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Twisting perturbative supergravity via pure spinor superfields

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Pure spinor superfields provide a clean and powerful way of constructing and understanding supermultiplets, in any dimension and with any amount of supersymmetry, by using the algebraic geometry of the variety of square-zero elements in the corresponding supersymmetry algebra. This variety also classifies the possible twists of a supermultiplet. As such, it is natural to try and compute twists directly in a pure spinor superfield description. We show that this gives a general way of understanding the form of the twisted multiplets, which is related to the local geometry of the space of square-zero elements in the neighborhood of the twisting supercharge: in other words, the space of possible deformations of the selected twist to a further twist. The technique is efficient and requires essentially no detailed computations. Applications include new computations of the holomorphic twists of the eleven-dimensional and type IIB supergravity multiplets, verifying conjectures of Costello and Li.

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