This part is devoted to the optimization of element partition trees controlling the LU factorization of systems of linear equations. These systems result from the finite element method discretization over two-dimensional meshes with rectangular elements.

We begin by presenting an introduction to the topic followed by the main notions and definitions in Chap. 13. These notions span meshes, element partition trees, and cost functions for element partition trees.

We create and study polynomial time algorithms for the optimization of element partition trees which use only straight lines for the partitioning of rectangular meshes. The considered algorithms are based on the extensions of dynamic programming and allow multi-stage optimization of element partition trees relative to different criteria such as time and memory complexity, and bi-criteria optimization of element partition trees including construction of the set of Pareto optimal points. We describe the multi-stage optimization process and the experimental results in Chap. 14. Polynomial time algorithms for bi-criteria optimization of element partition trees along with possible applications are presented in Chap. 15.