

Semantic Model Of Electronic Educational Resources

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Abstract—This paper proposes an approach to development of semantic models of electronic educational resources, which is a basic element in the design of virtual learning processes. On the basis of the semantic model are determined by the content structure of the relationship of the studied materials in the multimedia environment.

Keywords — educational recourses, semantic model, semantic relationships.

In the development of electronic educational resources required first of all to determine its overall structure. That is the design of electronic educational resources should be solved the problem of locating the materials constituting their essence and determine the order of their relationship. Through the development of semantic models of electronic educational resources creates a sequence of specific guidelines on their use [1, 2].

Development of semantic models of electronic educational resources recommended the following stages:

1. Highlight content of the material components of electronic educational resources in the set of structural elements, $E=\{e_1, \dots, e_n\}$;
2. Classification of structural elements in the form of $G:E \rightarrow T$. Here $T = S \cup C \cup L$ - many of species. **S** - a lot of many types of semantic elements corresponding didactic units (DU) content, such as "lecture", "determination", "theorem", "term". **C** - many types of multimedia elements, such as "text", "schedule", "animation", "video". **L** - a lot of kinds of semantic connection elements used to establish a logical connection, such as "exodus", "determined", "expresses".
3. The hierarchical ordering of the content defined within the structural elements of the relation "part of a whole." The hierarchy is determined by the mapping $F:E \rightarrow 2^E$, which each structural element compares the set of its derivative elements (Fig. 1).

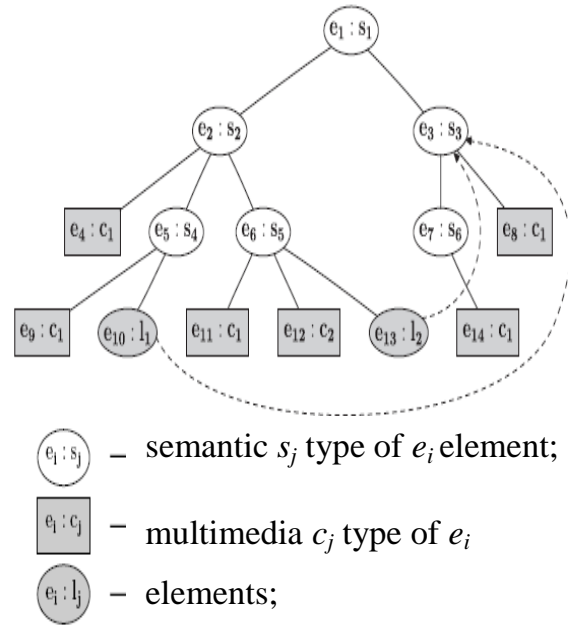


Fig. 1. The hierarchical ordering of content

4. Determination of the semantic relationships representing a logical link between the structural elements.

Semantic relationship is defined as a mapping of the semantic elements due to the set of semantic elements $H : \{e : G(e) \in L\} \rightarrow \{e : G(e) \in S\}$. When developing electronic learning resources as a domain selected target audience and elements that use such a variety of factors and constraints identified in the possible relationship between them. To check the correctness of the structure of the content will need a mechanism of registration of such restrictions. The method proposed in this research work needs to take into account the following restrictions:

1. Definition of plurality of types of structural elements.

$S = \{s_1, s_2, \dots, s_n\}$ - set of used semantic elements;

$L = \{l_1, l_2, \dots, l_n\}$ - set of elements used semantic relationships;

$C = \{c_1, c_2, \dots, c_n\}$ - set of used multimedia elements.

2. The specification of the content of the hierarchical structure in the form of $s \rightarrow exp$, where exp - template defines types of derivative elements s and consists of the following expressions:

- t - desired type of element t ;
- $t?$ - not required type of element t ;

- t^* - t arbitrary number of elements of type t;
- t_1/t_2 - type of elements t_1 or t_2 ;
- t_1, t_2 - type of element t_1 standing after the type of element t_2 ;
- (...) - group of elements.

