A Note on Bruss' Stopping Problem with Random Availability

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Abstract

Bruss (1987) has studied a continuous-time generalization of the so-called secretary problem, where options arise according to homogeneous Poisson processes with an unknown intensity of λ. In this note, the solution is extended to the case with random availability, that is, there exists a fixed known probability $p(0 < p \leq 1)$ of availability, and the number of offering chances allowed at most is $m(\geq 1)$. The case when the probability of availability depends on m is also studied.

Keywords: Apartment problem, secretary problem, Pascal process, optimality principle

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1 Introduction

Bruss (1987) has studied the following problem. A decision maker has been allowed a fixed time T in which to find an apartment. Opportunities to inspect apartments occur at the epochs of a homogeneous Poisson process of unknown intensity λ. The decision maker inspects each apartment immediately when the opportunity arises, and he must decide immediately whether to accept or not. At any epoch he is able to rank a given apartment among all those inspected to date, where all permutations of ranks are equally likely and independent of the Poisson process. The objective is to maximize the probability of selecting the best apartment from those (if any) available in the interval $(0, T]$. This is an extension of the problem studied by Cowan and Zabczyk (1976), who assume that the intensity λ of the process is known. Bruss (1987) has shown that if the prior density of the intensity of the Poisson process is an exponential with the rate parameter $a \geq 0$, then the optimal stopping rule is to accept the first relatively best option (if any) after time $s^* = (T + a)/e - a$. Sakaguchi (1989) has studied