Revision

7 Speed tests

The two-dimensional laminar lid-driven cavity and backward-facing step configurations has been run on an 8×supersparc 50Mhz SPARC 1000. The execution times of the multitask and the corresponding singletask computations has been compared to test the speed of execution. Some changes, compared with the previous program, has been implemented.

7.1 Execution times

In table 7.1: (Revised), the new execution times are displayed. For the testing of the program, the lid-driven cavity configuration is used. The global pressure convergence criteria is, for multitask calculations, `res`=0.1 and, for singletask calculations, `tol`=0.1. This gives equal multitask and singletask global pressure residuals when leaving the **SLAP**-solver. The times in the table are in minutes required for solving 50 time steps of the flow. The multitask calculations are represented by a four task configuration, where the domain is divided into (`lnodes`, `mnodes`, `nnodes`) = (2, 2, 1) parts. The 64×64×6 grid has been used. When subtracting a pressure reference, taken from a node in the sub-domain with `id`=1, the speed of execution is approximately 2.3 times faster than for the previous parallel multiblock solver for `tol`=0.3. This brings down the execution time to 0.85 times the execution time of the corresponding singletask calculation for `tol`=0.45.
Tests regarding two of the speed increasing changes described in the report has been made;

- Introduction of overrelaxation on inner boundaries has not been advantageous and has therefore been abandoned.
- Overlapping the subdomains more results in a less parallel program, but since the inner boundaries converge much faster, the speed of execution is raised to the double of the corresponding singletask case. The calculations give steady global convergence similar to the singletask calculation, starting at 7 iterations at the first time step. Because of the increased convergence rate for the inner boundaries, the number of times through the **SLAP**-solver each time step has a mean of less than ten. The execution times are displayed in table 7.1: (Revised).

From the information in the table, it is quite obvious that it is possible to get execution times that are much lower than for the singletask case, using this parallel multiblock solver. This revision is only a first approach to reducing the computational times and should be followed up with more tests. At this moment, a parallel multiblock code using the SIMPLE method is implemented.

tol	2×2×1 multitask with different tol-values					
	0.3	0.4	0.45	0.5	0.6	0.7
Previous	274min					
Previous % of singletask	251%					
New	120min	95min	93min	93min	142min	141min
New % of singletask	110%	87%	85%	85%	130%	129%
overlap=2			63min			
overlap=2 new % of singletask			58%			
overlap=3			54min			
overlap=3 new % of singletask			50%			
overlap=4			66min			
overlap=4 new % of singletask			61%			
overlap=5			59min			
overlap=5 new % of singletask			54%			
overlap=10			88min			
overlap=10 new % of singletask			81%			

Table 7.1: (Revised): Execution times for solving 50 time steps of the lid-driven cavity configuration. The previous code is compared with the new code. Different values of the local pressure convergence criteria (tol) for the multitask case is applied and the execution times are compared with the corresponding singletask case (109min,100%). Execution times for different amount of overlapping is also dispayed.