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Sujet de Thèse :

**Contribution to Linear Moment Problem and Linear Trigonometric Moment Problem using
Recursiveness**

Abstract:

In our thesis, we examine the linear moment problem and the linear trigonometric moment problem which have received considerable attention within the scientific community for their fundamental role in various mathematical and applied sciences, particularly in the field of quantum dynamical systems. Furthermore, it has been noted that it presents a close relationship with the Lanczos numerical method, which is an essential technique for determining the positions of particles given specified values of the first moments. This study aims to examine the linear trigonometric moment problem for real sequences defined by non-homogeneous linear recursive relations, focusing on properties such as those associated with Hankel matrices and the K-moment problem. Additionally, the relationship between the linear trigonometric moment problem and sequences defined by homogeneous and non-homogeneous recursive relations is studied. The exploration of this relationship is carried out through the use of properties of the Toeplitz matrix and its associated quadratic form, leading to the establishment of conditions for the solvability of the non-homogeneous and homogeneous linear trigonometric moment problem and the derivation of results for the of homogeneous linear trigonometric moment problem. The ultimate goal of this research is to contribute to a better understanding of the intricacies of the linear trigonometric moment problem and its relationship with non-homogeneous recursive sequences. The innovative results of this thesis are likely to attract the attention of researchers in operator theory and functional analysis in general and offer valuable perspectives and advances in these fields, which should be of interest to researchers working in these areas.

Keywords: Linear moment problem, trigonometric linear moment problem, self-adjoint operator, unitary operator, nonhomogeneous, Hankel matrix, Toeplitz matrix, linear recursive sequences, homogeneous linear recursive sequences