TRIGONOMETRIC OPTIMIZATION WITH SYMMETRY

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Abstract. Trigonometric polynomials are usually defined on the lattice of integers. In this talk, we consider the larger class of weight and root lattices with crystallographic symmetry. We give a new approach to minimize trigonometric polynomials, which are invariant under the associated reflection group. The invariance assumption allows us to rewrite the objective function in terms of generalized Chebyshev polynomials. The new objective function is defined on a compact basic semi–algebraic set, so that we can benefit from the rich theory of polynomial optimization.

We present an algorithm to compute the minimum: Based on the Hol–Scherer Positivstellensatz, we impose matrix–sums of squares conditions on the objective function in the Chebyshev basis. The degree of the sums of squares is weighted, defined by the root system. Increasing the degree yields a converging Lasserre–type hierarchy of lower bounds. This builds a bridge between trigonometric and polynomial optimization, allowing us to compare with existing techniques.

The presented results are based on joint work with Evelyne Hubert (Inria d'Université Côte d'Azur), Philippe Moustrou (Université Toulouse Jean Jaures) and Cordian Riener (UiT The Arctic University).

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