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Varieties over Module Homomorphisms and their Correspondence to Free Algebras

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Homomorphisms of modules are fundamental objects in algebra and applied mathematics. Recent developments in symbolic computation allow a formal verification and exploration of identities between homomorphisms. Systems of those identities define varieties similar as in classical algebraic geometry. For constant-free systems one has a Galois connection to free algebras, and morphisms of varieties can be associated to homomorphisms of factor algebras via a faithful functor. This yields a purely algebraic characterization of isomorphic varieties which can be addressed with Gröbner bases from computer algebra. The suggested formalizm finds application in theory on generalized inverses and in recent developments concerning equivalent parametrizations of stabilizing controllers.

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