

A Spinor Model for Cascading Two-port Scattering Matrices In Conformal Geometric Algebra

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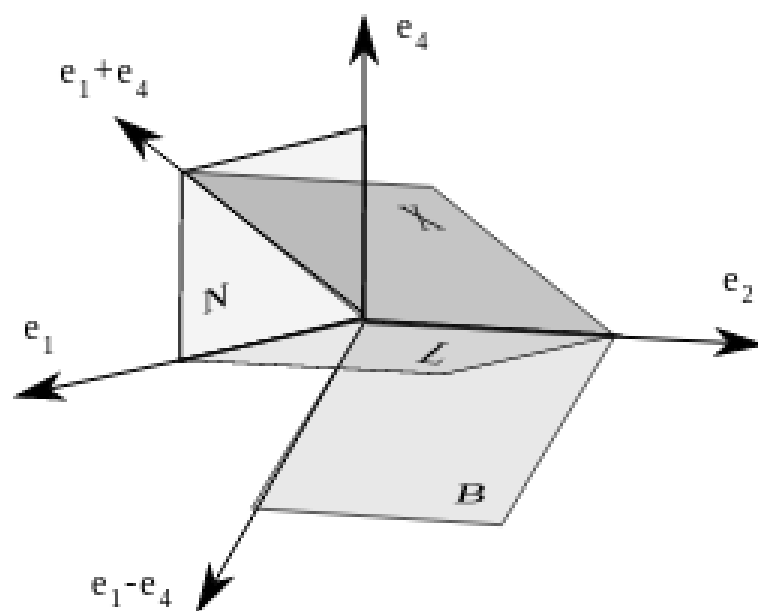
December 8, 2021

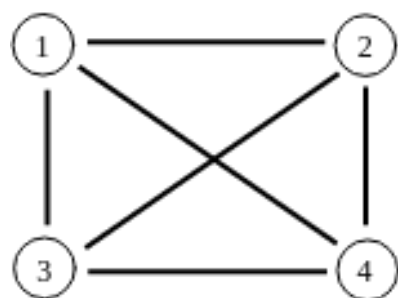
Abstract

Building on the work in [1], this paper shows how Conformal Geometric Algebra (CGA) can be used to model an arbitrary two-port scattering matrix as a rotation in four dimensional Minkowski space, known as a spinor. This spinor model plays the role of the wave-cascading matrix in conventional microwave network theory. Techniques to translate two-port scattering matrix in and out of spinor form are given. Once the translation is laid out, geometric interpretations are given to the physical properties of reciprocity, loss, and symmetry and some mathematical groups are identified. Methods to decompose a network into various sub-networks, are given. An example application of interpolating a 2-port network is provided demonstrating an advantage of the spinor model. Since rotations in four dimensional Minkowski space are Lorentz transformations, this model opens up the field of network theory to physicists familiar with relativity, and vice versa.

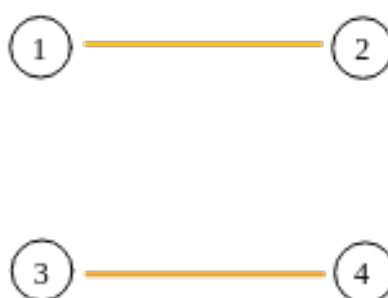
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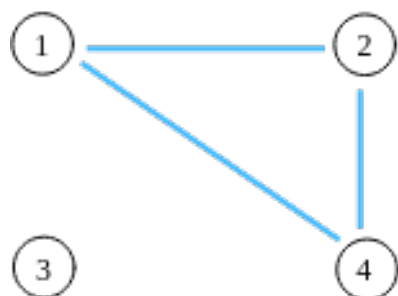




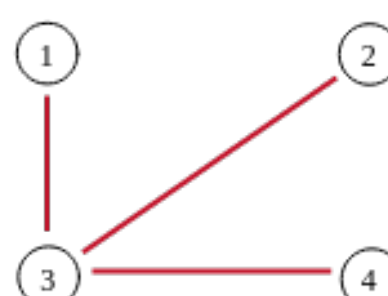
Reciprocal (6)



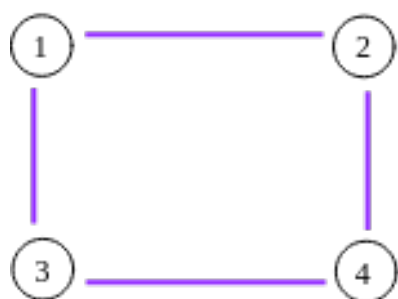
Matched (2)



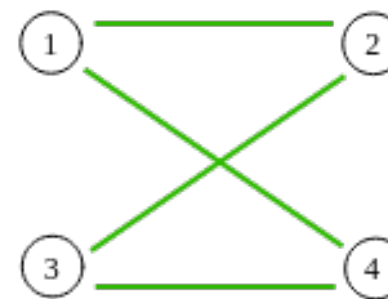
Lossless(3)



