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THE EFFICIENT CALCULATION OF THE CRITICAL ε VALUE FOR CONVEXITY ON IRREGULAR PLANAR REGIONS IN THE VARIATIONAL GRID GENERATION PROBLEM

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ABSTRACT

The variational problem of generating structured grids in the plane, in the context of the direct optimization method, has been successfully discussed in detail in previous papers. There is currently a robust theory regarding area and harmonic functionals, which can be used for the successful gridding of very irregular regions [1-7,11-14] A deep geometric insight of these functionals is available, as presented in [1]. Adaptive versions for all these functionals have also been developed [2].

By analyzing the grids generated on very irregular regions, a question that arises immediately is how good they are or can be. To answer it, we must pose what can be understood as quality in the variational setting of the grid generation problem.

By noting that the main difficulty to answer this question is the large scale feature of the problem, in [4], we provided an intuitive scale independent new convexity test motivated by the geometrical interpretation of the algorithms addressed in those papers, and the fact that the area values of the cells in every optimal grid are as less spread out as possible. Such test is remarkable useful to classify irregular regions in a very intuitive scale.

In this paper, we propose a simple genetic-like algorithm in order to produce a fast and robust calculation of the critical convexity parameters of the optimal grids generated by variational methods.

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