ESSENTIAL NONLINEARITY IN FIELD THEORY AND CONTINUUM MECHANICS. SECOND- AND FIRST-ORDER GENERALLY-COVARIANT MODELS

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Abstract. Discussed is the problem of the mutual relationship of differentially first-order and second-order field theories and quantum-mechanical concepts. We show that unlike the real history of physics, the theories with algebraically second-order Lagrangians are primary, and in any case more adequate. It is shown that in principle, the primary Schrödinger idea about Lagrangians which are quadratic in derivatives, and leading to second-order differential equations, is not only acceptable, but just it opens some new perspective in field theory. This has to do with using the Lorentz-conformal or rather its universal covering $SU(2,2)$ as a gauge group. This has also some influence on the theory of defects in continua.

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1. Summary

It is well-known that fundamental laws of motion of discrete or continuous systems of material points are given by the second-order differential equations, in any