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Mathematical Physics

A Top-Down Account of Linear Canonical Transforms

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(Submitted on 6 Jun 2012)

We contend that what are called Linear Canonical Transforms (LCTs) should be seen as a part of the theory of unitary irreducible representations of the '2+1' Lorentz group. The integral kernel representation found by Collins, Moshinsky and Quesne, and the radial and hyperbolic LCTs introduced thereafter, belong to the discrete and continuous representation series of the Lorentz group in its parabolic subgroup reduction. The reduction by the elliptic and hyperbolic subgroups can also be considered to yield LCTs that act on functions, discrete or continuous in other Hilbert spaces. We gather the summation and integration kernels reported by Basu and Wolf when studiying all discrete, continuous, and mixed representations of the linear group of 2×2 real matrices. We add some comments on why all should be considered canonical.

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