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Computing Sparse Fourier Sum of Squares on Finite Abelian Groups by Lihong Zhi

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Abstract. The non-negativity of a function on a finite abelian group can be certified by its Fourier sum of squares (FSOS). We propose a method of certifying the nonnegativity of an integer valued function by an FSOS certificate, which is defined to be an FSOS with a small error. We prove the existence of exponentially sparse polynomial and rational FSOS certificates and provide two methods to validate them. As a consequence of the aforementioned existence theorems, we propose a semidefinite programming (SDP)-based algorithm to efficiently compute a sparse FSOS certificate. For applications, we consider certificate problems for maximum satisfiability (MAX-SAT) and maximum k-colorable subgraph (MkCS) and demonstrate our theoretical results and algorithm by numerical experiments.

Jointed work with Jianting Yang and Ke Ye.