UNIVERSIDAD DE LA FRONTERA

SEMINARIO CRUZ DEL SUR

Spectrum bounding curves

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Resumen.
The spectrum of a matrix A is contained in its numerical range or field of values $F(A)$, which is defined as the set in the complex plane of all values of x^*Ax, where x is a complex unit vector. The spectrum is also located to the left of the vertical line determined by the largest eigenvalue of the Hermitian part $H(A)$ of A, and applying this to $e^{-i\theta}A$ for all angles θ, the spectrum is inside the envelope of such lines rotated by θ. In fact, Johnson showed that the boundary of $F(A)$ is precisely this envelope. More recently, Adam, Psarrakos and Tsatsomeros have shown that using the two largest eigenvalues of $H(A)$, the above lines can be replaced by cubic curves that restrict the location of eigenvalues, and the envelope of such cubic curves defines a region inside $F(A)$ that still contains the spectrum. We present a generalization of their results and show how new restricting curves for the spectrum can be found if one utilizes more than two eigenvalues of $H(A)$, and how envelopes of such curves bound new smaller regions for the spectrum.

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