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New identities for differential-polynomial structures built from Jacobian determinants

The Nambu-determinant Poisson brackets on R[^]d are expressed by the formula

 $\{f,g\}d(x) = \frac{\int d(x) \det(partial(f,g,a_1,...a\{d-2\}) / \operatorname{partial}(x^1,...,x^d)),$

where a_1,...,a_{d-2} are smooth functions and x^1,...,x^d are global coordinates (e.g., Cartesian), so that $rho(x)\cdot\partial_{x}$ is the top-degree multivector.

For an example of Nambu–Poisson bracket in classical mechanics, consider the Euler top with $\{x,y\}3 = z$ and so on cyclically on R^3 .

Independently, Nambu's binary bracket {-,-}_d *with Jacobian determinant and d-2 Casimirs a_1,...,a*{d-2} belong to the Nambu (1973) class of N-ary multi-linear antisymmetric polyderivational brackets {-,...,-}_d which satisfy natural N-ary generalizations of the Jacobi identity for Lie algebras.

In the study of Kontsevich's infinitsimal deformations of Poisson brackets by using 'good' cocycles from the graph complex, we detect case-by-case that these deformations preserve the Nambu class, and we observe new, highly nonlinear differential-polynomial identities for Jacobian determinants over affine manifolds. In this talk, several types of such identities will be presented.

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