

Algorithms of Scientific Computing

Hierarchization in Higher Dimensions, Spatial Adaptivity

Proposed solution

Exercise 2: Adaptive Sparse Grids

Here, the exercise is to adaptively refine a 2-dimensional sparse grid without boundary. We follow the notation introduced in the lecture and choose our domain accordingly with $\Omega = [0.0, 1.0]^2$.

- In the following image you see an incomplete regular sparse grid V_2^1 . Insert the missing grid points using small **squares**. What are the level-index-vector pairs \vec{l}, \vec{i} for each of them?

(2, 1), (3, 1)

- Use the (modified) picture from the previous task to perform two steps of adaptive refinement:
 - Refine grid point $\vec{l}, \vec{i} = (1, 2), (1, 3)$: create all hierarchical children. Draw its children as small **triangles**. Make sure that you also insert all missing hierarchical parents (and parents of parents, ...) of these children to make the grid suitable for typical algorithms on sparse grids.
 - Now refine grid point (2, 2), (3, 3). Again, do not forget to create all missing parents. Draw all new points as small **crosses**.

