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The methods and processes of creating virtual simulator

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***Abstract* – Actuality development of multimedia models of arms and military equipment due to both scientific purposes theoretical concepts and practical purposes a more effective educational systems (systems) and their implementation should ensure the necessary quality of military education, in particular accordance with the documents governing the content of education.**

***Keywords* – information technology; conceptual mode; CMSA; virtual simulator.**

I. Research methods

Identification of the idea of the project is to develop a multimedia complex computerized training of military specialists.

The problem is the lack of educational materials, increased danger at training on a real technique, great price for the purchase and maintenance of educational layouts a real technology.

Purpose is to improve the quality of learning.

The aim is to develop a computerized method of learning based on the three-dimensional graphics.

Process of creating a virtual simulator is used methods of simulation and performed several working stages:

1. Learning of physics processes input and installation of measurable parameters. This stage of work is determined, of which the main elements will be built imitation of the shutter mechanism. Knowing the specific input parameters, decide which method will be implemented controls virtual model - "devices" regulation.
2. Create geometric models shutter mechanisms. At this level, the virtual model graphics solution - advanced virtual simulators performed in three-dimensional graphics with a maximum imitation of materials and lighting that significantly improves the quality of work.

The main objective here is to approximate the model to the real object, through compliance with correct proportions, sizes, colors and lighting [1].

3. Development of interactive modules, combining geometric patterns and physical dependence. Writing code virtual model is the most time-consuming part of the job. The task is to develop an algorithm that adequately describes the physics of the interaction mechanisms of the shutter.

The program binds together the graphics, sound and text support, interactive component, and according to precise mathematical relationships, simulates the dynamics of the process or phenomenon [2].

4. Implementation of guidance and background information. When the virtual model is generated, it is necessary to provide accompanying methodological information or informative, allowing the user to more fully explore the nature of the study and master the management of a virtual simulator.

At this stage, the major challenge is structuring all educational material to make affordable, easy to handle "workplace" that teaches the user. One effective way to implement the system of methodological support virtual simulator is to develop a program environment that allows the user to get acquainted with the structure of the training course, to make direct access to sections of the course, run interactive modules labs, store and read statistics passage rate [4].

After following steps to create a virtual simulator developed information technology scheme, which is shown at the Figure 1.

Creation of an information system anyway faces with a problem of information exchange. Information exchange – a process which consists of the sender and recipient who are connected by a reliable channel of communication that is the message from the sender to the recipient using the communication channel.

So using of information is connected with the concept of “knowledge” in a certain subject area.

The subject area - part of the real world, which is considered within a given context. By the context we can be understood, for example, field of study or area that is the subject of some activities. In our case it is a breech block of the artillery. The conceptual model of subject area (CMSA) - a set of concepts, terms and relations between them that correspond to meaning from the real world.

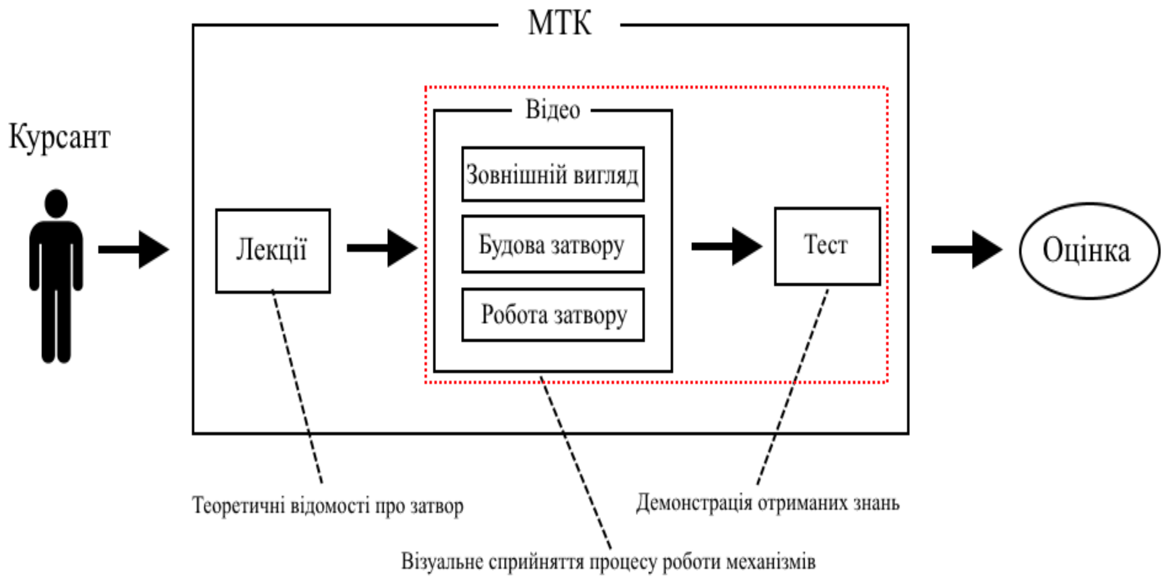

Figure 1. Scheme information technology

II. THE CONCEPTUAL MODEL

The conceptual model of subject area have two components: conceptual and substantive. The conceptual part defines the concepts, terminology of the domain and the relationships between them.

Any relationship should also be a concept, which can be in relations with other concepts. The conceptual model of subject area is a basic element in working with the information, as it defines the "skeleton" on which a substantive component is attached.

Information component of the content model domain correspond to the real domain objects. The relationships described by the conceptual terms of (CMSA) can be divided into two types: substantive and conceptual.

Substantive define the relations of one information element to another, and the conceptual - the relationship of element to the concept with the conceptual (CMSA).

