

DISCRETE ELEMENT MODEL: FROM MULTIBODY PROBLEMS TO COMPLEX DYNAMICS PROBLEMS.

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Abstract

It is important to begin with an evidence: Discrete Model is based on the description of the physical state (velocity, position, temperature, magnetic moment, electric potential ..) of a large number of discrete elements that form the media to be studied. It is not based on a continuous description of the media. Then, it is particularly well adapted to describe media evolution driven by discontinuous phenomena:

- behavior of initially discrete materials like sand, powder and granular materials,
- behavior of organized and/or/ heterogeneous materials like composites, foams
- multi fracturation problems like abrasion process, ice impact, composite machining, impact on brittle materials,
- description of multi fracturation followed by debris flow like wear study, snow and rock avalanches.

Different Discrete Element Methods are developed. The presentation describes the different approaches and focuses on the explicit spherical method. It shows how this approach is particularly well adapted to dynamic problems, impacts and debris generation. This method is briefly described.

Then, some practical examples are presented: machining of composite material, impact loading with a soft impactor, static and dynamic behavior of fused silica.

Finally, the crushable spherical particle model is presented. It allows the study of complex material like foam. Simulations of foam are presented. It is shown that the main foam properties can be caught by this extended DEM method.