A NEW AMR-SOLVER FOR PRECISE AND FAST SIMULATIONS OF BLAST EVENTS IN URBAN SCENARIOS

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There is a demand for reliable, fast and easy-to-use simulation tools for the analysis of blast effects in urban environments. Most existing easy-to-use tools for this purpose are based on simplified calculation models, which limit their accuracy and/or their flexibility. General-purpose hydrocodes offer both accuracy and flexibility in application, they are however difficult to use and require long calculation times. Given this situation we have developed a fast and precise solver specifically for the simulation of blast propagation in urban scenarios. The method allows the simulation of blast propagation outside and inside of one or more buildings and can be coupled to damage models for the assessment of blast effects. An automated calculation setup makes the tool easy to use.

The solver implements a first principles calculation, using an explicit finite volume scheme with Cartesian grids and automatic mesh refinement (AMR). The tool includes a 1D multi-fluid method for the calculation of the initially spherical detonation, which provides the initial blast wave for the subsequent three-dimensional simulation phase. The computational domain is set up automatically based on the scenario information.

The first version of this tool has been introduced in a previous contribution [1]. The current paper focuses on a new AMR-concept, which as recently been implemented in the solver. The new concept led to a significant speedup and increase in modeling flexibility. Details of the new method are presented together we new experimental data used for the validation.

Reference

[1] Herzog, O., Klomfass, A., A Specialized Fast Finite Volume AMR Solver for Simulation of Blast Events in Urban Scenarios, Proc. MABS 20