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Towards a deterministic and local interpretation of quantum mechanics

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By assuming a deterministic evolution of quantum systems and taking realism into account, we carefully build a hidden variable theory for Quantum Mechanics based on the notion of ontological states proposed by 't Hooft[1]. We view these ontological states as the ones embedded with realism and compare them to the (usual) quantum states that represent superpositions, viewing the latter as mere information of the system they describe. Such a deterministic model puts forward conditions for the applicability of Bell's inequality: the usual inequality cannot be applied to the usual experiments. We build[2] a Bell-like inequality that can be applied to the EPR scenario and show that this inequality is always satisfied by Quantum Mechanics. In this way we show that Quantum Mechanics can indeed have a local interpretation, and thus meet with the causal structure imposed by the Theory of Special Relativity in a satisfying way.

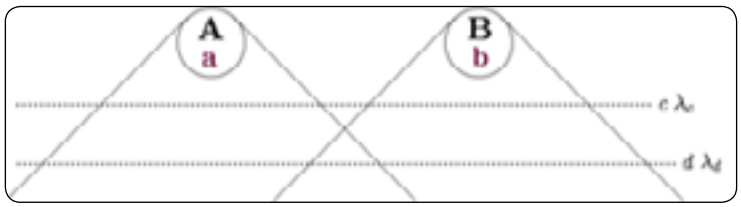

Figure 1: Events A and B, space-like separated, with results A and B from detectors setup at conditions (angles) ~a and~b, together with their past light-cones. The set (c;c), with c the values of any variables that describe the experimental setup, and c the values of any additional (hidden) variables necessary to obtain a complete theory, completely species the results as it totally screens each result from the other's past light-cone. Figure adapted from figure 6 of J.S. Bell: La Nouvelle Cuisine".

Recent Publications

1. Sanchez-Kuntz N and Nahmad-Achar E (2018) Quantum locality, rings a bell?: bell's inequality meets local reality and true determinism. Found. Phys. 48, 27-47.
2. Cordero S, Nahmad-Achar E, Casta~nos O and Lopez-Pe~na R (2018) Dynamic generation of light states with discrete symmetries. Phys. Rev. A 97:013808.
3. Quezada L F and Nahmad-Achar E (2018) Entropy of entanglement between quantum phases of a three-level matter-radiation interaction model. Entropy 20(2):72.
4. Quezada L F and Nahmad-Achar E (2018) Quantum phases of a three-level matter-radiation interaction model using SU(3) coherent states with di erent cooperation numbers. Phys. Rev. A 97(6):063819.
5. Casta~nos O, Cordero S, Lopez-Pe~na R and Nahmad-Achar E (2018) Phase space properties of light within the generalised Dicke model. Phys. Scr. 93(8):085102.

Biography

Eduardo Nahmad-Achar has been an active researcher in the fields of General Relativity, Physics and Chemistry of Polymers, Quantum Optics, Relativistic Properties of Important Quantities in Quantum Information Theory, and Foundations of Quantum Mechanics. He was also Founding Director of the Centre for Polymer Research, nr. Mexico City, Mexico. Research Interest: Quantum Optics, Relativistic Properties of Important Quantities in Quantum Information Theory, and Foundations of Quantum Mechanics Pro le .

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