



A GRADIENT SYSTEM BASED ON ANISOTROPIC MONOCHROME IMAGE PROCESSING WITH ORIENTATION AUTO-ADJUSTMENT

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Abstract. This paper is devoted to the mathematical analysis of a system of pseudo-parabolic partial differential equations governed by an energy functional, associated with anisotropic monochrome image processing. The energy functional is based on the one proposed by [Berkels et al. *Cartoon extraction based on anisotropic image classification*, SFB 611, 2006], which incorporates an orientation auto-adjustment mechanism, and our energy is a simplified version which reduces the order of derivatives to improve computational efficiency. The aim of this paper is to establish a stable minimization process that addresses some instability of the algorithm caused by the reduction of derivative order. As a part of the study, we here prove Main Theorems concerned with the well-posedness of the pseudo-parabolic system, and provide a mathematically rigorous guarantee for the stability of the image denoising process derived from our system.

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