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Collective motion in active solids and active crystals[1] CRISTIAN HUEPE, Unaffiliated, ELISEO FERRANTE, ALI EMRE TURGUT, IRIDIA, CoDE, Université Libre de Bruxelles — We introduce a minimal model for self-propelled particles with strong attraction-repulsion interactions, but no explicit alignment rules, that displays collective polar or rotational motion. We describe a novel elasticity-based mechanism responsible for such collective motion and compute analytically its required conditions in the continuous elastic sheet approximation. By studying the mechanism's dynamics numerically and analytically, we show that it supports collective motion even for finite noise levels if the coupling between individual self-propulsion and elastic modes transfers energy towards larger and larger wavelengths. We hypothesize that this elasticity-based mechanism could provide an alternative explanation for collective motion in some biological groups without explicit alignment interactions, given their natural cohesion.

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Cristian Huepe
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