# Review of: "Fundamentals of Classical and Supersymmetric Quantum Stochastic Filtering Theory"

E. M. Elsayed[1]

1 King Abdul Aziz University

Potential competing interests: No potential competing interests to declare.

**Report on the paper entitled**

**“Fundamentals of classical and supersymmetric quantum stochastic filtering theory”**

**By**

**Harish Parthasarathy**

In this article, it is mainly about how to design a real-time quantum filter for estimating the evolving quantum state according to Schrödinger's equation in the presence of both Bosonic and fermionic quantum noise processes. It generalizes the well-known Belavkin filter to the case when both Bosonic and fermionic processes drive the state evolution, apart from the Hamiltonian. The crucial idea is that Bosonic noise plus fermionic counting noise can form a non-demolition measurement process. In contrast with the usual fermionic filter of John Gough et al., the given model for the fermionic noise is based on the classic twisting method of Hudson and Parthasarathy by applying the minus one power to the counting process to the Bosonic noise differentials. Apart from giving an explicit realization of fermionic noise in Boson Fock space, this method shows that the fermionic noise is non-local, i.e., it has tensor memory. The theorems proved in this paper demonstrate the non-demolition property of the measurement process to which we apply the orthogonality principle of estimation theory and the quantum into formula to derive the super-symmetric filter. The orthogonality principle in the quantum context has been termed as the reference probability approach by John Gough et al.

In summary, the results in this paper are interesting and correct. I recommend the publication of the paper.