Preface

Voronoi tessellations have a long history, probably because they often appear in nature and because they are ubiquitously useful. They were known to Decartes and certainly to Reimann and, because of their usefulness, were rediscovered many times ever since Voronoi, a Russian mathematician, studied them in connection with quadratic forms.

Centroidal Voronoi tessellations (CVTs) are special Voronoi tessellations for which the generating points coincide with the centers of mass, with respect to a given density function, of the Voronoi cells. In their simplest form in discrete settings, CVTs are the well-known k-means clustering algorithm. Also, again in their simplest form, they are known as vector quantization. However, in the last decade, because of several advantageous features possessed by CVTs, they have found many new uses in a wide variety of disparate applications. Moreover, over that time period, significant advances have been made in the generalization and analysis of CVTs and in the development of improved algorithms for their construction.

In this special issue, in addition to our mini-survey on CVTs, we gather some representative papers on recent developments in CVT analysis, algorithms and applications which are contributed by research groups from Asia, Europe and North America who work in a number of differential fields: the paper by M. Busch and J. Moehlis considers equilibrium configurations for a territorial model that corresponds to CVTs; the paper by H. Chao and Y. Q. Chen studies the application of CVTs in the cooperative sensing and distributed control; the paper by J. Chen and D. Wang explains the finite element superconvergence on a triangulation corresponding to a special 3D CVT; the paper by M. Emelianenko describes multilevel CVT-based algorithms for adaptive data visualization; the paper by J. Tournois, P. Alliez and O. Devillers constructs 2D CVTs with constraints; and the paper by J. Wang and X. Wang discusses edge-weighted CVTs. We would like to express our gratitude to all the authors for their support and contribution to the special issue. We also thank all the referees for their time and assistance.

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