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Review text:

This paper is of interest to students and researchers regarding the algebraic description of 1D special relativistic motions in the 2D Minkowski plane with basis $\{e_1, e_2\}, e_1^2 = -e_2^2 = 1, e_1 \cdot e_2 = 0$. The authors use instead of vectors hyperbolic numbers, which are equivalent to the even subalgebra of the Clifford geometric algebra $Cl_{1,1}$, i.e. points $p = xe_1 + ye_2$, $x, y \in \mathbb{R}$ in the plane are described by the geometric product with a fixed vector (e.g. e_1): $p \to z = pe_1 = x + yj, j = e_2e_1, j^2 = +1$. In analogy to the complex number plane for Euclidean geometry, the hyperbolic plane is used systematically to describe Lorentzian geometry. The norm is given by $\sqrt{x^2 - y^2}$, the role of circles is taken by hyperbolas $\pm re^{j\phi}$, with hyperbolic radius $0 \leq r \in \mathbb{R}$ and angle $\phi \in \mathbb{R}$. The exponential $e^{j\phi}$ describes a hyperbolic rotation, multiplication with j gives a hyperbolic orthogonal (Lorentz perpendicular) vector.

Then the authors discuss coordinate transformations between two hyperbolic planes with time dependent, continuously differentiable relative rotation and relative translation. They define the notions of relative, absolute and sliding velocity, and rotation pole (vanishing sliding velocity), leading to moving and fixed pole curves. Further differentiation w.r.t. time yields relative, absolute, sliding and Coriolis accelerations. The acceleration pole is given as the point of vanishing sliding acceleration. The vector connecting the rotation pole and the point in motion is Lorentz perpendicular to the sliding velocity, and the Coriolis acceleration is Lorentz perpendicular to the relative velocity.