MODERN REPRODUCING KERNEL PARTICLE METHODS FOR PENETRATION AND FRAGMENTATION SIMULATIONS: THEORY AND APPLICATION

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ABSTRACT

Over the past several decades, meshfree and particle methods coupled with continuum damage mechanics have proved advantageous in problems with high-density fractures too numerous to model discretely, such as those in fragment-impact perforation and fragmentation of blast-loaded structures [1]. Essential issues that require special care in these methods include but are not limited to stability and consistency, capturing material stability and instability, shock physics, contact mechanics, and tensile and kernel instabilities [2]. The reproducing kernel particle method (RKPM) with strain-smoothing [3] is selected as an overarching framework to address these issues. The state-of-the-art advancements for RKPM developed over the years are described along with recent improvements and how and why these methods work mathematically. The stability, robustness, and modeling capabilities are demonstrated using a large-scale parallel code in applications with severe material damage and fragmentation.

REFERENCES

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