The presented method combines two different means of representing shapes:

- On the one hand, they are meshed explicitly, which allows for efficient mechanical calculations by means of any standard Finite Element solver;

- On the other hand, they are represented implictly, by means of the level set method, a format under which it is easy to track their evolution.

The cornerstone of our method then relies on efficient algorithms for switching from either of these representations to the other.

Several numerical examples are discussed in two and three space dimensions, in the "classical"physical setting of linear elastic structures, but also in more involved situations involving e.g. fluid-structure interactions.

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