

WAITING TIME DISTRIBUTIONS OF RUNS IN HIGHER ORDER MARKOV CHAINS

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Abstract. We consider a $\{\mathbf{0}, \mathbf{1}\}$ -valued m -th order stationary Markov chain. We study the occurrences of runs where two $\mathbf{1}$'s are separated by *at most/exactly/at least* k $\mathbf{0}$'s under the overlapping enumeration scheme where $k \geq 0$ and occurrences of scans (at least k_1 successes in a window of length at most k , $1 \leq k_1 \leq k$) under both non-overlapping and overlapping enumeration schemes. We derive the generating function of first two types of runs. Under the conditions, (1) strong tendency towards success and (2) strong tendency towards reversing the state, we establish the convergence of waiting times of the r -th occurrence of runs and scans to Poisson type distributions. We establish the central limit theorem and law of the iterated logarithm for the number of runs and scans up to time n .

Key words and phrases: m -th order Markov chain, generating function, scans, Poisson distribution, central limit theorem, law of the iterated logarithm, α -mixing, strong Markov property.