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McKay matrices for finite-dimensional Hopf algebras

Let H be a finite dimensional Hopf algebra over an algebraically closed field of characteristic zero with simple modules $S_1, \ldots, S_m$, and let V be a fixed H-module. The McKay matrix M_V of V encodes the multiplicities of each S_j as a composition factor of each $S_i \otimes V$. Steinberg showed that for $H = \mathbb{C}G$ the eigenvalues and the eigenvectors of M_V are related to characters, and further results in characteristic p were obtained by Grinberg, Huang and Reiner. We prove general results about McKay matrices, their eigenvalues, and their (left and right) (generalized) eigenvectors by using the coproduct and the characters of simple and projective H-modules. We illustrate these results for the Drinfeld double D_n of the Taft algebra for n odd and $n \geq 3$. This is joint work with Georgia Benkart, Rekha Biswal, Van Nguyen, and Jieru Zhu.