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Kostant's partition function and magic multiplex juggling sequences

Kostant's partition function is a vector partition function that counts the number of ways one can express a weight of a Lie algebra g as a nonnegative integral linear combination of the positive roots of g. Multiplex juggling sequences are generalizations of juggling sequences that specify an initial and terminal configuration of balls and allow for multiple balls at any particular discrete height. Magic multiplex juggling sequences generalize further to include magic balls, which cancel with standard balls when they meet at the same height. In this talk, we present a combinatorial equivalence between positive roots of a Lie algebra and throws during a juggling sequence. This provides a juggling framework to calculate Kostant's partition functions, and a partition function framework to compute the number of juggling sequences. This is joint work with Carolina Benedetti, Christopher R. H. Hanusa, Alejandro Morales, and Anthony Simpson.