Review of: "Quantum mechanics and symplectic topology"

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The article deals with the formulation of on-relativistic quantum theory with in the purview of symplectic topology. The state of a system at time zero, occupy a 2-D ball and the projected ball on phase space gives the area . Choosing the value of \epsilon^2 = h/2\pi, the area gives the minimum uncertainty. The ball B is a representation for the coherent state. The authors argued that the interior of the ball is necessarily complex valued and stated that such complex nature is mysterious. The overlap of two coherent states gives a corresponding projected area on phase space which is a measure of indistinguishability of states. Since this area is complex valued, authors introduced a quantum fidelity function with certain imposed conditions and found that the unitarity is a restatement of conservation of quantum fidelity. In other words, the Schrödinger equation for overlap is a consequence of conservation of quantum fidelity. The theory is extended to an ensemble of quantum states. The article is quite interesting and thought provoking.

In my view, the complex nature of quantum state of a particle may be attributed to the spin angular momentum or zero-point angular momentum. The presence of i (root minus one) in the quantum equations is normally a consequence of spin. In general, a charged particle immersed in the zero-point field may be considered as an oscillator. These oscillations may be considered as complex rotations characteristic of internal spin angular momentum. Further, the random oscillations of the particle allow one to consider an extended structure of the particle. This extended structure gives the so-called uncertainty in both position and momentum. Thus, we have no ambiguity about complexity of quantum state once we consider the existence of random zero-point field.