Part I

Stages in Developing Fast Solvers

The intention of this part is to organize existing multigrid approaches in an order which corresponds to actual stages in developing fast multigrid solvers. Each section (§2 through 7) represents a separate stage. To get an overview of these stages, the reader may first go through the opening remarks of all sections, skipping the subsections. The actual sequence of development may correspond to the actual order of the sections; but §5, 6, and 7.4 represent three independent stages, which can be taken in any order following §4. In fact, an increasing current tendency is to replace the usual two-level mode analysis (§5) by the two-level FMG mode analysis (§7.4). Generally, one can skip a stage, risking a lesser control over potential mistakes. Even when one does, the information and advice contained in the corresponding subsections are still important.

This part emphasizes the *linear* solver: relaxation of nonlinear equations is described, but the Full Approximation Scheme (FAS) used in intergrid transfers of nonlinear solvers is deferred to the next part (§8).