Continuous and Discrete Oscillation

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In the first part of this talk we present an oscillation theorem on differential systems. We consider an eigenvalue problem, which consists of a linear, Hamiltonian differential system and Dirichlet boundary conditions. The oscillation theorem states that the number of eigenvalues, which are less than a given number, are equal to the number of focal points ("zeros") of a certain solution (the so-called "principal solution") of the corresponding differential system.

In the second part we state analogical results for corresponding *discrete* eigenvalue problems, which consist of a symplectic difference system and Dirichlet boundary conditions. With the right notion of focal points and their multiplicities for solutions of the symplectic difference system the corresponding discrete oscillation theorem is completely analogous to the continuous result. Moreover, we discuss applications to the numerical analysis of symmetric banded matrices. Every banded matrix corresponds uniquely to a self-adjoint Sturm-Liouville difference equation, which can be written as a symplectic difference system.