10 May 2001

Superlinear Convergence for Length Estimation

Reinhard Klette
CITR, The University of Auckland, Tamaki campus
Morrin Road, Glen Innes, Auckland 1005, New Zealand
email: r.klette@auckland.ac.nz

There are several methods (having both, a convergence theorem and an efficient algorithm) for length estimation of planar digital curves, for example DSS (digital straight segment approximation), GC-MLP (grid-continua minimum-length polygon) and AS-MLP (approximating sausage minimum-length polygon). These methods do have a linear convergence speed towards the true length of convex curves.

A superlinear convergence $O(\frac{1}{r^{1.5}})$ of asymptotic length estimation has been achieved in [1] just for the case of digitized straight lines. Length estimates based on polynomial interpolations of sampled planar curves also possess superlinear convergence speed [2] (to be precise: arbitrary rate of convergence for uniform sampling, and up to quartic order for ε-uniform sampling).

Show whether it is possible or not to have superlinear convergence of estimated curve length towards the true value in case of digitized planar curves (digitization in a regular grid in the plane) for a class of curves also containing non-straight curves such as boundaries of convex sets.

References

[1] L. Dorst, A.W.M. Smeulders. Discrete straight line segments: parameters, primitives and properties. In: R. Melter,P. Bhattacharya, A. Rosenfeld (eds): *Ser. Contemp. Maths.*, Amer. Math. Soc. 119:45–62, 1991.

[2] L. Noakes, R. Kozera, and R. Klette. Length estimation for curves with different samplings. CITR-TR-85, The University of Auckland, March 2001.