OPERATOR EQUATIONS GENERALIZING THE NOTIONS OF HANKEL AND TOEPLITZ OPERATORS

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Abstract

Hankel and Toeplitz operators came into existence with the work of H. Hankel in 1861 and O. Toeplitz in 1911 respectively. Although, the initial appearance of these operators was seen in matrix form, but various equivalent forms were obtained subsequently. In terms of matrices, a Hankel operator is an operator on a Hilbert space whose matrix with respect to an orthonormal basis is constant along each diagonal perpendicular to the main one and a Toeplitz operator is one whose matrix is constant along each diagonal parallel to the main one. In terms of operator equations, Hankel and Toeplitz operators on Hardy spaces are nothing but the solutions of operator equations $U^*X = XU$ and $U^*XU = X$ respectively, where U is the forward unilateral shift and U^* is its adjoint.

Barria and Halmos in 1982 focused the attention of mathematicians towards a new direction by proposing the operator equation $U^*XU = \lambda X$ for an arbitrary complex number . The study of Hankel and Toeplitz operators has gone a long way with the inception of various classes of operators like slant Hankel, slant Toeplitz, essentially slant Hankel, essentially slant Toeplitz, k^{th}-order slant Hankel, k^{th}-order slant Toeplitz operators, λ-Hankel operators. The present talk is a motivation of the work of Barria and Halmos that leads to some generalization of the operator equations characterizing Hankel and Toeplitz operators and has come up as a recent development in this direction.

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