COMPOSITE CRUSH SIMULATION WITH GENERAL CONTACT

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ABSTRACT

Composite crush simulation with explicit dynamic FEM using CZone technology has been incorporated in a general contact algorithm and enhanced in various important respects. The composite crush simulation approach bridges the gap between experimental observations regarding a material's ability to absorb energy in an impact and the need to understand complex structural interaction and stability in larger-scale crash events. This approach integrates material, element, and contact algorithms to simulate crushing of composite structures due to impact.

An overview of the composite crush simulation approach will be provided. Much of the crushing constitutive behaviour is incorporated into the treatment of contact by limiting the contact pressure based on the composite crush stress. Previously, implementation of this capability was limited to a traditional contact pair algorithm with a variety of imposed limitations.

By expanding implementation of the composite crush simulation capability to be used with a general contact algorithm, many additional characteristics and applicability are automatically "inherited," based on pre-existing advancements of general contact capabilities over contact pair capabilities, including:

- Ability to model crushing of a part with T-junctions and other complex junction topologies;

- Ability to model crushing of a part against multiple surfaces;
- Ability to model crushing of a part against a shell-like surface that may be rotating such that contact occurs against the front and back sides of the surface at different intervals of a simulation;
- Ability to model crushing of a part against an eroding body.

Furthermore, the following enhancements have been developed:

- A simplified user interface, with the most fundamental crushing characteristics specified in the material context and then automatically communicated to the contact algorithm;
- Robust avoidance of non-physical interactions between an actively crushing part and other parts in a penetrated region;
- Enhanced distributed memory parallelization, by enabling domain decomposition in the crushing region;
- Additional user control over crush initiation.

Various examples will be provided to demonstrate advantages of the general contact implementation and the various enhancements.