

Algorithms of Scientific Computing (Algorithmen des Wissenschaftlichen Rechnens) Hierarchization in Higher Dimensions, Spatial Adaptivity

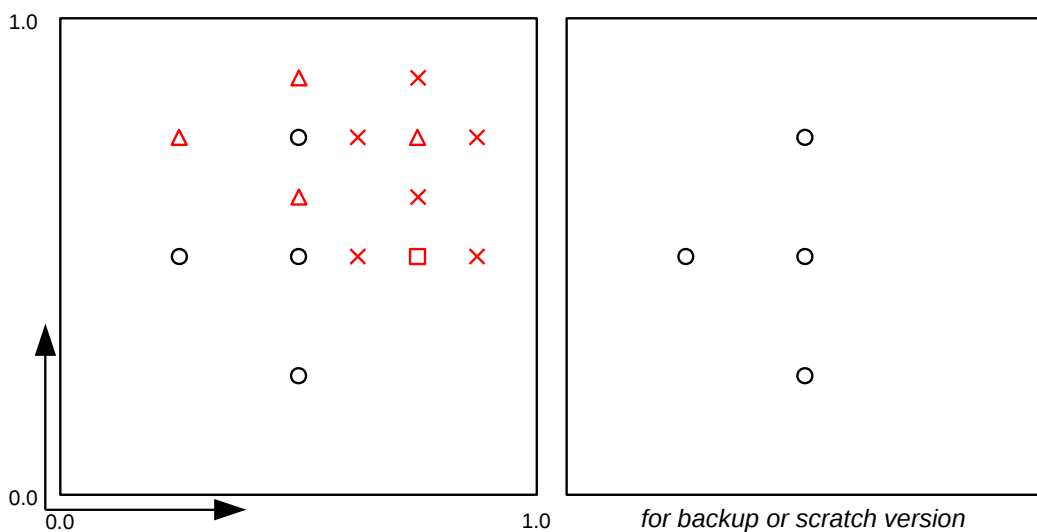
Proposed solution

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 also 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.

(b) Now refine grid point $(2, 2)$, $(3, 3)$. Again, do not forget to create all missing parents. Draw all new points as small **crosses**.