

MULTIDIMENSIONAL CHANGE-POINT PROBLEMS AND BOUNDARY ESTIMATION

BY A. B. TSYBAKOV
Université Catholique de Louvain
and Russian Academy of Sciences

We consider a multivariate extension of the change-point problem where one has to estimate a change curve (or surface). Three versions of this problem are considered

- 1) the regression-type model of image segmentation,
- 2) the estimation of a discontinuity curve in an unknown density, and
- 3) the estimation of the edge of Poisson forest.

For these problems we give two approaches to the construction of estimators, study the rates of convergence of the proposed estimators, and show their optimality.

1. Introduction. Multidimensional change-point problems are the problems of estimating boundaries of regions of certain homogeneity in images. The first example of such a problem arises in image reconstruction: considering an image as a regression function with jump discontinuity between an object and the background, and given the noisy observations of the image, estimate the discontinuity curve. In image analysis this curve is called edge, and the problem is called *edge estimation*. In most of applications one cannot assume a parametric structure of the edge curve. However, it is often possible to postulate some general nonparametric features of the curve, such as continuity, smoothness, convexity, etc. Thus, a nonparametric estimation of edge curves is interesting. This problem was studied recently by Tsybakov (1989, 1991), Korostelev (1991), Korostelev and Tsybakov¹ (1991, 1992a,b 1993), Rudemo, Skovgaard and Stryhn (1990), Rudemo and Stryhn (1991), Carlstein and Krishnamoorthy (1992), Mammen and Tsybakov² (1992), Müller and Song (1992

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¹ Later referred to as KT.

² Later referred to as MT.