around a high level. The harmonic mean formula leads to a proof of asymptotic convergence which is perhaps technically easier than standard proofs, and to a formula for c which is more amenable to analytic bounding and simulation.

On Invariant Record Processes and their Applications

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Let $A_1, A_2, \ldots$ be independent random variables with common continuous distribution function F defined on some finite or infinite interval $[0, t]$, and N be some $\mathbb{N}$-valued random variable independent of the A_i's.

Let $T_1 < T_2 < \cdots < T_N$ be the order statistics of $A_1, \ldots, A_N$. The A_i's are thought of as being random arrival times of objects drawn independently from a (not necessarily known) distribution, N as the total number of arrivals on $[0, t]$ and the T_i's as the chronological order in which an observer can see them. We say that T_j is a k-record, if the associated object is the kth best of the first j. The problem is to predict, having observed $[0, \tau]$, $\tau < t$, the total number of future k-records in any subinterval of $[\tau_1, \tau_2]$ with $\tau \leq \tau_1 < \tau_2 \leq t$.

Suppose that the observer, not knowing N or its distribution, starts, at time 0, with a noninformative prior (e.g. $P(N = n) = c, \forall n$). If we denote by σ_τ the σ-field generated by arrivals (or records) up to time τ then clearly $P(N = n \mid \sigma_\tau)$ depends on σ_τ. We will, however, prove the following somewhat surprising result.

Theorem. *Let $R_K^\tau(s) = \#k$-records in $(\tau, s]$. Then, given $T_j \leq \tau$, all record counting processes $(R_1^\tau(s)), (R_2^\tau(s)), \ldots, (R_{j+1}^\tau(s))$ are i.i.d. inhomogeneous Poisson processes with intensity $1/F(s)$ on $[\tau, t]$.*

Applications show how several optimal selecting problems can be reduced to easy exercises simply by imbedding them into this model.

References

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From a Solar Energy Model to Extreme-Type Limit Laws

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Let $X_1 = x$ and define, for $n \geq 2$,

$$X_n = \max\{\alpha X_{n-1}, \alpha X_{n-1} + Y_n\}, \quad \alpha \in [0, 1),$$

where Y_n is an i.i.d. sequence with distribution F.