QUANTUM/CLASSICAL INTERFACE: A GEOMETRIC APPROACH FROM THE CLASSICAL SIDE

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Abstract Classical relativistic physics in Clifford's geometric algebra has a spinorial formulation that is closely related to the standard quantum formalism. The algebraic use of spinors and projectors, together with the bilinear relations of spinors to observed currents, gives quantum-mechanical form to many classical results, and the clear geometric content of the algebra makes it an illuminating probe of the quantum/classical interface. The aim of this lecture is to close the conceptual gap between quantum and classical phenomena while highlighting their essential differences. The paravector representation of spacetime in APS is used in particular to provide insight into what many pioneering quantum physicists have considered classically indescribable: spin-1/2 systems and their measurement.

Keywords: algebra of physical space, Clifford algebra, entanglement, paravectors, quantum/classical interface, quantum computing, quantum information, relativity