GENERAL DESCRIPTION OF THE GDT SOFTWARE AND ITS APPLICATION TO BLAST AND SHOCK PHENOMENA SIMULATION

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ABSTRACT

The article presents an overview of the GDT package, basic principles of CFD application construction and its architecture. Basic schemes are demonstrated for calculating both chemically neutral gas systems and different types of chemically reacting systems including porous energetic materials, fuel-air explosives, high explosives and multiphase compositions. The approach developed allows the uniform ideology for the package usage both on conventional PC and high-performance parallel systems. The same approach facilitates porting the programs to different hardware and software platforms. It is possible to perform calculations using a grid of 10 bln cells on clusters with about 200 cores.

In addition to CFD modules the visualization engine has been developed which allows processing data, controlling computation processes and managing projects on-the-fly on distributed multiprocessor systems.

Various examples of GDT application are given. They are shock-wave interaction with obstacles; muzzle blast formation in intermediate ballistics processes in rocket and artillery systems; formation and interaction of high-gradient flows and jets during stages separation in rocketry; explosion simulation of different composition charges; and modeling different situations related to counterterrorism operations.

Finally, the efficiency (computation time and memory usage) of the package application is given for different hardware and OS platforms.