Inverse problems in bar code decoding

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Abstract

The presentation paper addresses inverse problems relative to bar code decoding. De-blurring and de-noising of a bi-level signal yielded by scanning 1-D bar codes by a flying-spot laser scanner poses an ill-defined problem, yet it is fundamental to increasing reading performance of a scanner and to advances in device miniaturization. Three different approaches will be discussed, all of which rely on a-priori knowledge based heuristic models; in particular methods using HMM and wavelet maxima for de-noising, and edge interaction model for de-blurring. Such approach will be compared to a L2 norm minimization approach suggested by Santosa and Esodoglu. Decoding 2D bar codes scanned by an imaging scanner presents different set of obstacles. We will focus on a challenge posed by a low resolution of imaging sensor resulting in bar code image were few pixels (less than 2) represent a bar code element; this is related to "super resolution". Decoding bar code placed in curved surface is yet another challenge is. Both problems may be solved by finding a proper mapping between image and 2D matrix representing ideal bar code.