,y)$:

$$\alpha^0(x,y) = \sum_{i=1}^{K_0} \alpha_i^0 \, B_i^0(x,y)$$

$$\alpha^1(x,y) = \sum_{i=1}^{K_1} \alpha_i^1 \, B_i^1(x,y) \quad \ldots$$

$$\alpha^N(x,y) = \sum_{i=0}^{K_N} \alpha_i^N \, B_i^N(x,y)$$

ii) Repeated computation of a "LOCALLY BEST" approximation of a locally defined residual / error function with respect to t-line



subdivision of "corresponding boxes" done via grid refinement

(Note: functions R, B, A properly mapped via LOG!)

R – recorded projection data

B – basis functions defined by grid boxes

A – (BEST) approximation of R via functions B

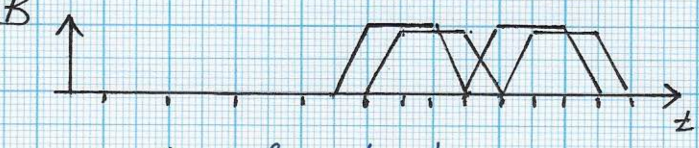
E – error $(A(t) - R(t))^2$

→ principle:

- determine t-intervals with relatively larger error values
- perform refinement of the "corresponding grid boxes" and determine the additional basis fcts.

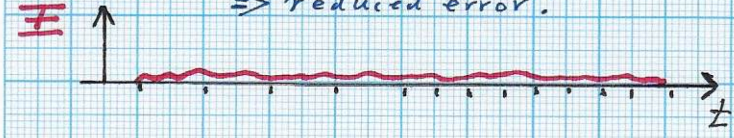
▪ AMR RECONSTRUCTION AND LOCALIZATION – Cont'd.

here: 4 additional basis functions used



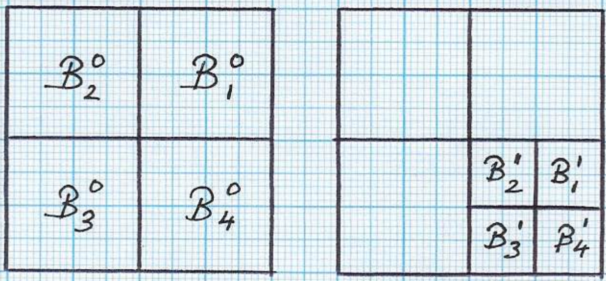
+ perform best approximation

⇒ reduced error!



⇒ one computes successively best approximations of "local residuals/errors" with respect to the t-line; these local best residual approximations are then used in an "additive fashion" to improve the reconstruction $\alpha(x,y)$.

in xy-space:



initial approx:

$$\alpha^0(x,y) = \sum_{i=1}^{K_0} \alpha_i^0 B_i^0(x,y)$$

first local residual/error approx:

$$\alpha^1(x,y) = \sum_{i=1}^{K_1} \alpha_i^1 B_i^1(x,y)$$

⇒ improved approximation: $\underline{\underline{\alpha^{0,1}(x,y) = \alpha^0(x,y) - \alpha^1(x,y)}}$

(Iterate until all local residuals/errors are below a specific threshold.)

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