Generating Point Sets of Small Star Discrepancy

Carola Doerr*[1]

[1]LIP6 – Sorbonne Université, CNRS, LIP6 – France

Résumé

The L∞ star discrepancy is a very well-studied measure used to quantify the uniformity of a point set distribution. Constructing optimal point sets for this measure is seen as a very hard problem in the discrepancy community. Indeed, provably optimal point sets were known, up to now, only for up to 6 points in dimension 2 and up to two points in higher dimensions. In this talk, we will present different approaches to construct low discrepancy point sets. We first introduce mathematical programming formulations to construct point sets with optimal L∞ star discrepancy values in dimension 2 for up to 21 points and up to 8 points in dimension 3. We show that these optimal sets have a far lower discrepancy than the previous references. More importantly, they present a very different structure. We will then discuss extensions of this approach to obtain good, but not provably optimal, point sets and show that there is much room for improvement over state-of-the-art constructions. We also show that additional symmetry requirements can be satisfied at very small loss in discrepancy value. Point sets of small discrepancy are relevant in numerous applications in mathematics, in computer science, and engineering. We therefore hope to bring an interesting problem to the attention of the GDR IFM community. The presentation is based on joint work with François Clément (Sorbonne Université), Kathrin Klamroth (University of Wuppertal, Germany), and Luís Paquete (University of Coimbra, Portugal).

*Intervenant