

AN APPLICATION OF THE THEORY OF MEALY MACHINE FOR MODELLING OF THE PATIENT'S MEDICAL CONDITION

Melnykova N.I., Shakhovska N.B., Kis Y.P.

Information Systems and Networks Department, Institute of Computer Science and Information Technology,
Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE

This article discusses the implementation of the decision making process in support systems of medical decision (SSMD) by means of the theory of finite Mealy machine, which allows adequate treatment by evaluating the patient's current state.

Creation and implementation of the new technologies of personalized medicine contribute to the further study of new personalized approaches during the analysis of individual patient's data; development of new methods for treatment assignment and personal risk assessment of diseases based on the quality of patients' life; development of recommendations regarding drug therapy based on patient characteristics.

To improve the effective treatment of patients it is important to introduce quantitative criteria for evaluating the patient, according to which a valid approach in decision-making of determining the diagnosis or choice of treatment schemes is made. Based on this, a full examination of the patient should be carried out, and then his/her overall condition is evaluated. The evaluation of the general patient's condition is based on a comprehensive assessment of number of indicators that characterize: the state of consciousness, motor activity and social dependence.

When developing methods for personalized approach for assignment of treatment there is a need in the use the indicators of integrated assessment of the patient's condition during the treatment will allow objectify these dynamic changes taking place in the patient's condition under the influence of therapy and to choose the most appropriate therapeutic interventions in the treatment of the patient. The assessment after treatment compared with original data showing the efficiency spent therapy.

So using a tabular representation of transitions and outputs of MLS2-finite machine for example, enables SSMD formalize the characteristics of the patient, which appear as input parameters, and specify the raw signals to the pharmacological treatment prescription schemes, while the system's state corresponds to the patient's medical condition. Coding of the signal MLS2-machine that characterizes decision making in SSMD is based on the concept of theory of Mealy machine and provides an opportunity to correct treatments by evaluating the current patient's condition and determining the weight of outputs of MLS2-machine which changed the therapeutic scheme.

Taking into account the paradigm of the theory of automata, we propose the implementation of the decision making process with SSMD tools that give input signals in the form of the data of the patient, and their processing of the internal state of the machine that is the patient's medical condition and create the final conclusion in the form of the output signals, which are standard conservative treatment schemes.

Keywords – support systems of medical decision, Mealy machine, patient's current state.