Smoothing noisy data under monotonicity constraints existence, characterization and convergence rates

Utreras, Florencio I.

In recent years there has been an increasing interest in the study of interpolation procedures preserving some shape defined in the form of a convex constraint, such as: monotonicity, positivity and convexity. In a recent paper the author proved that the convergence rates obtained using interpolatory monotone (or positive or convex) splines are the same as those obtained in the unconstrained case. In this paper we aim to extend those results to the case of constrained smoothing splines. We define general constrained smoothing splines and obtain theorems proving their existence, uniqueness and a general result concerning their characterization. We use this result to characterize the monotone smoothing spline. Finally, we study the convergence rates of this smoothing splines when smoothing data coming from a "smooth" function plus "noise". If we call Sn,?,C to the smoothing spline and ?2 to the variance of the data, we prove that {Mathematical expression}. This result shows that in the c