3. For each type of communication for which treatment is organized and consists of expressions $l_i \rightarrow \{s_{j1}, \dots, s_{jk}\}$ detected specification defining semantic relationships are many types of elements for these types of communication. It proposed a series of numerical characteristics for assessing the semantic structure of the content. The main requirement for the proposed content is considered to be an adequate image of the semantics of teaching materials and production opportunities for content processing. The proposed specifications are designed to assess the structure of the data requirements of content.

Based on the semantic model, the use of the mechanisms structuring characteristics are divided into three types: unbundling, semantic relationship, hierarchical structure.

The main characteristic of the structure of the content is the number of structural elements. According to the rules, as far as many of the structural elements used for image content, so there are high possibilities of their use in the program.

The following features enable typing divide the structural elements of the types and classes:

$|TP_{t_i}(E)|$ - number of elements in the form

t_i ;

$|\bigcup_{t_i \in S} TP_{t_i}(E)|$ - number of semantic

elements;

$|\bigcup_{t_i \in C} TP_{t_i}(E)|$ - number of multimedia items;

$|\bigcup_{t_i \in L} TP_{t_i}(E)|$ - number of elements of

semantic relationships.

To study the structure of semantic relations define an index in a variety of semantic elements. If the semantic element s linked with derivative element s' with a pointer, it is considered a very direct connection. However, in some cases, it requires a pointer to take into account and communicate through a third element (intermediary) or "father" element (Fig. 2).

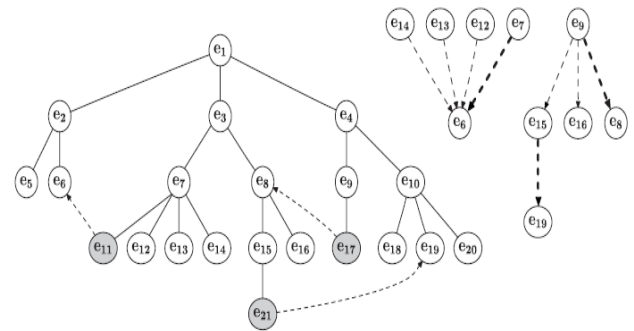


Fig. 2. Structure of the content and the situation for the relationship pointer

On the figure 2 - bold lines direct pointers. In some cases, the ratio pointer incorporates all semantic links between elements, in particular, are not taken into account the relationship between the derivative elements. For example, if paragraph is given one lecture to another paragraph in a natural way can be considered related to the lectures. To analyze these relations, we introduce the semantically related attitude. If one of the following conditions shall be considered semantically related elements: the elements are the same; elements or their heirs related by the pointer; elements are connected recursively. In connection with the relatedness of each element to their heirs, it is proposed to consider this relationship on a set consisting of a pair of such elements.

For evaluation of the hierarchical structure of content is necessary to pay its effect on the ability to process data, primarily for information retrieval. It is recommended by the operations of the hierarchical structure defined indirectly assess secretion of many different partial sets of the set of structural elements.

The basic requirements for the structure of the content are: image semantics adequate teaching materials and creating opportunities for content processing. The proposed specifications are used to assess compliance with these requirements the structure of content. Typing and characterization of semantic relationships allows experts on the subject, and staff involved in the preparation for publication of content to explore its semantic structure and assess its compliance with the semantics of using didactic materials and the laws of the subject area. Features hierarchical structures are designed to assess the content of laws on the creation of programs and considered unrelated to any of its structuring.

The model directly allocated structural elements coinciding with the didactic units of educational information on the basis of the technology can separate the semantic structure of the content of the mechanism of its visualization and dialogue with the user. The proposed specifications of content are allowed to create algorithms and quantify its parameters.

The main feature of the proposed technology is that it requires taking into account the semantics of content, allowing even more extend the functionality created during operation of electronic educational

resources. To create an e-learning resources developed by software-tool complex. To save content uses language extension XML, and to edit it - a standard XML editor [3].

Content can be placed in various specialized formats for its visualization and organization using the appropriate browsers. They allow you to create different versions of the electronic educational resources. Tool of software system for content distribution network supports the version used on the Internet, making the local version is distributed to the media. Because of this, to account for the semantic content during conversion creates the possibility of using one of the existing technologies spread.

References

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