

PREDICTION OF LOW MACH NUMBER FLOWS USING QUASI GAS DYNAMIC SYSTEM OF EQUATIONS

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ABSTRACT This paper is concerned with the development of a new approach to numerical simulation of viscous compressible gas flows at low Mach number. The procedure of the pressure decomposition into two components — a volume-averaged part and a dynamic part — is applied to the quasi gas dynamical system of equations instead of the full Navier-Stokes equations. To derive the dimensionless form of the governing equations, two different reference values for these two components are used what allows avoid singularities at $M \rightarrow 0$. To implement the above model, a new implicit computational algorithm was developed. It was parallelized on the basis of domain decomposition technique and adapted to the distributed memory multiprocessor system Parsytec CC with the MPI communication platform. Isothermal lid-driven cavity flow and gas flows in a horizontal chemical reactor are considered as applications. Test predictions have indicated a high accuracy, robustness and efficiency of the developed model and the corresponding parallel algorithm.