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Title: The Helmholtz conditions for systems of second order homogeneous differential equations

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Variationality of systems of second order ordinary differential equations is studied within the class of positive homogeneous systems. The concept of a higher order positive homogeneous function, related to Finsler geometry, is represented by the well-known Zermelo conditions, and applied to the theory of variational equations. In particular, it is shown that every system of $m+1$ second order variational and positive homogeneous differential equations is linearly dependent and admits subsystems of m differential equations which are variational in sense of parameter-invariant variational problems, and vice versa. An example of a positive homogeneous variational system of second order differential equations is given.

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