ASYMPTOTIC BEHAVIOR OF SEQUENTIAL DESIGN WITH COSTS OF EXPERIMENTS

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1. Introduction.

We shall consider the two kinds of experiments E_1 and E_2 which have two events "Success S" or "Feilure F". The probabilities of success or failure by the experiments E_1 and E_2 are given by

$$P\{S|E_1\}=p_1, \qquad P\{F|E_1\}=1-p_1$$

and

$$P\{S|E_2\}=p_2, \qquad P\{F|E_2\}=1-p_2$$

respectively, where we assume that $p_1 \neq p_2$.

Moreover, following to Kunisawa [4], we introduce the notion of costs of experiments, i.e., if we execute the experiment E_1, it costs c_1 ($c_1>0$), and if E_2, it costs c_2 ($c_2>0$).

The object of this paper is to discriminate the hypotheses $p_1>p_2$ or $p_1<p_2$. What a procedure, with which we repeat the experiments, is optimal, in order to maximize the information of discrimination per unit cost?

According to Chernoff [1] a procedure is given, which maximizes the information, when $c_1=c_2$.

In this paper we shall show the asymptotic behavior of the procedure which maximizes the information of discrimination per unit cost.

2. Notations and definitions.

Given Θ the two dimensional closed rectangular set $[0, 1]\otimes[0, 1]$, i.e., the set of elements (p_1, p_2) satisfying $0\leqq p_1\leqq 1$ and $0\leqq p_2\leqq 1$. And put

$$H_1=\{(p_1, p_2)\colon p_1>p_2,\ (p_1, p_2)\in\Theta\},$$

$$H_2=\{(p_1, p_2)\colon p_1<p_2,\ (p_1, p_2)\in\Theta\}$$

and

$$B_{12}=\{(p_1, p_2)\colon p_1=p_2,\ (p_1, p_2)\in\Theta\}$$

Then Θ is clearly the sum of sets H_1, H_2 and B_{12}. Next let $E^{(i)}$ be i-th experiment, and define x_i as follows:

Received April 23, 1964.