

A covariant simultaneous action for branes

A covariant simultaneous action for branes in an arbitrary curved background spacetime is considered. The term 'simultaneous' is imported from variational calculus and refers to the fact that extremization of the action produces at once both the first and second variation of a given geometrical action for the brane. The action depends on a pair of independent field variables, the brane embedding functions, through the canonical momentum of a reparametrization invariant geometric model for the brane, and an auxiliary vector field. The form of the action is analogous to a symplectic potential. Extremization of the simultaneous action produces at once the equations of motion and the Jacobi equations for the brane geometric model, and it also provides a convenient shortcut towards its second variation. In this note, we consider geometric models depending only on the intrinsic geometry of the brane worldvolume, and discuss briefly the generalization to extrinsic geometry dependent models. The approach is illustrated for Dirac-Nambu-Goto [DNG] branes. For a relativistic particle, a simultaneous action was introduced by Bazanski, that served as an inspiration for the present work.

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