Despite the fact that the graph structure of (CMSA) limits us to using only binary relations, it has no significant effect on the severity of the simulation, because, obviously, any n-pairwise relation can be represented in the form of several binary relations.

The conceptual domain model can be represented in a graph M_d:

$$M_d = < W_d, L_d > \qquad (1)$$

where: W_d is the set of vertices, corresponding to the terms of the subject area,

L_d is the set of arcs that represent relationships between the concepts.

Developed graph model depicted in figure 2.

Graph (1), and model view M_d can be further expanded to multiple interpretations of concepts. Obtained in this case structure is actually a special case of the model of the ontology:

$$ONT = < W_d, L_d, F > \qquad (2)$$

where: F - final set of interpretation functions defined on the concepts and/or relations of ontology.

In computer science, it is an accepted working definition, according to which ontology is a database of data/knowledge that describes facts that are assumed to be always true within a particular subject area and the particular community of users.

In the private case we have a taxonomy that is defined as:

$$ONT = < W_d, \{is\_a\}, \{\ \} > \qquad (3)$$

Taxonomy structure means a hierarchical system of concepts, connected by relations of the form $\{is\_a\}$"to be part of the class." This type of relations allows to organize the structure of concepts of the ontology in a tree view, that is makes it identical to model (1).

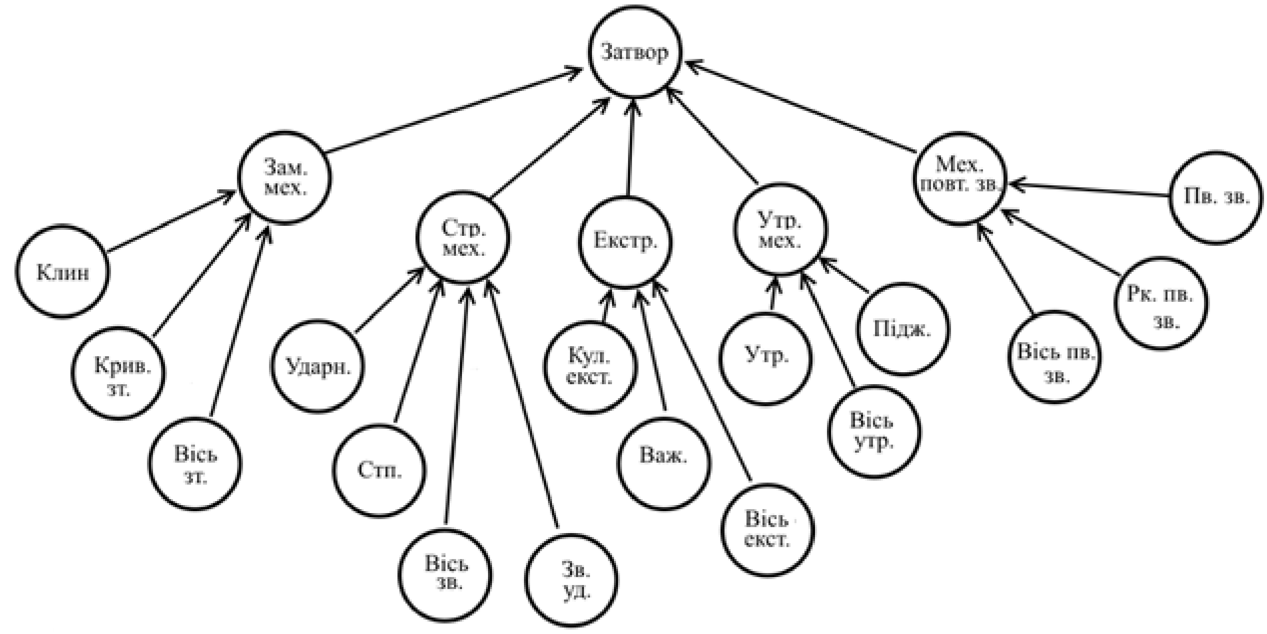

Figure 2. Graph model of shutter

The conceptual model species the M_d, developed with the establishment of a virtual simulator shutter, which includes the 7 mechanisms of basic level: locking, firing, extraction, re-construction, preventive, holding, semi-automatic.

The vertices of the first level, form a number W_{d1}, define the basic concepts of the subject area. Each concept with W_{d1}, is the root vertex to some fragment of the subject knowledge that defines the lower level.

However, the formation of information models (In_Mi) on the basis of the establishment of the equivalence relations of type $\forall_i \left(In\_M_i \leftrightarrow W_{d^1}(i) \right)$ is not appropriate.

Experience of creation of applied intelligent automated systems in the field of research, diagnosis, design and training, shows that development of software based on the mono-alternative set of information models leads to loss of functionality of training tools.

Depending on the purposes and methods of processing information to key concepts (W_{d^1}) it is necessary to develop several different models of representation.

The model reflects the basic concepts of the subject area and existing between generic-specific (class-subclass) relationships L_d. Each concept or conjunction can interpret some fact, define the object or abstract entity. When expanding many L_d by incorporating the set $\{ot_i\}$ and functional relations, causal relations, it is possible to display more complex utterances and relationships between objects.

CONCLUSION

Most serious training systems are complex software and hardware systems. Such embodiment maximizes training. However, such systems require significant financial investments and difficult to maintain. The disadvantages of such simulators is that they are highly specialized for a specific task, and almost no opportunity to change goals.

In some areas of computer simulators severely restricted and permissible only in the initial stages of training.

It is therefore necessary to create virtual or multimedia simulators that perform the task. The advantages of this simulator are a low cost, compactness, possibility of location in almost any room.

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