Effectiveness Evaluation Methods of Multimedia Learning Courses

Kalin H. Monov[1], Oleg D. Asenov[2] and Raycho T. Ilarionov[3]

Abstract – **The dynamical changes of the social environment the conditions for professional realization impose the use of intensive learning methods. The possibility for the realization of numerous multimedia learning systems imposes certain requirements to the developers concerning the effectiveness of the courses. A model for effectiveness evaluation of MMLC (Multimedia Learning Courses), using indirect methods and interface technologies presented in this paper.**

Keywords – **effectiveness, model, MMLC, direct and indirect evaluation methods.**

I. Introduction

The use of IT technologies as a means of development and progress of intensive learning methods is important because the information is a basic element of every learning technology. The intensive methods involve the use of IT technologies.

The progress of the forms and the migration to a continuous learning is a prerequisite for the appearance of uniform learning environments. They are result of the synthesis of the particular forms. The use of uniform learning environments is prompted by the possibility for a full and complete cycle of preparation.

The implementation of the learning environments in different fields of application imposes the use of different types of document models and modeling the data base [1].

The realization of learning courses is directly bound with a series of requirements and norms organized in s.c. Standards. The strict fulfillment of the standards is a prerequisite for successful realization of each learning course. The statistics concerning the feedback – learnee-learner is of great importance. In this case the role of the learner is performed by the learning system. The accumulation of statistics is possible by means of information. The information is possible to accumulate by means of two main methods: direct and indirect. The indirect methods are realized on the basis of metrical evaluations in respect of the perception from the user's aspect, accumulated by two main approaches – event approach and time approach.

[1]Kalin H. Monov is with the Technical University of Gabrovo, 4 H. Dimitar Str., 5300 Gabrovo, Bulgaria, E-mail: monov@tugab.bg

[2]Oleg D. Asenov is with the Technical University of Gabrovo, 4 H. Dimitar Str., 5300 Gabrovo, Bulgaria, E-mail: oleg@lirex.bg

[3]Raycho T. Ilarionov is with the Technical University of Gabrovo, 4 H. Dimitar Str., 5300 Gabrovo, Bulgaria, E-mail: ilar@tugab.bg

II. Main Topics

The life cycle of the development of a MMLC is directly bound with the time [2]. The time necessary for development, introduction and exploitation is of great importance. The idea of the presented model is by using of indirect methods to realize a module, which will register, analyze and actualize the effectiveness of the MMLC. For that purpose a limited finite set of criteria and parameters, tracking and analyzing the multi-modality (the modality) of the particular MMLC can be used [1].

Let us present the life cycle of the development of a particular MMLC in function of time (Fig. 1). Let us assume, that t_1 is the time, for which the learning course is fully finished. Let Δt_{21} is the time interval, for which the course is introduced for exploitation. Let Δt_{32} is the time interval necessary for adjustment of the course and Δt_{43} is the time for exploitation of the already improved course.

The purpose of this development is: increasing the effectiveness of the course by decreasing the total time for product actualization, where the total effectiveness is a function of the time (1).

$$\Delta Q_i = F(\Delta T_j) \tag{1}$$

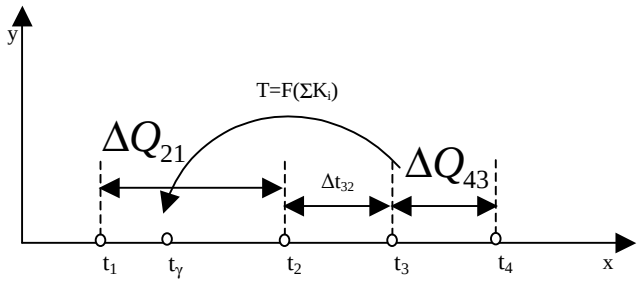

Fig. 1. Life cycle of MMLC

Let us assume that the relation of the effectiveness ΔQ_{ij} to the time factor Δt_{ij} is a value which determines the quality of the MMLC, readed in the time interval Δt_{ij}. Then the following relation can be deduced from the formed intervals in Fig. 1:

$$\frac{\Delta Q_{21}}{\Delta t_{21}} = \Delta \gamma_{21} \tag{2}$$

$$\frac{\Delta Q_{43}}{\Delta t_{43}} = \Delta\gamma_{43} \quad (3)$$

where it is assumed, that condition (4) is satisfied.