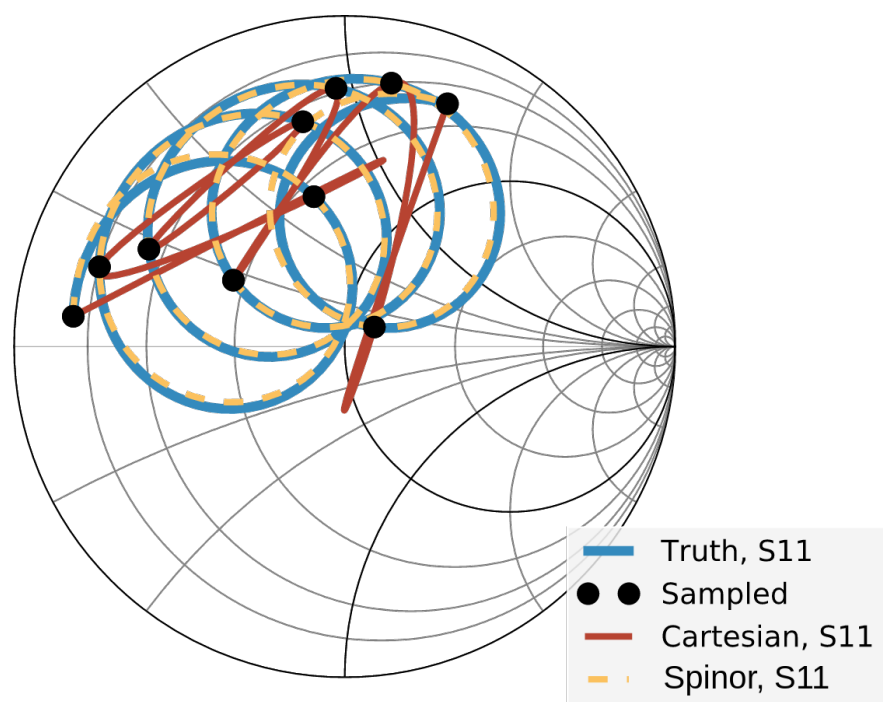
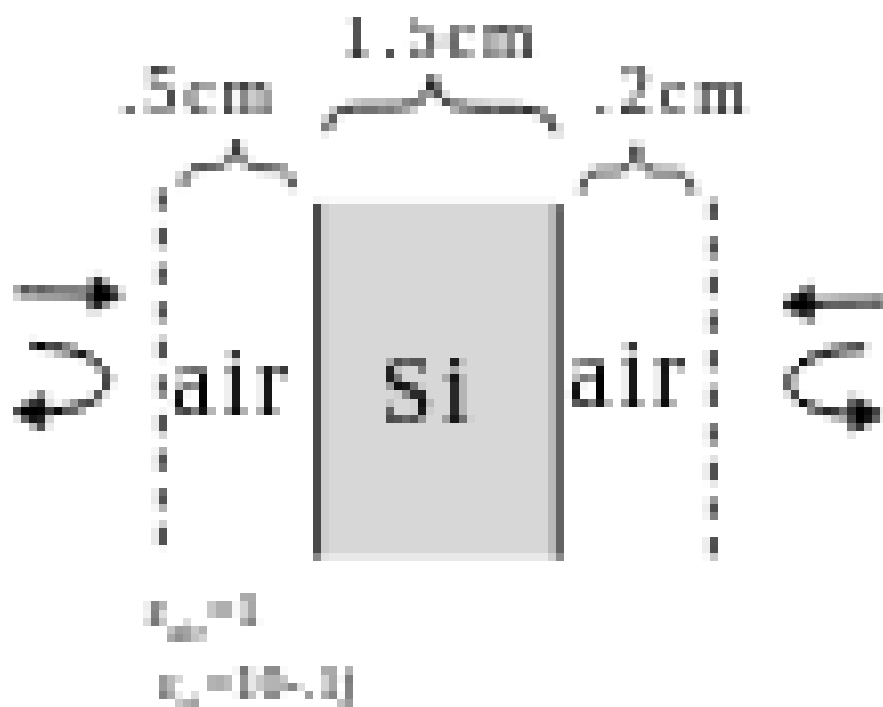
Non-propagating(3)

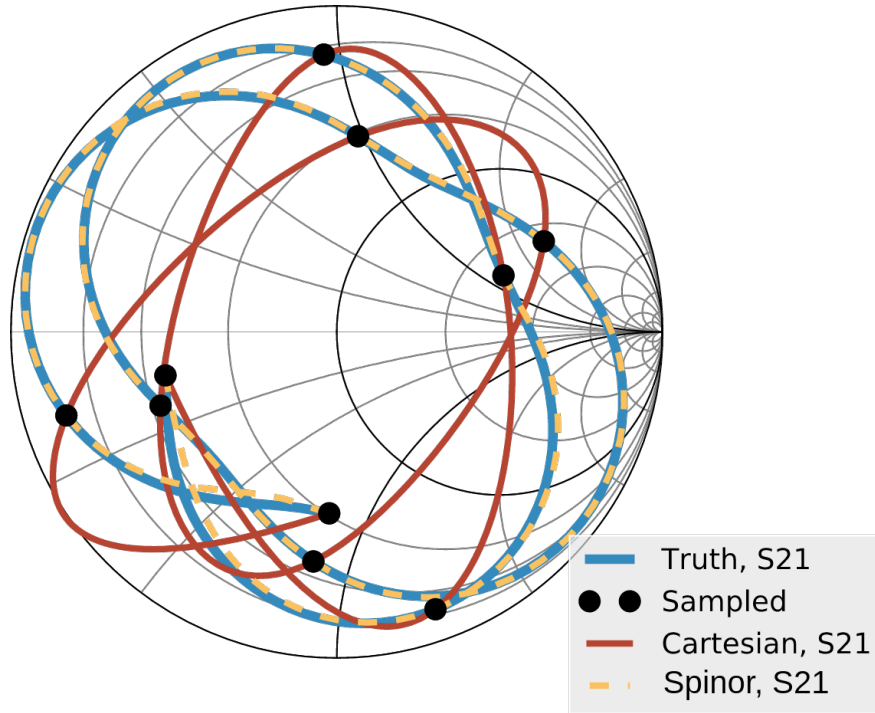


Symmetric(4)



Asymmetric(4)





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