Optimal design for smoothing splines

**Holger Dette · Viatcheslav B. Melas ·
Andrey Pepelyshev**

Abstract   In the common nonparametric regression model we consider the problem of constructing optimal designs, if the unknown curve is estimated by a smoothing spline. A special basis for the space of natural splines is introduced and the local minimax property for these splines is used to derive two optimality criteria for the construction of optimal designs. The first criterion determines the design for a most precise estimation of the coefficients in the spline representation and corresponds to D-optimality, while the second criterion is the G-optimality criterion and corresponds to an accurate prediction of the curve. Several properties of the optimal designs are derived. In general, D- and G-optimal designs are not equivalent. Optimal designs are determined numerically and compared with the uniform design.

Keywords   Smoothing spline · D- and G-optimal designs · Saturated designs