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APPLICATION AND DEVELOPMENT OVERVIEW OF SIMULATION TECHNOLOGY IN AEROSPACE

Abstract

Aerospace simulation technology (AST) is the combination of the system simulation technology and the aerospace engineering technology. AST provides the mathematical or semi-physical verification approaches and simulation platform for design and analysis, performance evaluation, command control, fault diagnosis and operation management of the aeronautical and aerospace vehicle, launch vehicle and missile weapon system. AST contains the aerospace engineering simulation and the aeronautical and aerospace vehicle system simulation. It involves the subsystem simulation and modeling, overall simulation with multi-physics coupling and efficient collaborative simulation. The following four aspects to the application and development status are mainly overviewed in the paper.

- i) The first part introduces the application status of simulation technology in aerospace according two kinds of classifications. The first classification is aerospace engineering vs. aeronautical and aerospace vehicle system, while the second one is aviation field vs. aerospace field. Several typical aerospace engineering projects are discussed in the second classification. These projects include large aircraft design and manufacturing, man-spacecraft system evaluation analysis in the manned spaceflight mission, on-orbit spacecraft maintenance, lunar rover design and space debris removal. The necessity of developing AST is pointed out at the end.

- ii) The second part overviews the worldwide AST development. Several states including America, Russia, European Space Agency(ESA), Japan and China are placed emphasis. The AST development characteristics are analyzed at the end of this part.

- iii) The third part reviews the key technologies of aerospace simulation. These key techniques discussed include modeling technology of the complex system; virtual flight experiment design, verification and assessment technology; verification, identification and correction of simulation model; generic supportive technology (including collaboration technique between heterogeneous software, supportive technology for simulation environment, virtual environment technology). Two worthy problems demanding future work are given at the end of this part. The first is how to design the overall simulation system architecture, while the second is how to develop multi-system, multi-physics coupling, distributed and heterogeneous ensemble co-simulation technique of aeronautical and aerospace vehicle.

- iv) The last part gives new considerations for the development trend of AST. Three thoughts are discussed in detail: 1) Developing AST should be fully integrated with the modern advanced information technology. 2) The research and development of new aerospace simulation technologies

should combine with multi-disciplinary knowledge. 3) New aerospace simulation technologies should be developed to fulfill the requirements of the major aerospace projects of frontier.