

Direct Methods for Determining a Point-Spread Function in Image Analysis, Without the Benefit of a Model

Peihua QIU, *University of Minnesota Minneapolis, USA*

Abstract: The removal of blur from an image, in the presence of noise, is readily accomplished if the blur can be described in precise mathematical terms. However, there is growing interest in problems where the extent of blur is known only approximately, for example in terms of a point-spread function which depends on unknown parameters that must be computed from image data. More challenging still is the case where no parametric assumptions are made about the point-spread function. There has been a limited amount of work in this setting, but it invariably relies on iterative methods, sometimes under assumptions that are mathematically convenient but physically unrealistic (for example, that the operator defined by the point-spread function has an integrable inverse). In this talk we discuss a direct, non-iterative approach to nonparametric blind image restoration. We impose only mild restrictions on the point-spread function, for example that it is radially symmetric and monotone decreasing away from its centre. We show that our technique has good performance, in both numerical and mathematical terms. In particular, assuming a white-noise model for observation error, the method gives statistically consistent results under a wide range of conditions. This is a joint research with Professor Peter Hall of Australian National University.