5. *Сперанский Д. В.* Лекции по теории экспериментов с конечными автоматами. М. : БИНОМ. Лаборатория знаний, 2010. 287 с.

6. *Сперанский Д. В.* О тестировании линейных автоматов // Автоматика и телемеханика. 2000. № 5. С. 157–165.

7. *Агибалов Г. П., Юфат А. Г.* О простых экспериментах для линейных инициальных автоматов // Автоматика и вычислительная техника. 1972. № 2. С. 17–19.

8. *Колесов Н. В.* Построение проверяющего теста для линейного конечного автомата // Автоматика и телемеханика. 1982. № 2. С. 61–66.

Fuzzy Linear Automata Testing

D. V. Speranskiy

Dmitriy V. Speranskiy, https://orcid.org/0000-0002-6882-0297, Russian University of Transport (MIIT), 22/2 Chasovaja St., Moscow 125993, Russia, Speranskiy.dv@gmail.com

The article deals with the problem of synthesis of tests for fuzzy linear automata (FLA). Now several varieties of FLA are used as models of real fuzzy systems. The article introduces and investigates one particular type of FLA. The fuzziness of the behavior of the automaton is suggested to appear due to the use of elements of a special type in the characteristic matrices. Each such element is a certain set of elements of the field over which the FLA is given. During the functioning of the FLA (at each clock cycle) an alternative matrix element is replaced randomly by one of the elements of the alternative set. The notion of the FLA acceptable fault is introduced. Substantially it means replacing the alternative elements of matrices by one element of the sets corresponding to them. The method of the tests synthesis for detecting faults of this type is proposed. This method reduces to solving systems of linear algebraic equations. The method is oriented to μ-definite and synchronized FLA and synthesizes tests of sufficiently short length (not more than FLA dimension).

Keywords: fuzzy linear automata, fault detection, test synthesis method.

References

1. Zadeh L. A. Fuzzy sets. *Information and Control*, 1965, vol. 8, iss. 3, pp. 338–353. DOI: https://doi.org/10.1016/S0019-9958(65)90241-X

2. Speranskii D. V. Experiments with fuzzy finite state machines. *Autom. Remote Control*, 2015, vol. 76, iss. 2, pp. 278–291. DOI: https://doi.org/10.1134/S0005117915020071

3. Speranskiy D. V. Synchronization of fuzzy linear automata. *Automatic Control and Computer Sciences*, 2016, vol. 50, iss. 2, pp. 72–79. DOI: https://doi.org/10.3103/S014641161602005X

4. Gill A. *Introduction to the theory of finite-state machines*. New York, McGraw-Hill, 1962. 207 p. (Russ. ed.: Moscow, Nauka, 1966. 288 p.).

5. Speranskiy D. V. *Lektsii po teorii eksperimentov s konechnymi avtomatami* [Lectures on the theory of experiments with finite automata]. Moscow, BINOM. Laboratoriya znanij Publ., 2010. 287 p. (in Russian).

6. Speranskii D. V. A test for linear automata. *Autom. Remote Control*, 2000, vol. 61, iss. 5, pp. 858–865 (in Russian).

7. Agibalov G. P., Yufat A. G. O prostykh eksperimentakh dlya lineinykh initsial'nykh avtomatov [On simple experiments for linear initial automata]. *Avtomatika i vychislitel'naya tekhnika* [Automatic Control and Computer Sciences], 1972, no. 2, pp. 17–19 (in Russian).

8. Kolesov N. V. Designing a checking test for a linear finite automaton. *Autom. Remote Control*, 1982, vol. 43, iss. 2, pp. 185–189.