



GruntSim: Optimization of Warfighter Load



Developed by the University of Iowa's Virtual Soldier Research (VSR) Program for the US Marines, GruntSim is a digital human modeling and simulation (M&S) environment to support Warfighter task performance analysis to help acquisition professionals make objective trade-off analysis on new equipment designs before live testing and fielding. GruntSim M&S uses physics-based and predictive optimization to provide substantial human performance metrics in conducting trade-off analysis of new equipment and/or loading configurations. GruntSim includes seven male avatars and seven female avatars representing general Warfighter body-type boundary cases. These avatars are based on a recent US Army Soldier Center ANSUR II anthropometric

survey.

GruntSim has significant capabilities

- 1) Warrior Configuration Mode — enables the user to configure the warfighter with PPE, weapons, and gear requirements with varying billets. This mode also includes the ability to restrict the range of motion for each configuration. A user can perform static posture analysis, aiming envelop analysis, eye relief analysis, and center of mass visualization.
- 2) Simulation Builder Mode —The user can select any task from the library of available tasks and simulate the task to evaluate the Warfighter performance in the presence of specific loading conditions. Examples include typical warfighting tasks such as stair ascend (steep and regular), vertical jump, ladder ascend, and extended load carriage. These tasks have been selected from the Marine Corps Load Effects Assessment Program (MCLEAP) course. During the course of executing these tasks, the system has significant capabilities for assessing human performance metrics such as energy expenditures, fatigue, and hydration levels. It predicts motion, encumbrances, and provides a unique environment for conducting trade off analysis, informing requirements, and testing new products before live testing and fielding. The system has proven to reduce cost and time. The environment also simulates Warfighter conditions through variable environments as they perform a prolonged walking task, for example, including weather (temperature, humidity, and cloud cover), terrain, and elevation.

