PIMS Distinguished Lecture Series

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Friday,
November, 17, 2017
3:30 - 4:30 p.m.
Education Building (ED) 314

Geometrical Properties of the (*p*,*q*)-Matricial Range

Let $\mathbf{A} = (A_1, \ldots, A_m)$ be an m-tuple of bounded linear operators acting on a Hilbert space $\mathcal{H}$. In connection to the study of quantum error correction, we consider the joint (p, q)-matricial range $\Lambda_{p,q}(\mathbf{A})$ of $\mathbf{A}$ as the set consisting of $(B_1, \ldots, B_m) \in \mathbf{M}_q^m$, where $I_p \otimes B_j$ is a compression of A_j on a pq-dimensional subspace. This definition covers various kinds of generalized numerical ranges for different values of p, q including

(1) The classical joint numerical range if $(p, q) = (1, 1)$,

(2) The joint rank p-numerical range when $q = 1$,

(3) The joint q-matricial range when $p = 1$.

In this talk, we discuss some recent results concerning the geometrical properties such as the star-shapedness and convexity of the joint (p, q)-matricial range of $\mathbf{A}$. If $\dim \mathcal{H}$ is infinite, we extend the definition of $\Lambda_{p,q}(\mathbf{A})$ to $\Lambda_{\infty,q}(\mathbf{A})$ consisting of $(B_1, \ldots, B_m) \in \mathbf{M}_q^m$ such that $I_\infty \otimes B_j$ is a compression of A_j on a subspace of $\mathcal{H}$, and consider the joint essential (p, q)-matricial range

$$\Lambda_{p,q}^{ess}(\mathbf{A}) = \bigcap \{\mathbf{cl}(\Lambda_{p,q}(A_1 + F_1, \ldots, A_m + F_m)) : F_1, \ldots, F_m \text{ are compact operators}\}.$$

Their geometrical properties will also be discussed.

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