Review of: "An alternative foundation of quantum theory"

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Potential competing interests: No potential competing interests to declare.

In this paper, the author proposes a theoretical foundation for quantum mechanics based on two complementary variables, some of which are attached to the observer. Based on this approach, some variables are accessible, while others are theoretical or inaccessible; in this case, variables can only be represented mathematically. The author contends that by focusing only on physical variables rather than mathematical variables, the concept of inaccessible variables is replaced by the concept of notions. It is understood that a 'notion' can be anything that exists in the mind of an actor or in the minds of actors who are communicating with one another. By applying category theory to these notions and their relationship to accessible variables, a mathematical model can be developed. A general epistemic theory of quantum mechanics is presented by the author in this regard. In this way, the author seeks to provide a theoretical framework in which the observer and its mental states are considered from the perspective of quantum mechanics.

The author proposes a novel interpretation of quantum mechanics, which differs from other accepted interpretations such as the Everett interpretation of many worlds. Furthermore, the author attempts to explicitly consider convivial solipsism and includes the observer's mental states in the definition of quantum states.

Pros: This proposal is interesting and presents an alternative to current interpretations. In my opinion, the explicit consideration of the observers' mental states is still a very relevant problem. Currently quantum mechanics finds its way to be applied in different applications. One of them is quantum computation, quantum cryptography and quantum internet. In such applications it is assumed that quantum states can be controlled. But if there is a remaining subjective component, this can always imply a significant limitation in any technological application. This is where robust and subject-independent, i.e., perfectly objective, behavior is expected.

Though this article focuses on fundamental aspects of quantum mechanics, I still miss a section that provides a critical discussion of its implications for technology. Is there some remaining component in the definition of quantum states that could affect a computation? Is there some aspect of this formalism that should be considered in quantum algorithm formulation? I can assume that the theory presented in this article could be relevant in understanding the challenges in the upscaling of quantum computers.

Furthermore, it is not clear what is the difference between the author's approach and Deutsch’s argument concerning subjective probabilities, and Deutsch’s decision-theory axioms, in terms of rational agent preferences, considering that the measurement problem can be considered as a game. It would be helpful if the author presented a relation between his theory and this theory (See for instance Simon Saunders, “What is Probability?”, in the book “Quo vadis Quantum Mechanics” - https://link.springer.com/book/10.1007/b137897).

Also, the article could be much more self-contained: instead of merely referring to a certain article or book (number of references, see for instance page 3, line 1), the author should provide a short description about what is the main argument in this reference and why there is an overlap or divergence between previous and this work.