$$\Delta\gamma_{21} < \Delta\gamma_{43} \quad (4)$$

An additional reservation that equality (5) is fulfilled can be made the obtained relations (2) and (3).

$$\Delta t_{21} = \Delta t_{43} \quad (5)$$

The fulfillment of the upgrade of the life cycle of the course presented in fig. 1 is carried out by means of direct feedback, i.e. by using of direct methods as: intermediate tests and tasks, control tasks and questions. The time interval Δt_{32} is of great importance for the development of the course.

The idea of the model for the evaluation the effectiveness of MMLC is through indirect methods and new interface technology to translate the point t_3 to the point t_γ - an arbitrary point from the interval $[t_1, t_2]$. The translation of the point of the practice ignore the time interval $[t_2, t_3]$. The upgrade of the course is done here in parallel with the passing of $[t_1, t_2]$.

Let us assume every of the intervals from fig. 1 is divided to a set of equal number intervals δ, which for the fake of brevity we will call step (Fig.2).

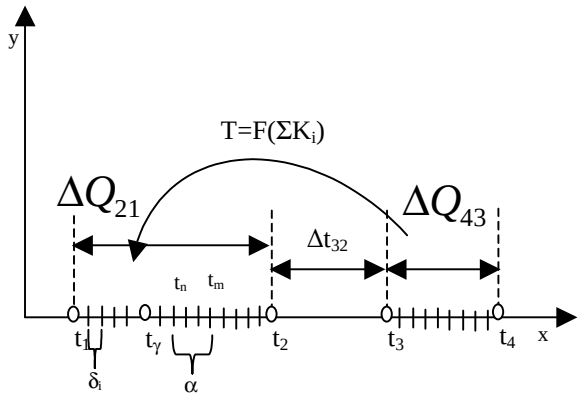

Fig. 2. Discredited life cycle of MMLC

Let $\alpha = [t_n, t_m]$ is a specified finite set of step for the realization of the course upgrade on the basic of a metric evaluation. The effectiveness of the MMLC in the interval $[t_1, t_2]$ is (6)

$$\Delta Q_{21} = Q\sum\delta_1 + \alpha \quad (6)$$

The effectiveness of the course in the interval $[t_3, t_4]$ is (7)

$$\Delta Q_{43} = Q\sum\delta_1 + \alpha \quad (7)$$

which satisfies the inequality (8)

$$\Delta Q_{43} > \Delta Q_{21} \quad (8)$$

After the transformation of point t_3 to point t_γ, the effectiveness ΔQ_{43} to automatically transferred over the step of the interval $[t_n, t_m]$. Hence the aggregate effectiveness of $[t_1, t_2]$ is the following:

$$\Delta Q_{21} = Q\sum\delta_1 + Q_{43}\sum\delta_i + \alpha \quad (9)$$

which satisfies the following condition:

