Abstract

An Analyst's Take on Gauge Theory †

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We work with a pair of complex-valued scalar fields over a 4-manifold. Our object of study is a first-order Hermitian sesquilinear form, i.e., an integral over the manifold whose integrand is a linear combination of terms "product of gradient of scalar field and scalar field" and "product of two scalar fields", with complex conjugation in the appropriate places.

We call two sesquilinear forms equivalent if one is obtained from the other by some x-dependent GL (2,C) transformation, i.e., by a change of basis in the infinite-dimensional vector space of pairs of complex-valued scalar fields. Our aim is to provide an explicit description of equivalence classes of sesquilinear forms. We achieve this aim, and in doing this we show that our sesquilinear forms implicitly contain geometric constructs such as Lorentzian metric, connection coefficients and electromagnetic covector potential.

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