Jaromír Běláček

Elimination of bias for general measures of associations [Abstract of thesis]

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is to obtain a highly effective method of numerical integration of some particular classes of functions whose ranges are split into two parts with essentially different complexities, e.g. peak functions etc.

Useful error bounds are derived and their effectivity checked on some – one and two – dimensional test functions. Also a comparison is made with some stochastic integration methods.

ELIMINATION OF BIAS FOR GENERAL MEASURES OF ASSOCIATIONS

J. BĚLÁČEK, Geografický ústav ČSAV, Na Slupi 14, 120 00 Praha 2, Czechoslovakia

(12.4.1989, supervisor V.Dupač)

Measures of association have been introduced to detect special statistical dependence of categorical variables. The thesis extends some theoretical results to a large class of measures which are representable as smooth functions of multinomial frequency vectors.

The method for arbitrarily exact approximations of expectations based on the central moments of the multinomial distribution law is formalized in the first part of the thesis. General formulas are applied to the class of logarithmic interactions and to the coefficients of explanatory decomposition power following the D–model for categorical data analysis.

The main results of the thesis are based on the explicit formula for K–th order jackknife transformation, the application of which eliminates all terms up to the order $O(N^{-K})$ in the typical bias expansion of the original estimator. General properties derived for general von Mises differentiable estimators are formalized for the class of association measures. The verification of the asymptotic normality for the basic transformation $J_K(\,.\,)$ is a generalization of a result by Parr and Tolley.

The third part of the thesis extends the above results to the situation of S independent random samples. The S–sample jackknife transformation $J_K^S(\,.\,)$ is derived from the structure of bias generated by this sample plan. The explicit computational formulas are introduced for $K = 1, \ldots, 4$.

General conclusions from the simulation experiments are illustrated by numerical examples in an appendix.

NUMERICAL MODELLING OF VISCOUS INCOMPRESSIBLE FLOW

V. PEKSOVÁ, Mathematical Institute, Charles University, Sokolovská 83, 186 00 Praha 8, Czechoslovakia

(17.4.1989, supervisors I.Černý, M.Feistauer)

The theme of this work is the mathematical study of one of the classical models of turbulent flow of viscous incompressible fluids. This model generalizes Prandtl's idea of mixing length.

The weak solution of the model is defined and investigated in the theoretical part. The existence of a weak solution for the velocity and the pressure is proved in spaces $\overrightarrow{W}^{1,3}(\Omega)$ and $L_{\frac{3}{2}}(\Omega)$. The nonhomogeneous boundary conditions of Dirichlet's type