Neo Science Peer Reviewed Journal
Volume 4, Dec. 2022 ISSN (E): 2949-7701
www.neojournals.com

PROBABILISTIC PROBLEMS IN EXPERIMENT PLANNING

Gafurov Mahamat Uktamovich
A. a. m. A. professor
Tashkent State Transport University

Abstract:
It is known that for many specialists in solving applied problems , the importance of studying the numerical characteristics of random variables - one of the basic concepts of probability theory and mathematical statistics, one of the relatively young areas of modern mathematics.

Keywords:
The purpose of this article is to illuminate through one simple problem the application of the concept of mathematical expectation in solving problems of planning experiments.

Suppose that a series of experiments (they can also be mutually dependent) are carried out in order to achieve the result of interest to us$B$. It is not difficult to understand that with the increase in the number of experiments, m the probability of achieving a result B does not decrease. Let's denote by $P(m)$ the probability that at the first m experiments the event B will occur at least once. As soon as an event occurs$B$, the experiment is immediately stopped. If we X denote the number of experiments that need to be carried out, then it is obvious that its possible values consist of$1,2,\dots,n\dots$.

The problem is to calculate the mathematical expectation of a random variable , Xthat is, the "average" number of experiments for the event$B$, and its variance. Next, we will give a solution to this problem. Note that we will not be able to limit from above the number of experiments that need to beconducted before the implementation of the result$B$.

Let's assume that if the result B is not achieved before $i-$ the experiment, then $i-$ the experiment is "necessary" to conduct, otherwise it is "not necessary".

Enter the following random variables: for $i=1,2,\dots$

$$Y_i=\begin{cases} 1, & \text{если } i-\text{е эксперимент "необходимо"} \\ 0, & \text{если } i-\text{е эксперимент "не необходимо"} \end{cases}$$

Then the law of distributionY_i will be of the form

$P(Y_i=0)=P(i-1),\quad P(Y_i=1)=1-P(i-1)$,

and the expected value will be

$MY_i=1-P(i-1),\quad i=1,2,\dots$.

From here we have

$$X=\sum_{i=1}^{\infty}Y_i$$

and

===

$$MX = \sum_{i=1}^{\infty} MY_i = \sum_{i=1}^{\infty}[1 - P(i-1)] = \sum_{l=0}^{\infty}[1 - P(l)] \qquad (1)$$

Obviously,

$$DX = M\left(\sum_{i=1}^{\infty} Y_i^2 + 2\sum_{i<j} Y_i Y_j\right) - \left[\sum_{l=0}^{\infty}\big(1 - P(l)\big)\right]^2 \qquad (2)$$

When finding a mathematical expectation on the right side of the equation , pay attention to the following:

(a) Y_i AndY_i^2 have the same distribution;

b); $\sum_{i<j} MY_iY_j = \sum_{i=1}^{\infty}\sum_{j=i+1}^{\infty} MY_iY_j$

c) random variables takeY_iY_j only values of 1 or 0, i.e. and $P\big(Y_iY_j = 0\big) = P(j-1)$.$P\big(Y_iY_j = 1\big) = 1 - P(j-1)$

Thus, as a result, by virtue of the formula (2) we have

$$DX = \sum_{l=0}^{\infty}[1 - P(l)] + 2\sum_{l=0}^{\infty} l[1 - P(l)] - \left\{\sum_{l=0}^{\infty}[1 - P(l)]\right\}^2 = MX(1 - MX) + 2\sum_{l=0}^{\infty} l\big(1 - P(l)\big) \qquad (3)$$

Let's make some judgments according to the obtained formulas (1) and (3).

A) These formulas are solutions in the general form of the above problem, on a superficial examination their applications are not visible. However, depending on how the event is determined, B you can calculate the numeric values MX andDX .

B) The considered problem and its solutions are of great importance in the theory of decision-making, in obtaining practical conclusions through the processing of statistical data, in the search for optimal solutions in technology and economics.

C) Series in formulas (1) and (3) are often found in solving boundary problems of random wandering, and there the conditions for their convergence are sought.

References

1. Eddowes M, Stansfield R. Methods of decision-making. Moscow, "Audit", PUBLISHING HOUSE "UNITY" 1997
2. Economic and mathematical methods and applied models. UNITY Publishing House, Moscow, 2000
3. Gafurov M. U., Slastnikov A. D. "Some problems of exit of random wandering beyond the curvilinear boundary and large deviations" Theor. Ver. and application. 1987, vol. 32, vol. 2, 327-348;

===

4. Gafurov M. U. "Generalized variants of "r-fast" convergence of V. Strassen" Intelligent systems, 12, 2016, volume 20, vol. 1, Lomonosov Moscow State University Publishing House, 25-29;
5. Devis “Convergence rates for the law of the iterated logarithm” Ann. Math. Stat., 39, 1968, 1479-1485;
6. Akmal Mukhitdinov, Kamoliddin Ziyaev, Method of cycles by synthesis.2021.// Conference Network E3S. 6/4Volume No.264.-P.01033
7. Anvarovich M.A., Zukhritdinovich Z.K. Method for assessing the energy efficiency of regulated driving cycles. // Review of European Science, 2016
8. Kamoliddin Zukhritdinovich Ziyaev. Method for determining transport intensity in urban conditions20224/9.Volume No.264.-P.111-114
9. K Ziyaev The Appeal is at the Center of Youth Issues .// Academic Journal of Digital Economics and Stability, 2021 Том №6.-C.-36-38
10. K.Z . Ziyayev -Method of quantitative research of navoi city on the basis of choice of traffic flow.// The Scientific Journal of Vehicles and Roads, 2021 Том №2.-C 27-36
11. Gafurov M. U. “On the estimate of the rate of convergence in the law of iterated logarithm in probability theoty and mathematical statistics” (Tbilisi, 1982) in Lecture Notes in Math., vol. 1021, Springer-Verlag, Berlin, 1983, pp. 137-144;
12. Deli Li, Bao-Em Nguyen, Andrew Rosalsky “A supplement to precise asymptotics in the law of iterated logarithm” J. Math. Anal. Appl. 302 (2005), 84-96.