UDC 004.4

Dovgal′ V., associate professor, c.t.s.

ANALYTICAL ESTIMATION OF RELIABILITY PROGRAMMATIC PROVIDING OF COMPTROLLERS OF ASC TP

Zaporozhe state engineering academy

Concepts «Reliability of software» and program «error» are certain. Properties of software failures are considered. The methods of estimation of quality of debugging of comptroller software are offered ASC TP, based on the known Mills statistical model.

Keywords: reliability, refuse of the program, models of reliability, tests, testing, estimation of degree of program debugging

Introduction. In a monograph [1] reliability of software is certain as probability of its work without refuses during the certain period of time, calculated taking into account a cost for the user of every refuse.

Errors in the programs are divided into two groups [2]:

– functional errors are violations of programmatic specification (disparity to the functional or unfunctional requirements); there are result in degradation of functionality POE (fitness, exactness);

– unfunctional errors are violations of rules of the use of programming language, wrong use of library functions etc.; there are result in the decline of reliability and degradation of functionality (immunity) of software.

The problem of reliability of software has two aspects [3]: providing of reliability and estimation (measuring) of reliability.

Absence of confessedly criteria of reliability does not allow to answer a question, as far as more reliable software becomes at the observance of the offered procedures and technologies of development and expenses are justified in what degree. Thus, priority of task of estimation of reliability must be higher than priority of task of providing of reliability [3].

Errors in the programs are revealed and corrected on the stages of debugging and tests of software. Debugging of the programs is executed by the developers of software, and independent experts test. The some functional errors which in good time not found out can show up over the years after the transmission of ASC TP in an industrial exploitation and maintenance phase. Therefore it is very important high-quality to conduct test of software ASC TP and to estimate its reliability.

Program reliability does not change in course of time. For software, unlike the vehicle system, the phase of wear-in and wear absents. The correction of the program is analogical to making change in the construction of vehicle device - new software turns out, with other reliability factors.

In works [4-8] the different methods of estimation of reliability of software are considered. Static methods are based on the analysis of features of technological process of program (development of specifications, development of program architecture and writing of source code of the program). Architectural methods are based on the analysis of architecture of the system and can use both dynamic and static approaches. Empiric methods use information about the process of planning. Separate

attention is deserved dynamic methods which are based on using the results of implementation of the program. Their dignity consists of that they allow to get absolute program reliability factors.

Raising of task. To work out the engineering methods of experimental estimation of degree of debugging of software comptroller ASC TP, based on the statistical Mills model [9], which can be used for the estimation of reliability of the programs.

Basic material of researches. The methods of tests consist in that in the tested program by independent experts, without participation of program developers, artificial semantic errors which can not be found out by the compiler of the instrumental system of programming are brought. For tests there are used examples which are worked out by independent experts, including the representatives of for reception commission. Tests perform of simulator of comptroller, present in composition modern Soft Logic instrumental systems of programming of comptrollers. During tests the quantity of found out the artificially brought in errors and quantity of found out errors which were in the program to bringing of artificial errors (own errors of programmer) is fixed.

The tests of software are produced in the next order:

1. In the tested program artificially bring S errors.
2. The program with the artificially brought S errors is exposed to testing.
3. The program is considered passing muster, if in the process of their realization not found out own errors ($n = 0$) on condition that found out all artificially brought errors ($s = S$).
4. If found out not all brought in errors ($s < S$), then tests finish off and conduct retests.
5. If found out the several of own errors ($n > 0$), then estimate the initial number N own errors in the tested program.
6. There is pull out a hypothesis that in the program remained no more $k = N – n$ own errors and calculate the new quantity of the artificially brought in errors and repeat actions, since п. 2.
7. On results the repeated testing there is made conclusion about the degree of program debug and necessity of its revision in case if $n' > k$, depending on the degree of influence of remaining in the program errors, on the results of her implementation.

Conclusion. For the estimation of reliability of software of comptrollers ASC TP the engineering method of determination of degree of program debugging, based on the known statistical Mills model are offered. Methods allow a priori to define the quantity of the artificially brought errors, depending on confidence probability to the results of program tests.

REFRECTORIS

1. **Майерс, Г.** Надежность программного обеспечения [Текст] / Г. Майерс; перевод с анг. Ю.Ю. Галимова.– М. : Мир, 1980. – 360 с.
2. **Гласс, Р.** Руководство по надежному программированию: перевод с англ. Ю. П. Кондранина, В. М. Рабиновича. [Текст] / Р. Гласс. – М. : Финансы и статистика, 1982. – 256 с.
3. **Липаев, В. В.** Тестирование программ. [Текст] / В. В. Липаев. – М. : Радио и связь, 1986. – 296 с.

4. Штрик, А. А. Структурное проектирование надежных программ встроенных ЭВМ. [Текст] / А. А. Штрик, Л. Г. Осовецкий, И. Г. Мессих. – Л. : Машиностроение. Ленингр. отд-ние, 1989. – 296 с.
5. Благодатских, В. А. Стандартизация разработки программных средств: Учеб. пособие под ред. О. С. Разумова. [Текст] / В. А. Благодатских, В. А. Волнин, К. Ф. Поскакалов. - М. : Финансы и статистика, 2005. – 288 с. – ISBN 5-279-02657-3.
6. Василенко Н. В., Макаров В. А.. Модели оценки надежности программного обеспечения [Електронний ресурс] – Режим доступу: https://cyberleninka.ru/article/n/modeli-otsenki-nadezhnosti-programmnogo-obespecheniya – Дата доступу: вересень 2017. – Назва з екрана.
7. Формальные методы обеспечения качества ПО [Електронний ресурс] М. Моисеев. Методы оценки надежности ПО – Режим доступу: http://kspt.icc.spbstu.ru /media/files/2010/course/softwarequality/lec2.pdf – Дата доступу: вересень 2017. – Назва з екрана.
8. Открытые системы. СУБД [Електронний ресурс] С. Г. Романюк. Оценка надежности программного обеспечения – Режим доступу: https://www.osp.ru/os/1994/04/178540/ – Дата доступу: вересень 2017. – Назва з екрана.
9. StudFiles. [Електронний ресурс] Статистическая модель Миллса. – Режим доступу: https://studfiles.net/preview/6196491/page:6 – Дата доступу: вересень 2017. – Назва з екрана.