The method of equivalence and its applications

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Abstrak

The ideas of Elie Cartan are combined with the tools of Felix Klein and Sophus Lie to present in this book the only detailed treatment of the method of equivalence. An algorithmic description of this method, which finds invariants of geometric objects under infinite dimensional pseudo-groups, is presented for the first time.

As part of the algorithm, Gardner introduces several major new techniques. In particular, the use of Cartan's idea of principal components that appears in his theory of Repere Mobile, and the use of Lie algebras instead of Lie groups, effectively a linear procedure, provide a tremendous simplification. One must, however, know how to convert from one to the other, and the author provides the Rosetta stone to accomplish this. In complex problems, it is essential to be able to identify natural blocks in group actions and not just individual elements, and prior to this publication, there was no reference to block matrix techniques.

The Method of Equivalence and Its Applications details ten diverse applications including Lagrangian field theory, control theory, ordinary differential equations, and Riemannian and conformal geometry.

This volume contains a series of lectures, the purpose of which was to describe the equivalence algorithm and to show, in particular, how it is applied to several pedagogical examples and to a problem in control theory called state estimation of plants under feedback. The lectures, and hence the book, focus on problems in real geometry.