Magic windows and representations of generalized braid groups on the derived category of a GIT quotient

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One consequence of the homological mirror symmetry conjecture predicts that many varieties will have "hidden symmetries" in the form of autoequivalences of their derived categories of coherent sheaves which do not correspond to any automorphism of the underlying variety. In fact the fundamental groupoid of a certain "complexified Kaehler moduli space" conjecturally acts on the derived category. When the space in question is the cotangent bundle of a flag variety, actions of this kind have been studied intensely in the context of geometric representation theory and Kahzdan-Lusztig theory. We establish the conjectured group action on the derived category of any variety or orbifold which arises as a symplectic or hyperkaehler reduction of a linear representation of a compact Lie group. Our methods are quite explicit and essentially combinatorial -- leading to explicit generators for the derived category of certain GIT quotients and an explicit description of the complexified Kaehler moduli space. The method generalizes the work of Donovan, Segal, Hori, Herbst, and Page which studies grade restriction rules in specific examples associated to "magic windows".