1015-52-240 **Ousseini Lankoande*** (lankoande@ece.unm.edu), Electrical & Computer Engineering Department, MSC01 1100, 1 University of New Mexico, Albuquerque, NM 87131-0001, **Majeed M. Hayat**, Electrical & Computer Engineering Department, MSC01 1100, 1 University of New Mexico, Albuquerque, NM 87131-0001, and **Balu Santhanam**, Electrical & Computer Engineering Department, MSC01 1100, 1 University of New Mexico, Albuquerque, NM 87131-0001.
A convex Gibbs energy function for speckled ultrasound medical imagery.

Grainy in appearance, speckle noise is primarily due to the phase fluctuations of the electromagnetic returned signals. The traditionally used multiplicative models for speckle noise do not exploit the inherent signal-dependent correlation characteristics of speckle noise. In order to overcome this shortcoming, a new mathematical framework is proposed for modeling and mitigating speckle noise by means of utilizing Markov-random-fields (MRFs). MRFs have been proven to be excellent candidates to model complex physical phenomena and contextual constraints. In this work, the speckled ultrasound medical imagery is modeled as a realization of the proposed MRF model with high energy. The high-energy property is a consequence of the high variability of the pixel intensities in presence of speckle noise. The joint conditional probability density function (cpdf) of the intensity of a point, given its four neighbors, is derived by extending Goodman's cpdf for any two points in the speckled image. The Hammersley-Clifford theorem is then utilized to derive the convex Gibbs energy function that characterizes the MRF. The convexity of the derived Gibbs energy function guarantees the stability of de-noising algorithms, which tend to minimize the Gibb's energy function. (Received February 06, 2006)