

On the use of evolutionary methods in spaces of Euclidean signature

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ABSTRACT

Two examples of physical interest will be presented. Both, contrary to the folklore, demonstrate that evolutionary methods may play a significant role in spaces of Euclidean signature. First, the propagation of the constraints is considered. It is shown that once a clear separation of the evolutionary and constraint equations is done, the subsidiary equations satisfied by the constraint expressions form a first order symmetric hyperbolic system regardless whether the ambient Einsteinian space is of Lorentzian or Euclidean signature. Second, the constraints of Einstein's theory of gravity are considered. Since the seminal observations of Lichnerowicz and York these equations are usually referred to as a semilinear elliptic system. It will be shown that-according to the choice of the dependent variables-the constraints may have different characters. In particular, they may take the form of either a parabolic-hyperbolic or a strongly hyperbolic system. Some of the recent developments related to these alternative forms will also be discussed..