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Investigation of the reliability of computing systems

Abstract. *In the article is described the investigation of the reliability of computing system – personal computer and also specific computing machine which is charged to solve problems and tasks of various complication and have to suit the level of reliability, for example, for such implementation as constructing and production in mechanical engineering.*

Keywords: personal computer, reliability, operating time, failure.

Today in case of development and servicing of the microprocessor systems especially actual is the question about their reliability. It concern as personal computer, and also specific computing machine, which is charged to solve problems and tasks of various complexity and demanding various level of reliability.

The purpose of research in this article is evaluation of possibilities of operating reliability of computing systems.

PC units reliability characteristics are given in table 1.

Table 1. Personal computer (PC) components structure and reliability[3].

PC components	Quantity	Failure rate, $\lambda_j \cdot 10^{-5}$	Average operating time to failure,, $T_j \cdot 10^{5}$
Motherboard	1	5,0	0,2
Processor	1	0,1	6,6
Random access memory	2	0,5	2,0
Video card	1	2,6	0,375
Hard disk	1	1,0	1,0
Floppy disk	1	5,5	0,18
CD-ROM	1	5,0	0,2
Keyboard	1	5,0	0,2
Mouse manipulator	1	5,0	0,2
Power unit	1	2,6	0,375
Connector of floppy disk (25 pin)	1	0,4	2,6
Connector of Hard disk (40 pin)	1	0,48	2,1
Connector of CD-ROM (40 pin)	1	0,48	2,1
Cooler	2	0,76	1,3
Button switch	2	0,6	1,65

Research computing system reliability, for example, personal computer (PC) can be made in two ways:

1) with the help of exponential distribution which use failure rate λ (so-called „lambda"-method), traditionally used for device reliability calculation with influence of sudden failures;

2) with the help of diffusion distribution, based on DN-distribution function. It is used for device reliability calculation whith influence of gradual failures.

Using reliability characteristics of PC components which given in table 1, was calculated PC reliability measures. The results of calculations PC reliability measures received by lambda-method and probability-physical method with given operating time to failure t=1000 hours are shown in table 2.

Table 2. Results of PC reliability measures calculations.

Reliability index	Exponential distribution	Diffusion distribution
Average operating time to failure T_{av}, hours	2711	8189
Gamma-percentile operating time to failure T_γ, hours	286	1953
Realiability function $P(t)$	0,7	0,99

So according to calculated results of PC reliability measures, the most 'strict' results got based on exponential distribution by using lambda-method.

Graph of PC realiability function $P(t)$ based on exponential distribution by using lambda-method is shown on fig.2.

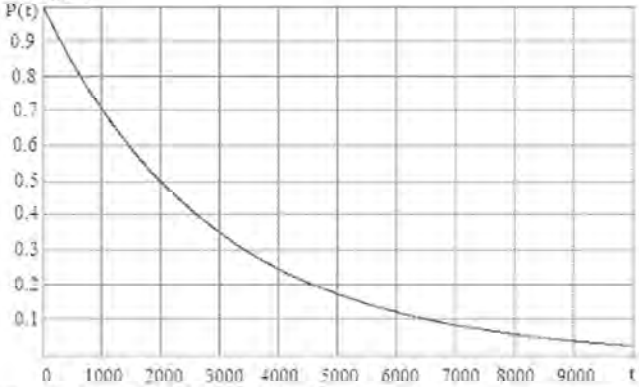

Fig. 2. Graph of PC realiability function $P(t)$ based on exponential distribution by using lambda-method

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