$$\Delta Q_{43} < \Delta Q_{21} \quad (10)$$

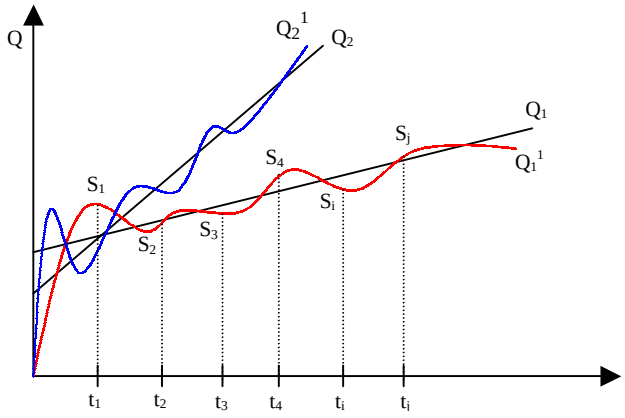

Fig. 3. Expected effectiveness for different group of users

The effectiveness of each learning course is different for the particular groups of learnees (user) - Q_i. The straight lines Q_1 and Q_2 represent the expected effectiveness for different group of users. When using the metrical methods for the effectiveness evaluation in the realcase, these straight lines would have looked in the following way – Q_1^1, Q_2^1. This is due to the following facts: on one hand the different concentration of users in the particular time intervals (t_i) and on the other hand of the single effectiveness of the particular screens (S_i).

It is seen from fig. 3 that Q_1^1 and Q_2^1 are a function, as of t_I as well as of S_i. If we assume that the learning course in not realized by a linear algorithm, i.e. the condition for the moduleness of the screens is not fulfilled, then let represent the user actions, by which he does navigation between the particular screens in the application in a band. Let call this band "band of a learning course" – fig. 4.

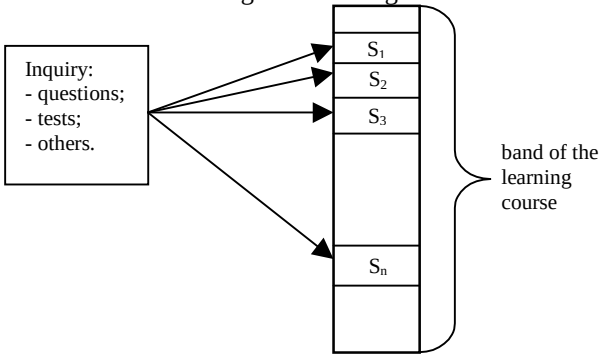

Fig. 4. Band of the learning course

In the cases when direct methods for the evaluation of the effectiveness of a given learning course are used, the most frequently encountered mean is the use of a questionnaire. The questionnaire can be a set of questions, test or expressing the user's opinion about the product given to him.

From the questionnaire made, which can be given in an arbitrary moment of time, belonging to the interval of work of the user in a system or after it, an evaluation is made which concerns the product as a whole. That is the effectiveness of the course, but as an unity. Let us represent the process of the evaluation in function of time – fig. 5.

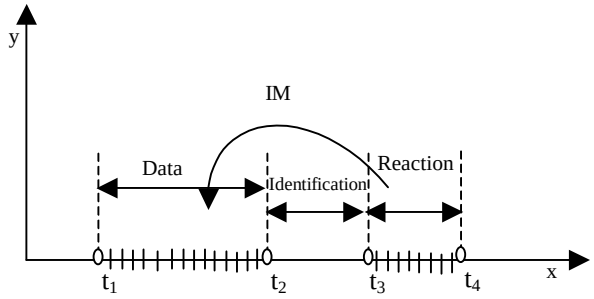

Fig. 5. Time for direct evaluation of a learning course.

The process consists of three stages: Data, Identification and Reaction. The data represent the questionnaire. Then an identification stage follows, whose aim is to generalize the results from the questionnaire and at the end is the reaction.

If indirect evaluation methods are used then it is possible practically to ignore the identification stage. Why? An advantage of the indirect methods is that it is possible to obtain more detailed information. An information concerning the particular screens, even the behavior of the particular user. The information becomes objective and has a direct attitude with respect to the effectiveness of the course.

Identification stage is actually not ignored but it takes a quite ting value in time in order not to have an leading effect on the process of indirect evaluation. The identification is known in every moment of time i.e. the evaluation system has a possibility in every moment to determine the following parameters: screen, time, and modality.

