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Donaldson-Thomas Invariants of Toric Quivers

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Donaldson-Thomas theory aims at counting sheaves on Calabi-Yau threefolds. The category of sheaves on a toric threefold is derived equivalent to the category of representation of a quiver with potential obtained from a tiling of the torus. On this class of example, the virtual Euler number of the moduli space of quiver representations can be computed by toric localization with respect to an action scaling the arrows of the quiver, by enumerating the fixed points, described combinatorially by pyramids partitions. A toric localization formula is provided by the K-theoretic DT formalism in order to compute the virtual cohomology of this moduli space, but these computations were shown not to agree with computations of the virtual cohomology based on the formalism of vanishing cycles even in the simplest cases. We present here how to interpret and solve this mismatch, using an equivalent of the Bialynicki-Birula decomposition for virtual cohomology. DT invariants for toric threefolds without compact divisors are completely classified, but those of toric threefolds with compact divisors are generally expected to be wild. We present a conjectural formula for attractor invariants of any toric quivers, elementary bricks from which all the DT invariants can be built, corresponding to initial data of the stability scattering diagram of the quiver. We will prove this formula for the projective plane, the simplest example with compact divisor.

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