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Compatibility conditions for director fields in flat and curved 2D geometries EFI EFRATI, IDAN NIV, Weizmann Institute of Science — Many biological and man made structures form geometrically frustrated assemblies where their constituents possess two or more mutually contradicting geometric tendencies. For example, banana shaped (bent-core) liquid crystals favor equally spaced director field lines that are also uniformly curved. Mathematically this leads to a locally preferred director field of vanishing splay and constant bend, correspondingly. One can easily show that these two tendencies cannot be simultaneously achieved in the plane. In this work we present a method for determining whether two prescribed bend and splay fields are compatible with a planar director field, and provide a direct formula for its reconstruction depending only on these fields and their derivatives when they are compatible. We generalize these methods for curved geometry, and explore how the geometric frustration is resolved in the specific case of bent core liquid crystals in the plane.

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