Computationally efficient algorithms for statistical image processing. Implementation in R.

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Abstract: In the series of our earlier papers on the subject, we proposed a novel statistical hypothesis testing method for detection of objects in noisy images. The method uses results from percolation theory and random graph theory. We developed algorithms that allowed to detect objects of unknown shapes in the presence of nonparametric noise of unknown level and of unknown distribution. No boundary shape constraints were imposed on the objects, only a weak bulk condition for the object's interior was required. Our algorithms have linear complexity and exponential accuracy. In the present paper, we describe an implementation of our nonparametric hypothesis testing method. We provide a program that can be used for statistical experiments in image processing. This program is written in the statistical programming language R.

Keywords: Image analysis, signal detection, image reconstruction, percolation, noisy image, nonparametric noise, robust test, unsupervised machine learning, spatial statistics.

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