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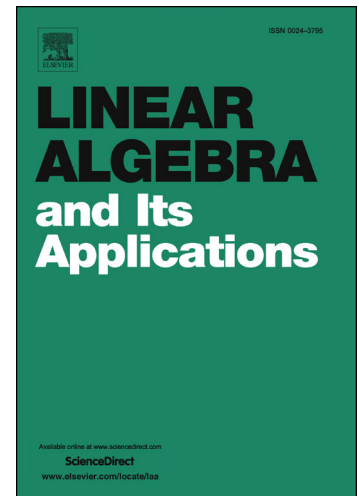
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ON JOINT SPECTRAL RADIUS OF COMMUTING OPERATORS IN HILBERT SPACES

Hamadi Baklouti¹ and Kais Feki²

ABSTRACT. Our aim in this paper is to give a new formula of the joint spectral radius of commuting d -tuples of operators on a complex Hilbert space. Also we show that $r(\mathbf{T}) \leq \omega(\mathbf{T})$ for a commuting d -tuple of operators \mathbf{T} , where $r(\mathbf{T})$ and $\omega(\mathbf{T})$ denote respectively the joint spectral radius and the joint numerical radius of \mathbf{T} . This generalizes the well known relation between the spectral and the numerical radii of Hilbert space operators which is proved in [10].

1. INTRODUCTION

In the sequel, \mathcal{H} is a complex Hilbert space, with inner product $\langle \cdot | \cdot \rangle$ and norm $\| \cdot \|$. The Banach algebra of all bounded linear operators on \mathcal{H} will be denoted by $\mathcal{B}(\mathcal{H})$. In all that follows, by an operator we mean a bounded linear operator.

Let $\mathbf{T} = (T_1, \dots, T_d) \in \mathcal{B}(\mathcal{H})^d$ be a d -tuple of commuting operators (i.e. the operators T_k are pairwise commuting). There are several different notions of a spectrum. For a good description, the reader is referred to [8] and the references there. There is a well-known notion of a joint spectrum of a commuting d -tuple \mathbf{T} called the Taylor joint spectrum [14]. This is a compact subset of \mathbb{C}^d and will be denoted here by the symbol $\sigma_T(\mathbf{T})$. The joint spectral radius of \mathbf{T} is defined to be the number

$$r(\mathbf{T}) = \max\{\|\lambda\|_2, \lambda = (\lambda_1, \dots, \lambda_d) \in \sigma_T(\mathbf{T})\}, \quad (1.1)$$

where $\|\lambda\|_2$ is the euclidean norm of $\lambda \in \mathbb{C}^d$. Notice that Ch \bar{o} and Żelazko proved in [7] that this definition of $r(\mathbf{T})$ is independent of the choice of the joint spectrum of \mathbf{T} . In particular one can replace $\sigma_T(\mathbf{T})$ by another joint spectrum of \mathbf{T} in (1.1) without changing the value of $r(\mathbf{T})$.

Furthermore, an analogue of the Gelfand-Beurling spectral radius formula for single operators has been established by Müller, and Soltysiak in [12] for commuting tuples. More precisely, the joint spectral radius of a commuting d -tuple of operators

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