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PRINCIPLES AND METHODOLOGY OF CREATING A KNOWLEDGE BASE IN AUTOMATED VARIANT DESIGN

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ABSTRACT

It is proposed to create a knowledge base in automated variant architectural and construction design. Logical-linguistic models of variant design of industrial buildings, which are a complex set of groups of evaluation criteria for the quality of design solutions, can be taken as a basis.

KEYWORDS: *Expert System "VARIANT", Knowledge Base, Subject Image, Logical Model.*

INTRODUCTION

The development of automated variant design is closely connected with the application of artificial intelligence achievements, the development of expert systems based on the knowledge of highly qualified specialists in a specific subject area.

This requires the definition of principles and the development of methods for presenting weakly structured tasks of automated variant design in the form of a knowledge base.

Automated variant design can be improved on the basis of achievements in the field of artificial intelligence by developing, for example, an expert system "Variant".

One of the ways to further improve the automated variant design is the intellectualization of the automated design system of construction objects based on advances in artificial intelligence. This

process is carried out by developing expert systems at the initial design stage - the expert system "OPTION", which has the ability to qualitatively and quantitatively evaluate a limited set of options, followed by the selection of the most effective design solutions for further development.

The Expert system OPTION contains the following main components: interface - Expert system, meta-knowledge base, logical-linguistic models of qualitative evaluation of the effectiveness of design solutions, information-logical models of quantitative evaluation of the effectiveness of design solutions, knowledge base, database, communication, linguistic processor, linguistic knowledge base, and user menu of the Expert System OPTION.

The core of the expert system is the Knowledge Base. It is a set of knowledge of highly qualified specialists in a specific subject area in a formalized form and a logical inference mechanism that, when asked by the user, is able to explain the results of solving the problem.

Research on the creation of a knowledge base in subject areas shows the possibility and effectiveness of creating a knowledge base in architectural and construction design, in particular automated variant design. The main feature here is the weak structuring of the objects and processes under consideration.

When creating a knowledge base, the logical-linguistic models of variant design of industrial buildings developed by us can be taken as a basis.

To formalize and present knowledge, it is necessary to solve the following tasks:

- To distinguish the distinctive features of knowledge from data in automated variant design;

- To substantiate linguistic criteria for assessing the quality of design solutions for presentation in the knowledge base in the form of knowledge of highly qualified specialists;

- To develop the structural components of the knowledge base in the variant design;

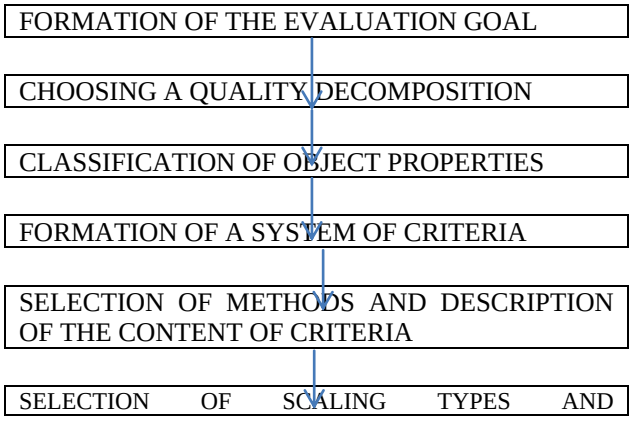
- Develop meaningful knowledge base structures;

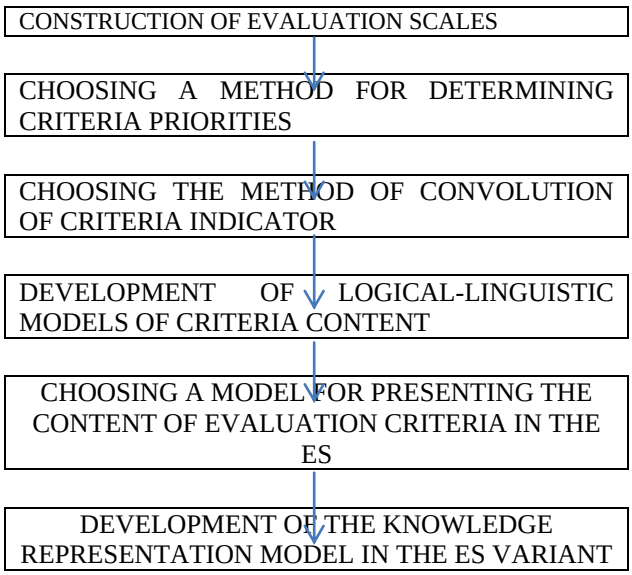
- Develop the principles of creating a knowledge base;

- Develop a methodology for creating a knowledge base;

- Develop knowledge representation models.

THE PROCEDURE FOR ASSESSING THE QUALITY OF OBJECTS AND PROCESSES IN THE EXPERT SYSTEM OPTION





Evaluation of the effectiveness of design solutions can be structured in the form of decomposition from general to particular. For example, "operating conditions of production - flow - human flow - orientation", etc.

Formally, the fuzzy set A of the universal set of elements U is defined by the membership function μ_A:U→0,10,1] which corresponds to each element u⊂U the number ____ from the interval0,10,1], characterizing the degree of membership of the element u to the set A.

Linguistic variables are the concepts: COMPLETED, PARTIALLY COMPLETED, NOT COMPLETED. They make up a set of fuzzy variables X, which can be interpreted in the interval [0,1]. The function of belonging is the task of the theory of psychological measurements in psychometric methods, which are actively being developed at the present time. In practice, it is possible to set an approximate representation of the form of the function μ_A, which is as follows: the error will not increase when combining fuzzy sets both using operations and using methods of the theory of possibility, since in this case, for the most part, only the operations of finding the minimum and maximum are used.

CONCLUSION AND RECOMMENDATIONS

1. The study of knowledge representation models "Expert System" shows the expediency of using logical models to represent the content of evaluation criteria for the quality of design solutions, since the formal axiomatic system of predicate logic of the first order, which is used to describe the content of criteria, has well-understood mathematical properties and a powerful inference mechanism can be directly programmed. With the software implementation of this Knowledge Base in the automated variant design of industrial buildings, the use of the representation of knowledge of the PROLOGUE language as a tool is provided.

2. The study of the content of the evaluation criteria of quality gives grounds to classify them as the knowledge of highly qualified specialists in this subject image, since their development was carried out with the participation of a group of experts on the design of industrial buildings of food industry enterprises.

Logical models of knowledge representation in the expert system of automated variant design of industrial buildings VARIANT have been developed. The developed logical models can be divided into groups: operating conditions of production, working conditions, layout, composition and flexibility, etc. In general, the developed logical models represent a complex set of groups of evaluation criteria for the quality of design solutions of industrial buildings in relation to the food industry.

The developed approach of presenting qualitative knowledge contributes to the intellectualization of the computer-aided design system of construction objects, and, in particular, the procedure for conducting automated variant design at the initial stage of development.

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