Abstract Submitted
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Physical Algebra KAY C ERB, Department of Physics Astronomy, University of Utah — A constructive algebra of physical units, physical algebra, is introduced with its application to fundamental physics and relativistic mechanics. The rules of this algebra are analogous to Euclidean constructions where the generalized concept of a unit and inverse unit are the fundamental elements of the geometry and the algebra. The units and inverse units are shown to be orthogonal and inverse subspaces of the algebra and have many ties to geometric algebra. In fact, physical algebra is an extension of geometric algebra over the field of hyperreal numbers, where physical units are elements of the ring. Though physical algebra is far from complete, some early implications and applications are explored in this presentation. In particular, it can be shown that the products of fundamental units representing space and time form orthogonal and inverse vector subspaces that correspond to light-like and mass-like physical subspaces. This framework applied to the QED picture of electrons and photons suggests a neutral concept, an entity that can be projected into light-like and mass-like frames and has components in both. As applied to relativity, these projections are consistent with and may be useful pedagogically to understanding the underlying geometry of spacetime.

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