Intellectualization CAD system of clothes at stage of the choice of the materials' package for the projected product

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The summary:
In modern CAD systems of clothes (CADSC) quality and laboriousness input of process of designing and its results depends on as far as CADS answers principles of integration and intellectualization. In other words, as far as interrelations between subsystems CADSC are fully realized both what volume and depth of engineering knowledge are incorporated in it. So, the analysis of existing CADSC was carried out according to these positions. It is revealed, that working CADSC relate to the concept "integration" not completely, and, engineering knowledge of experts, as a rule, remain not computerized. The direction of present research is the computerization of knowledge in the field of textile materiology and intellectualization of integrated CADSC while choosing materials package for the being designed product.

Key words: the automated designing of clothes, textile materiology, base of knowledge, expert system.

The problem of knowledge computerization in the field of materiology is actual, because one of the primary factors comparing products conformity to showed requirements is the account of material's properties while designing. Studying these problems it is expedient to address to the branches of the heavy industry in which the processes of automation, integration and intellectualizations occur much faster, than in sewing industries. A number of the software products were developed directly connected to materials and their properties within the framework of carried out tasks functions. For example, ASKON's «Library of materials and assortments» intended for storage and use of the corresponding information on the materials used in heavy industries (all in it more than 6000 marks). Also the library is a supplier of data on materials and in technological systems, in spelling of the technical processes, also it is used while choosing of the basic and auxiliary materials. MSC.Patran (interactive software) provides integration of automated systems designing, modelling, the analysis and an estimation of results of calculations. One of the basic features of this product is «The task of characteristics of settlement model» function which besides other parameters includes properties of materials and elements, for example: the program supports various options of properties of materials; properties of materials can directly associate with geometrical primitives; there is a feature of synthesis composite materials, of setting intense-, deformative-, temperature-and

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frequency-dependent properties of materials; the information about properties of materials which could be directly received from the database of MSC.Mvision; properties of elements can be set up to 96 parameters; all properties (materials, elements) can be coded and displayed on the screen by various colors. Company COMSOL develops the program of modelling of physical phenomena Multiphysics 3.3 in which the new version of the library contains more than 1400 materials and 15000 properties. Besides the program reads and can include in library of materials the files generated by a database (DB) of Internet-resource MatWeb. DB MatWeb includes more than 59000 pages of properties of materials, including the information on properties thermoplastic and thermosetting polymers, metals and other engineering materials. It is obvious, that for today there is no information on similar software for the decision of tasks of designing of garments.

One of the directions of present research is the computerization of knowledge of materials for garments, its properties and methods of definition, and influence of properties on stages of the integrated automated process of designing (APD) of clothes. Within the framework of the integrated CAD system of clothes, projected on faculty of Service and fashion VSUES, besides three basic subsystems (the Painter, the Designer, the Technologist) is offered to generate essentially new

subsystem named "Matheriologist". Thus all subsystems are interconnected among themselves.

Subsystem "Matheriologist" plays an important role during the manufacture since designing of clothes begins with development of requirements to a product which depend on properties of the chosen package of materials. Properties of textile materials take into account by development of designs of garments and technology of their manufacturing. At a stage of design preparation of manufacture define sizes of technological allowances on running-in, seaming and bending a bottom, on shrinkage and thickness, choose the way of forming. At a choice of technological decisions define opportunities of application of various kinds of influences (mechanical, physic and mechanical, physical and chemical, chemical). Methods of technological processing of the product and sequence of its assembly before to be unequivocally determined by a design, quantities of layers in a package, sex- and age-purposing, technological uniformity of models depend on a kind of product, properties of materials. The information on ways of creation of the volumetric form of a product also is necessary for development of technological process.

