NUMERICAL MODELLING OF SOILS SUBJECTED TO EXPLOSIVE LOADING

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Target response can vary greatly depending on soil conditions; to determine which soil model is the most effective, various soil modelling approaches are compared under explosive loading conditions. This is part of an overall effort to develop useful tools and techniques for modelling geo-technical materials for military applications [1]. One application is land mines, where soil is an energy transfer mechanism; depending on soil conditions the energy transfer can vary by a factor of four [2]. HESCO Bastion shelters are another application, where soil is an energy-absorbing medium used to protect personnel from the fragments and shock waves associated with an explosive threat. The ability to accurately model the soil is imperative when designing equipment and procedures to mitigate blast effects.

Numerical simulations are performed using available soil models, and results are compared with DRDC Suffield experimental data to determine the effectiveness of the various models. The first comparison is made against land mine explosion data obtained from a piston apparatus. This apparatus is used to measure the amount of energy transferred to a target plate from charges buried at a range of depths in soils of varying types and moisture contents. Numerical calculations are performed using a multiple-material model implemented in the Chinook CFD code. The second series of experimental trials simulated involve the detonation of an explosive charge in close proximity to a single HESCO Bastion concertainer. A fully-coupled fluid-structure interaction simulation is performed using the LS-DYNA finite element code.

References:

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