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A general implicit direct forcing immersed boundary method for rigid particles

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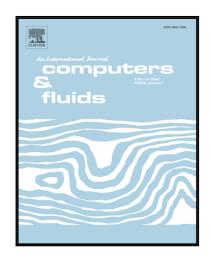
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#### ACCEPTED MANUSCRIPT

### Highlights

- Generalized non-iterative IBM for arbitrary rigid particles.
- Unconditional numerical stability for arbitrary fluid-particle interactions.
- Easy switching from weakly coupled direct forcing IBM to strong coupling.
- Simulation of various test cases, commonly unstable using weak coupling schemes.

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