

PHYS/517425.v1 Review Report

Recommendation

Reject (Paper is not of sufficient quality or novelty to be published in this Journal)

Comments

The author suggests to obtain the gauge fields from the multi-valued action. But this is rather well known procedure, see for example the general discussion of multi-valued actions in: S. P. Novikov The Hamiltonian formalism and a many-valued analogue of Morse theory, Journal Russian Mathematical Surveys, Volume 37, Number 5 (1982) doi: 10.1070/RM1982v037n05ABEH004020

<http://iopscience.iop.org/0036-0279/37/5/R01/> In principle, all the gauge fields (including the gravitational field) have been obtained from the multi-valuedness. In many cases the effective gauge fields have been introduced using the multivaluedness provided by topological defects (vortices, dislocations, disclinations), see e.g. the review paper I.E. Dzyaloshinskii and G.E. Volovick, "Poisson brackets in condensed matter," Ann. Phys. **125** 67 - 97 (1980). The other subject of the paper concerns the origin of spin degrees of freedom. Unfortunately the consideration of spin is also outdated. There exist more sophisticated scenarios of the origin of spin, which are based on topology and are universal. See e.g. the paper P. Hoveva, Phys. Rev. Lett. **95**, 016405 (2005), where the Gamma matrices which give rise to relativistic spin are obtained from the topological Atiyah-Bott-Shapiro construction.