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Regularized Micromagnetic Model

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Magnetic singularities known as Bloch points (BPs) present a fundamental challenge for micromagnetic theory due to the divergence of the effective field. To overcome this problem, we propose a regularized micromagnetic model in which the magnetization vector is defined on the S3-sphere, while, similar to quantum systems, only three of the four vector components correspond to measurable quantities. Within this framework, we derive a regularized Landau–Lifshitz–Gilbert equation and an analogue of the Thiele equation describing the steady motion of spin textures under external stimuli. The applicability of the theory is demonstrated by modeling the dynamics of several magnetic textures containing BPs. Further details are provided in our preprint [https://doi.org/10.48550/arXiv.2508.19784].

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