TECHNICAL COMMENT

A PROBLEM ON MARKOV CHAINS

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Abstract. A problem (arisen from applications to networks) is posed about the principal minors of the matrix of transition probabilities of a Markov chain.

Keywords: Markov chains, stochastic matrices.

1. THE PROBLEM

Let the Markov chain (P^0, P) be given, where P is the $n \times n$ matrix, whose entries are the transition probabilities, and $P^0 \in [0,1]^n$ is the initial distribution [1]. Every $K \subseteq \{1, \ldots, n\}$ identifies a principal minor of P, denoted by P_K; let $I_{|K|}$ be the identity matrix of order $|K|$. It is not difficult to show that

$$0 \leq \det(I_{|K|} - P_K) \leq 1, \quad \forall K \subseteq \{1 \ldots, n\}$$

where det denotes determinant. Is det $(I_{|K|} - P_K)$ a (conditioned or not) probability of an event related to Markov chain?

REFERENCE

[1] S.N. Ethier and T.G. Kurtz, *Markov processes: Characterization and convergence.* J. Wiley, New York (1986).