

Optimal Learning in Fuzzy Environment

V.L.Stefanuk

Institute for Information Transmission Problems RAS,
Peoples' Friendship University of Russia

Abstract. In the excellent Fuzzy Set theory created by Professor Lotfy A. Zadeh there is one point that needs further studying. Indeed, there is no clear explanation how to measure fuzzy membership functions in a practical setting. For measuring we proposed to apply a game of learning finite automata that are able to make an optimal choice among several alternatives. In principle, with this game it is possible to measure any fuzzy values with certain precision. For the mentioned game we used linear tactics automaton that was proposed by Mikhail Tsetlin as a construction with asymptotically optimal behavior. However, our study showed that its asymptotical optimality is achieved under certain restriction concerning the fuzzy environment. In practice the mentioned automata allow to measure fuzzy value only when it is greater than 0.5. Presently architecture has been chosen, referred to as trusting automata. The architecture of such an automaton has been proposed many years ago by Valentin Krinsky. The other day we proved mathematically that the trusting automata do have the asymptotic optimality property for arbitrary values of memberships in the fuzzy environment. Consequently, the trusting automata may be used to measure arbitrary membership values, by applying game procedure proposed before. Actually this procedure is somehow reminiscent of collecting statistics in Probability Theory. We have expected this result and promised to show it one day to Lotfy Zadeh, who unfortunately left our community ...



Vadim L. Stefanuk born in 1939, graduated from Moscow State University in 1962, Physics Department, with the special orientation to the learning automata study. The Diploma thesis title was "Some problems of Automata Behaviour. He have got the degree of Candidate of Science (Ph.D.) in 1968, with his thesis title "Collective automata behavior and the problem of stable local control in a communication system." Later, in 1990 he obtained the degree of Doctor of Technical Sciences (Dr.Sc.). His Dr.Sc. thesis title was "Local organization of expedient behavior of technical systems." He is Leading Researcher in the Institute for Information Transmission Problem of Russian Academy of Sciences and Professor in the Russian Institute for Peoples' Friendship, Moscow. V.L.Stefanuk published over 220 journal and conference papers, including 3 books. He is Vice-President of Russian Association for Artificial Intelligence and the fellow of European Coordinating Committee for Artificial Intelligence.