

# 國立中山大學應用數學系

## 學術演講

講者：李志光教授 Prof. Chi-Kwong Li (美國 William and Mary 學院)  
講題：Geometrical properties of the  $(p, q)$ -matricial range  
時間：Feb. 05, 2018 (Monday) 14:10 ~ 15:00 pm  
地點：理學院四樓理 SC 4013 室  
茶會：15:00 於理 SC 4010 室 (系辦公室)

### Abstract

Let  $\mathbf{A} = (A_1, \dots, A_m)$  be an  $m$ -tuple of bounded linear operators acting on a Hilbert space  $\mathbf{H}$ . 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  $(B_1, \dots, B_m) \in \mathbf{M}_q^m$ , where  $I_p \otimes B_j$  is a compression of  $A_j$  on a  $p \times q$ -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  $\dim \mathbf{H}$  is infinite, we extend the definition of  $\Lambda_{p,q}(\mathbf{A})$  to  $\Lambda_{\infty,q}(\mathbf{A})$  consisting of  $(B_1, \dots, B_m) \in \mathbf{M}_q^m$  such that  $I_\infty \otimes B_j$  is a compression of  $A_j$  on a subspace of  $\mathbf{H}$ , and consider the joint essential  $(p, q)$ -matricial range

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

Their geometrical properties will also be discussed.

This is a joint work with Pan-Shun Lau, Yiu-Tung Poon and Nung-Sing Sze.

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