NORMS OF POSITIVE DEFINITE TOEPLITZ MATRICES AND DETECTION OF ALMOST PERIODIC COMPONENTS IN RANDOM SIGNALS

VADYM ADAMYAN, JOSÉ LUIS ISERTE, IGOR M. TKACHENKO AND GUMERSINDO VERDÚ

Abstract. For positive definite Toeplitz matrices $Q_N = (b(j - k))_{j,k=0}^{N-1}$ generated by trigonometric moments $b(j)$ of a non-negative measure $d\sigma(\theta), \theta \in [-\pi, \pi]$, we note that the Hilbert-Schmidt norm $\|Q_N\|_2$ and the maximal eigenvalue $\lambda_m(N)$ satisfy the following relations

$$\lim_{N \to \infty} \frac{1}{N} \|Q_N\|_2^2 = \sum_{\alpha} m_{\alpha}^2, \quad \lim_{N \to \infty} \frac{1}{N} \lambda_m(N) = \max_{\alpha} m_{\alpha},$$

where $\{m_\alpha\}$ is the set of jumps of $\sigma(\theta)$. Analogous relations hold for positive definite integral operators with difference kernels. The above relations are used in order to detect hidden almost periodic components in random signals.

Mathematics subject classification (2010): Primary 47B35; Secondary 15B05, 45E10, 60G10, 60G35.

Keywords and phrases: Positive definite Toeplitz matrices, stationary processes, positive integral operators with difference kernels, signal processing.

REFERENCES