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Titel der Dissertation:
Rotation Invariant Diagrammatic Bases of Invariant Spaces

Kurzfassung:

An important problem in algebraic combinatorics is to study different bases of algebraic spaces in terms of combinatorial objects.
In this thesis we study the invariant subspaces of tensor products of representations of Lie groups and we aim to find bases indexed by chord diagrams, i.e. graphs where the vertices are depicted in a circle.

This thesis consists of three publications, which appeared in peer reviews journals:

In *Skew characters and cyclic sieving* we determine which characters of the symmetric group carry a permutation representation of the cyclic group. We apply our results to the invariant theory of tensor powers of the adjoint representation of the general linear group and prove the existence of a bijection between permutations and Stembridge's alternating tableaux, which intertwines rotation and promotion, yielding a diagrammatic basis.

This is only an existential result and no explicit construction. In the hope of finding this bijection we refine one of the key identities in *A refinement of the Murnaghan-Nakayama rule by descents for border strip tableaux*. We extend it to standard Young tableaux and border strip tableaux with a given number of descents. To do so, we introduce a new statistic for border strip tableaux, extending the classical definition of descents in standard Young tableaux.

In *Promotion and growth diagrams for fans of Dyck paths and vacillating tableaux* we discuss a new approach to construct a diagrammatic basis from the promotion orbit of tableaux. In particular we construct an injection from the set of r-fans of Dyck paths (resp. vacillating tableaux) of length n into the set of chord diagrams on $[n]$. This way we obtain suitable diagrams for the spin representation of the spin group and the vector representation of the special orthogonal group.