Chapter 14
Model in SM of DEE Based on Service–Oriented Interactions at Dynamic Software Product Lines

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ABSTRACT

Creation of distance learning systems that have the properties of mobility, adaptability, and service-orientation are currently the actual scientific and practical problem and future direction of development of general e-learning. The chapter suggests a possible approach to the construction of a single pervasive intellectual environment for e-education services based on the concept of Triple H-Avatar. Structural basis of the proposed distance education system is an interconnected pair of intelligent software agents (avatars): avatar of student and avatar of teacher are implemented using a service-oriented architecture. Avatars are able to adapt to the current level of the student's knowledge, currently available software, and provide technical, telecommunications, and environmental requirements, and various educational standards. As a basis of self-adaptation of avatars, a model of variability, including the three basic characteristics of hierarchy: educational content, interface, and software and technical support. In this case, the mathematical description of the model variability is implemented using the theory of hypergraphs.

INTRODUCTION

The rapid development of information and computer technology (ICT) and telecommunications identified key trends intellectualization learning tools. The starting point of these trends is the emergence of technology E-Learning, defining the main aspects of e-learning with the use of ICT, multimedia and the Internet. Emergence and establishment of further E-Learning has contributed a set of interdependent factors and causes, among which are:

- Unprecedented pace and scope informatization of society;

- Advances in the fields of information and telecommunications technologies;
- Mass use of mobile computing devices in the daily life of all ages and social strata of the population;
- Competitive benefits specialists with higher education in the global labor market;
- High mobility of countries with developed transport infrastructure and decentralization of scientific and industrial complexes;
- The rapid development of technological base, generating the need for continuous training of specialists (especially in ICT).

To date, the E-Learning technology has undergone significant evolution. In the initial version of the E-Learning 1.0 were laid down the basic principles such as the creation and delivery of e-learning materials, independent work with the training materials, help and exams remote way, the creation of educational resources and web-portals, getting modern knowledge without territorial attachment and etc. Subsequent interpretations of technology E-Learning 1.3 and E-Learning 2.0 has been a significant expansion of the functions of e-learning: video seminars and video lectures, forums, creating packages of specific tasks (cases), the use of computer graphics and animation. Now, scientific and educational community has come to the realization of a new phase of e-learning (E-Learning 3.0), which will play an important role distributed computer systems, cloud computing, mobile personal devices, artificial intelligence and virtual reality tools. Developments are particularly relevant for the integration of processes of internationalization and intellectualization education. This leads to a fundamental scientific problem of creating a unified interstate intellectual environment for e-education services, which will include heterogeneous forms of knowledge representation, interstate standards and forms of education, international faculty and student body. We can talk about a fundamentally new stage of e-learning - pervading Education or All-pervading E-Learning.

Another important issue for the immediate future is a multi-level self-organization (adaptability) component of electronic educational environment without unnecessary recompilation of processes that lead to their universalization and extend the life cycle. In particular, the problem should be resolved components of adaptability to changes in the volume and quality of knowledge in the subject areas, changes in the requirements of society to the knowledge and skills of specialists, changes to the forms and methods of training, changes in hardware computing and communications.

The result can be summarized as the basic requirements for specific forms and methods of distance education of the near future:

- The mobility and efficiency of educational technology;
- Adaptive educational courses and systems: both in terms of content and in terms of the forms of knowledge transfer;
- Service-oriented, allowing a flexible way to adjust the functional distance learning system to the requirements of each individual, as well as efficient use of distributed learning resources.

Creation of distance learning systems (DLS), having the properties of mobility, adaptability, and service-orientation is currently the actual scientific and practical problems and future direction of development of e-learning in general.

Broadly, under mobility remote technologies meant the possibility of educational services and various reference information using personal mobile devices (smartphones, tablets, netbooks, etc.) and wireless access to data networks (WiFi, WiMAX, 3G/4G, WAP). The user is given the possibility of permanent presence in the educational cloud without being tied to specific geographical areas, life circumstances or a hardware and software platforms.

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