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Symmetries in Yetter-Drinfel'd-Long categories

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Abstract: Symmetric categories have been of great interest in quantum algebra and mathematical physics. Cohen and Westreich in 1998 studied symmetries in the Yetter-Drinfel'd category over a Hopf algebra under some conditions. Pareigis in 2001 found the necessary and sufficient condition for $\!^{H}_{H}\mathcal{YD}$ to be symmetric. Later, Panaite et al. in 2010 proposed the definition of pseudosymmetric braided categories which can be viewed as a kind of weakened symmetric braided categories, and showed that the category $\!_{H}\mathcal{YD}^{H}$ is pseudosymmetric if and only if is commutative and cocommutative. Let H be a Hopf algebra and $\mathcal{LR}(H)$ the category of Yetter-Drinfel'd-Long bimodules over H. We first show that the Yetter-Drinfel'd-Long category $\mathcal{LR}(H)$ is symmetric if and only if H is trivial in four different methods, and that $\mathcal{LR}(H)$ is pseudosymmetric if and only if H is commutative and cocommutative. We then introduce the definition of the u-condition in $\mathcal{LR}(H)$ and give a necessary and sufficient condition for H_{i} $(i=1,2,3,4)$ to satisfy the u-condition. Then we study the relation between the u-condition and the symmetry of $\mathcal{LR}(H)$.

Keywords: symmetric category, Yetter-Drinfel'd-Long category, the u-condition, pseudosymmetry

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