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Title: Numerical method of obtaining physical properties from liquid crystal textures

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Abstract:

The 2D texture image is common in many different fields and on different scales (e.g., cartography, biology and engineering). Extracting useful information from such a texture image is a highly desirable. Valuable data can be obtained with suitable numerical analysis of the texture images, which is a discerning way of deriving information on subtle features of the studied material.

The main objective of the presented approach is to gain some physical properties of the liquid crystal material from analysis of 2D colour textures obtained with a polarizing microscope. Some examples will be shown in the presentation. The first concerns identification of the sequences of mesophases present in thermotropic liquid crystals by considering first and second order image characteristics. Second, the method allows to determine from the texture the temperature dependence of birefringence in the liquid crystal material. In third example, it will be shown how the method may be useful for determining an influence of the external electric field e.g., how the wavelength change with increasing external electric field in sample liquid crystal blue phases. A few examples of coloured textures obtained with a polarizing microscope, in which the sequence of ferroelectric smectic and blue phases occur, will be shown, together with the results of the numerical analysis of these images.