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Information model of knowledge representation in computer automated learning systems

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The report is devoted to a consideration of the problem of development and program realization of knowledge representation model, which allows teachers to organize their teaching materials in the form convenient for its representation and processing by means of computer aids. This model is an extended version of the model, which is offered by SCORM and IMS international e-learning standards [1, 2]. Such addition became possible thanks to that SCORM and IMS are based on XML syntax.

Special attention in the report is given to a designing of a course and test structure as an Activity Tree [1] and Test Tree [3] building process. LMS uses Activity Tree (Test Tree) data to control and organize the learning (testing) process.

In general view knowledge structure can be presented in the form of a tree. We will use a concept of an Activity Tree for training course structure and contents building, and a concept of a Test Tree for representation of computer training test structure. The idea of a Test Tree building is in many respects similar to idea of an Activity Tree building. The fundamental difference consists in used types of tree nodes and sets of their attributes.

Activity Tree is a connected marked graph $DD = (D, S)$, where S – a set of edges and $D = (D^1, D^2)$ – set of tree nodes, which are divided into $D^1 = \{d^1_1, \ldots, d^1_n\}$ – set of clusters, n – number of clusters and $D^2 = \{d^2_1, \ldots, d^2_n\}$ – set of leafs, m – number of leafs. Cluster – the special form of the educational action having subordinated actions. Formally any cluster can be presented as a train $<Id, Tit, M, L, P, S>$, where attribute Id is an unique identifier, Tit – node title, M – a set of modes defining an order of pass of a cluster, L – a set of limits, P – logical node conditions and S – a set of possible statuses of a cluster. Leaf – tree node which does not have descendants but can contain references to physical files. One of the most important characteristics of leaf is its performance in a context of its parent. In comparison with a cluster any leaf has such additional attributes as F which represents a set of the physical files, O – the educational purpose and Co which describes level of complexity of a learning material.

Thus, we can draw a conclusion that use and program realization of the considered information model will provide the detailed specification of learning and testing objects based, first of all, on functional compatibility and portability.

References

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