The model described above is based on so called indirect methods for the effectiveness evaluation. It is possible the process of building of indirect methods of evaluation to be realized on the basis of two main approaches: event approach and time approach.

- *event approach* – by this approach a set of the events is defined (e_1, e_2, … e_n) , as well as control intervals Δt_e. Within the framework of every control interval an information about the number of event that have taken place is accumulated by types e_1, e_2, … e_n . For each event type an area of a "guaranteed success" is determined. If the number of the events is such, that for every one the intervals Δt_e, the events registered as a number are in the area, it is accepted that an effectiveness of the interface influence with indirect metrical evaluation with parameter - event e_i is achieved - fig.6.

- *time approach* – the time, "consumed" for passing the atomical interface objects – the screens – S_1,S_2, … S_m , is registered by this approach. For each screen S_i a control

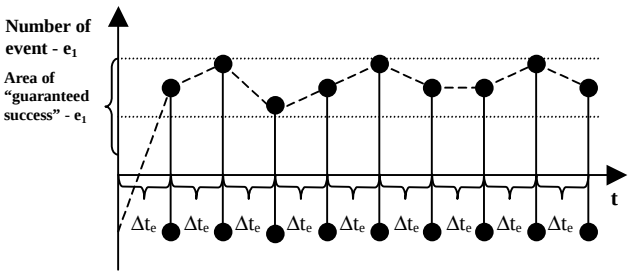

Fig. 6. Event approach for indirect feedback

interval for successful passing is defined - Δt_i. For each user an individual profile about passing the screens is accumulated. In case of completely falling into the control intervals for all screens, it is accepted that for the concrete user the learning effect is expected to be effective – fig. 7. It is of great importance by this approach the selection of a representative excerpt of learnees about implementing of an experimental testing. The process of an indirect feedback is possible to continue after the introducing of the interface environment in the real environment. The indirect methods for metrical evaluation ere usually used about off-line corrections of the learning effect since this necessitates statistical processing of the results for more than one learnee.

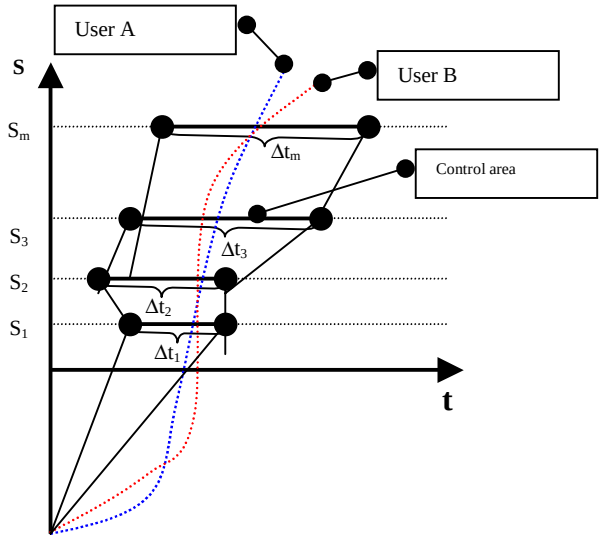

Fig. 7. Time approach for indirect feedback

III. Conclusion

The use of the effectiveness model of MMLC involves the use of so called Modality Pads. These are different peripheral devices for reading of subjective user factors such as concentration, concentration of the eyesight over the learning course and others.

The effectiveness model of a MMLC has the following advantages: it concedes the developers of the course a quick possibility by for actualization, reducing the total time for corrections, possibility for better realization of the particular MMLC.

Some disadvantages are: conforming of the model with a great number of subjective factors, concerning different objective fields of application, a complex algorithm.

The suggested model is a possibility for correction and eliminating of errors in different by type and structure MMLC.

References

[1]. http://www.learningcircuits.org

[2]. Blattner, M.M. and Glinert, E.P., “Multimodal Integration,” *IEEE Multimedia*, 4(3), IEEE Press, 14-24, 1996.