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Circuits of vector configurations and the binomial arithmetical rank of toric ideals of graphs

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Toric ideals arise naturally in problems from diverse areas of mathematics, including algebraic statistics, integer programming, dynamical systems and graph theory. A basic problem in the theory of toric ideals is to determine the least number of polynomials needed to generate the toric ideal up to radical. This number is commonly known as the arithmetical rank of a toric ideal. A usual approach to this problem is to restrict to a certain class of polynomials and ask how many polynomials from this class can generate the toric ideal up to radical. Restricting the polynomials to the class of binomials we arrive at the notion of the binomial arithmetical rank of a toric ideal. In this talk we study the binomial arithmetical rank of the toric ideal IG of a finite graph G in the following case: there is no induced subgraph of G consisting of two odd cycles vertex disjoint joined by a path of length ≥ 1. T. Hibi and H. Ohsugi showed that every such toric ideal is generated by squarefree circuits, i.e. each of the monomials of the binomial is squarefree. We prove that the binomial arithmetical rank equals the minimal number of generators of IG . This extends a result of A. Katsabekis showing that the above equality holds for bipartite graphs and also toric ideals generated by quadratic binomials.
