Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Quantification of Partially Ordered Sets with Application to Special Relativity NEWSHAW BAHREYNI, KEVIN H. KNUTH, Department of Physics, University at Albany, Albany NY — A partially ordered set is a set of elements ordered by a binary ordering relation. We have shown that a subset of a partially ordered set can be quantified by projecting elements onto a pair of chains where the elements of each chain are quantified by real numbers. This results in a quantification based on pairs of real numbers (pair). Intervals, defined by pairs of elements, can be quantified similarly. A pair can be decomposed into a sum of a symmetric pair and an antisymmetric pair and mapped to a unique scalar which results in the Minkowskian form. Changing the basis of quantification from one pair of chains to another, under special conditions, leads to the generalized Lorentz transformation for pairs. We apply these results to a causally-ordered set of events by identifying a chain of events with an observer equipped with a clock in an inertial frame. We obtain the Minkowski metric of flat space-time as well as Lorentz transformations, which results in there being a maximum invariant speed. We find that the mathematics of special relativity arises from quantifying causal relationships among events, and requires neither the principle of relativity nor the fact that the speed of light is constant.

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Date submitted: 16 Nov 2010 Electronic form version 1.4