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Shuai Wang, 110 Cummington Mall, Boston University, Boston, MA , and **John Baillieul***
(johnb@bu.edu), 110 Cummington Mall, Boston, MA 02215. *Orthogonality, Duality, and
Variational Principles in Mixed Source Electrical Networks.*

Problems in classical mechanics are frequently solved by means of the principle of least action. Classical circuit theory, on the other hand, is based on Kirchhoff's laws, Ohm's law, and the principle of superposition. These laws can be conveniently formulated as a system of linear equations that determine the currents and voltages throughout the circuit. When the circuit topology is changed by adding or removing a branch, there is a general redistribution of the current flowing throughout the whole circuit. The change of the flow increases with the extent of the redistribution, and the redistribution then ceases when a new equilibrium is attained. The equilibrium is considered stable since the circuit always returns to it after small disturbances. In this talk, we examine whether the stability of the equilibrium can be found as a set of electrical values where the I^2R losses across a circuit are minimized subject to the circuit laws mentioned above. We shall propose a principle of least power loss as a theoretical basis for understanding classical electrical networks that are driven by a mixture of current and voltage sources. (Received August 15, 2018)