Weighted Basis

Let w be a function with bounded gradient, which is positive on D and vanishes linearly on a subset Γ of ∂D. Then, the weighted uniform B-splines with grid width h,

$$B_k = wb_k, \quad k \sim D\,,$$

which have some support in D, span an admissible finite element subspace $\mathbb{B}_h = wS_\xi^{(n,\dots,n)}(D)$ for problems with homogeneous essential boundary conditions on Γ.

R-Functions

Assume that the domains D_ν are described in implicit form by the weight functions w_ν, i.e., $D_\nu :\ w_\nu > 0$. Then, the standard R-functions

$$
\begin{aligned}
r_c(w_1) \qquad &= -w_1, \\
r_\backslash(w_1, w_2) \quad &= w_1 - w_2 - \sqrt{w_1^2 + w_2^2}, \\
r_\cup(w_1, w_2) \quad &= w_1 + w_2 + \sqrt{w_1^2 + w_2^2}, \\
r_\cap(w_1, w_2) \quad &= w_1 + w_2 - \sqrt{w_1^2 + w_2^2}
\end{aligned}
$$

describe the domains

$$
D_1^{\mathrm{c}},\ D_1 \backslash D_2,\ D_1 \cup D_2,\ D_1 \cap D_2\,,
$$

respectively.