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New results about the Bernoulli sieve

A random sequence $B = (P_j : j \in \mathbb{N}_0)$ of the form

$$P_0 := 1, \quad P_j = \prod_{i=1}^{j} W_i,$$

where $(W_i : i \in \mathbb{N})$ are independent copies of a random variable W taking values in open interval $(0, 1)$, is called a multiplicative random walk or a stick-breaking set. Let $U_1, \ldots, U_n$ be independent uniform $[0, 1]$ random points which are independent of B.

The random set B together with points $U_1, \ldots, U_n$ define a random occupancy scheme, called the *Bernoulli sieve*, in which n 'balls' $1, \ldots, n$ are dropped into infinitely many 'boxes' indexed by positive integers according to the rule: ball i falls in box j if the event that the point U_i falls in the interval $]P_j, P_{j-1}[$ occurs.

The Bernoulli sieve provides a model of random compositions which is the most prominent application of it. Also the Bernoulli sieve is a generalization of (1) Karlin's occupancy scheme which appears when the law of W is degenerate and (2) better known models related to random permutations which arise when the law of W is beta $(\theta, 1)$ law, $\theta > 0$.

Two functionals of intrinsic interest are

- K_n–the number of occupied boxes and
- $K_{n,0}$– the number of empty boxes with indices not exceeding the index of the leftmost occupied box.

In [1, 2] it was shown that, provided $\nu := \mathbb{E} \log |1 - W| < \infty$, $K_{n,0} = M_n - K_n$ converges in distribution which entails that the weak asymptotic behaviour of K_n coincides with that of M_n. In the talk I will briefly present these results, and the partially open case $\nu = \infty$ will be discussed, too.

[1] Gnedin, A., Iksanov, A., Negadajlov, P., and Roesler, U. The Bernoulli sieve revisited // Ann. Appl. Prob. —2009+. —, to appear.

[2] Gnedin, A., Iksanov, A. and Roesler, U. Small parts in the Bernoulli sieve // Discrete Mathematics and Theoretical Computer Science, Proceedings Series. —2008. — **AI**, 235–242.