



Direct calculation of higher rank invariants of stable pairs using the Joyce machinery of stack functions

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The rank 2 invariants of stable pairs over a Calabi-Yau threefold were computed in ([arXiv:1101.2252](#)) using the wall-crossing formula of Joyce-Song and Kontsevich-Soibelman. The computations in ([arXiv:1101.2252](#)) depended on the combinatorial properties of the elements of the Hall-algebra given as stack functions defined by Joyce ([arXiv:math/0503029](#)). These combinatorial computations become immediately complicated and hard to carry out when studying higher rank stable pairs with $\text{rank} > 2$. In this article we introduce an independent approach to computation of rank 2 stable pair invariants not using the wallcrossing formula and rather using the stratification of their corresponding moduli spaces and directly computing the weighted Euler characteristic of the strata. This approach may be used to avoid complex combinatorial wallcrossing calculations and to carry out the computation of invariants in $\text{rank} > 2$ cases directly. Moreover, we suspect that the method introduced in this article may be used to prove the integrality of the corresponding partition functions for higher rank invariants in special cases.

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