During the selection of materials for the product it is necessary to take into account a number of parameters which significally can influence technological process of products manufacturing, like fibrous structure, thickness, shrinkage, crumbling,

expansion of the thread, etc. For example, practically at all stages of garments creation we need to take into account the information about fibrous structure of used materials. So, at the stage of designing the fibrous structure influences the choice of forming methods, at the stage of cutting it depends on cutting equipment, at the fabrication stage of a product - the equipment and modes of connection of details of a garment. While using in a product glutinous connections the fibrous structure defines the choice of modes of pasting. For today there is no information on the full account of physic and mechanical properties at designing clothes, including in an automatic mode.

The result of subsystem "Matheriologist" performance is an electronic confectional map with the indication of package of materials for projected product and concrete parameters of materials properties, practical recommendations for taking into account properties of the chosen materials during designing at various stages.

To increase efficiency of "Matheriologist's" performance it is necessary to narrow the group of requirements for materials, choosing the most significant, according to the characteristics of a product. Continuing the research of each assortment of products it is planned to define degrees of the importance of properties of materials - from the most important to the least important. The system in automatic mode will offer the designer the optimal decisions on selection of materials for a product on the set most important properties. The quantity of variants offered by system should be reduced if not to the only thing, to a minimum quantity that will considerably facilitate work of the expert at the given design stage.

In conditions of modern designing of clothes the choice of a package of materials is made on the basis of experience and knowledge of the expert. The task of intellectualization ICADSC at the stage of choosing a package of materials for projected product can be realized by formation of corresponding expert system (ES). The expert system is the system with artificial intellect containing saved up knowledge of experts in a certain subject domain. It is capable to develop recommendations what would be given by the expert - person, requesting if necessary the additional information. Working level with experts, in some cases ES it is better, because collective experience of their founders is enclosed in them. Main advantage ES is the opportunity of accumulation of knowledge and preservation their long time, and also absence of the biases, the systematized consideration of all details and a choice of the best alternative from all possible. Structure ES includes base of knowledge (BK), the mechanism of a logic conclusion and a subsystem of explanations. The base of knowledge allows answering such questions from the certain subject domain, answers on which in an

obvious kind are not present at a database. As against the person - expert, BK in ES can be significant; entered into the machine once, knowledge are kept for ever. Using advantages BK, it is possible to create unique means of accumulation, storage, transfer, an exchange, and in the future and automatic generation of new knowledge on the basis of incorporated.

For a choice of optimum variant of a materials package with minimal expenses for creation of knowledge base, which would give a feature of complex account of materials properties, assortment and purpose of a projected product is necessary. Now such base of knowledge is formed. Principles of influence of properties of materials on stages integrated APD clothes are revealed. Any textile material is characterized by the certain set of properties. Thus not each property is powerful at designing this or that kind of clothes. Now researches on an establishment of the importance of properties of materials are carried out depending on assortment and purpose of a product. In this case by means of ES on the set assortment and purpose of a product the most significant properties of required materials are defined, and further - on corresponding parameters of these properties - the system offers the expert the optimal design decisions.

Both from a position of BK's formation, and from the practical side, the information on methods of definition of parameters of properties of materials is important. Expansion of assortment of textile materials, and, hence, and occurrence of their new characteristics, results in constant updating databases of materials. The certain difficulties at use of the new materials acting on manufacture, causes of definition of parameters of their properties. One of investigation phases includes carrying out of the analysis and formation of a DB of existing methods of definition of characteristics of properties of materials. The analysis assumes the account of laboriousness input of performance of a method, necessity of use of the special equipment, a skill level of the expert. At use of existing methods the special equipment and observance of the certain conditions is required, that not always it is obviously possible in conditions of the real enterprises of various capacity. Therefore one of the directions of present research is development of the express methods of parameter's definition of materials properties.

The formed expert system will allow making a choice of a package of materials for a projected product maximum objective, not dependent on influence of external factors which directly are not connected to a decided task. Thus, application ES will provide the big efficiency of the integrated automated process of designing of clothes and will raise quality of a finished article.