

SYMMETRY PRINCIPLES
IN
NONLINEAR CIRCUITS

Leon O.Chua

Department of Electrical Engineering and Computer Sciences,
University of California, Berkeley, CA 94720

Various forms of symmetry can be identified in a large class of nonlinear circuits. This paper will present an in-depth analysis of the more subtle forms of symmetry principles and their circuit-theoretic implications. The properties of reciprocity and anti-reciprocity and their implications in terms of various stationary and variational principles in nonlinear circuits will be analysed. In particular, decomposition of an arbitrary vector field in terms of a reciprocal and solenoidal n-port will be presented. Finally, the symmetry principles will be used to relate nonlinear conservative circuits to Newtonian mechanics and thermodynamics.