

## THE AXIOMATIC DESIGN OF PATIENTS' CLOTHING

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**Abstract:** *To ensure a comfortable life activity of people with various diseases clothing should take into account the peculiarities of the course and treatment of disease and should be a different type of clothes than the usually used. Clothing as an object of study can be viewed in the aggregate of morphological characteristics: the silhouette, the sleeves cut, the type of clasps, technology of processing the neck hole, the presence of constructive decorative elements, color palette design, type of material. Morphological analysis suggests a multilevel study of object signs of and variants of their execution, adequate for the specific conditions of using cloths. The combination of morphological variants will provide a variety of product models, which, if further development can be considered as a model in the product line offers the group of hospital clothing in accordance with the requirements and peculiarities of its exploitation.*

**Keywords:** *special clothing, people with disabilities, comfort requirements, axiomatic design, classification of hospital garments, morphological analysis.*

### 1. INTRODUCTION

The most important wealth of the country - is the health of its population. An essential means to provide the necessary conditions for the treatment of patients could serve to ensure them with comfortable clothing. This group of consumers needs social adaptation, which contributes to including in use the specially designed range of clothing. In this context, relevant is to create ergonomic, functional and esthetic hospital clothing for physical and mental rehabilitation of patients.

The aim of this work is to develop an information base for the design of the range of hospital clothes. The basic concept is that the hospital clothes should be comfortable for patients, and its simple design solution should provide a quick access to carry out medical procedures.

Researchers have observed that the moral condition of the patient depends largely on the success of treatment. The system approach to the design of hospital garments based on the classification of garments. Classification of hospital garments takes into account the sex and age, seasonality, destination, the division into types and subtypes of clothing. Axiomatic design is a methodology for system design using matrix methods for systems analysis and transformation of customer needs into functional requirements, design parameters and process variables [1].

### 2. EXPERIMENTAL

On the basis of the exploitation conditions of hospital cloths defined its basic functions, which are different from casual wear. In this case, along with standard functions directed to ensure comfort microclimate under the apparel space, protection from adverse environmental conditions, and hospitals from mechanical damage have been revealed special functions. Identify the special functions of hospital clothing, and their formalization will allow for the development of targeted products in narrowing the search field and the cutoff previously unacceptable solutions. An important function is the provision of hospital clothing comfort to sick and medical personnel during various medical procedures, while providing psychological comfort of the patient is an equivalent function. Under the psychological comfort we mean creating the conditions for excluding any patient discomfort due to his physical state.

The study on the fuzzy front end [5] phase during the survey, conducted among patients at the clinic and medical staff, identified the basic procedures, techniques and its topography executing, then it was grouped according to the relevant parts of the body surface [4].

Based on the allocation of specific groups of diseases, should be developed the corresponding them design of hospital clothing, providing quick access to the patient's body without causing discomfort. The concept of

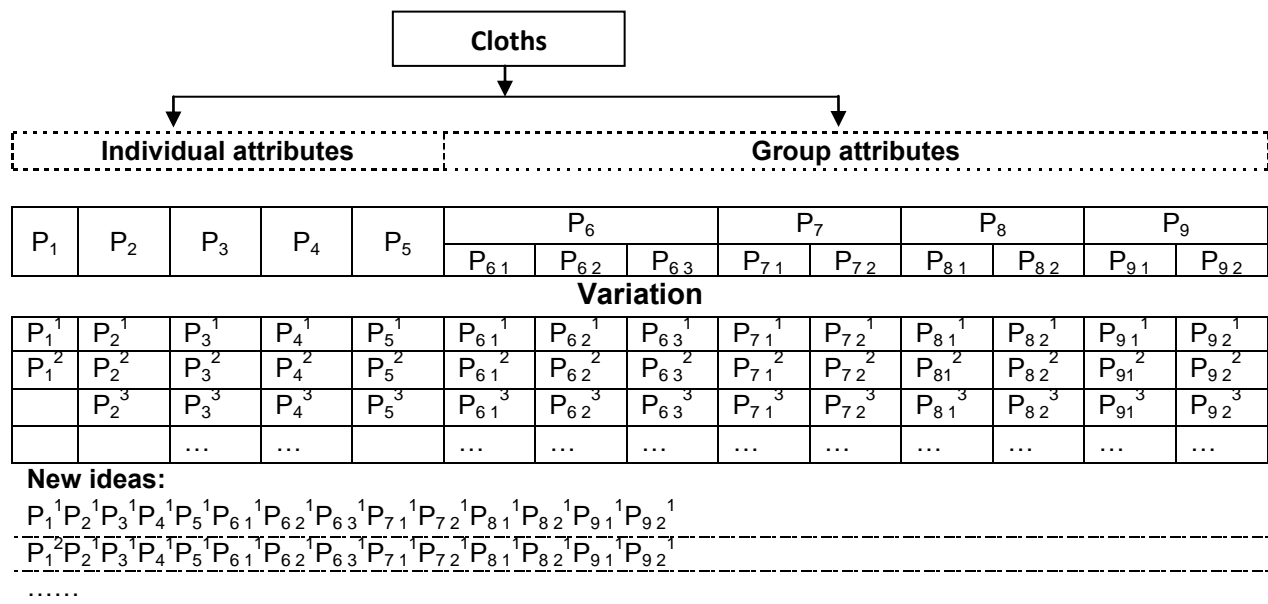
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property - "a set of access zones to the patient' body" was proposed by Kharlova [2, 3]. Access zones, which are necessary to provide in design of hospital cloths, represents the set of design solutions, which are primarily characterized by the clasp presence, location and structure, as well as features cut sleeves, neck hole design. Variants of the various possible combinations of these structural elements specially designed will be adapted specifically for the needs of the patient in accordance with his disease.

Find new ideas for solving this problem can be carried out by methods of system analysis. The systems approach is widely used to solve various search problems in engineering, science and industry. It involves consideration of the object as a system having multiple links between its elements, and allows seeing the problem more fully and extensively. To generate ideas for a systematic approach to the problem of designing hospital clothes was used morphological analysis. The essence of the method of morphological analysis consist that the object defines several functional and morphological attribute. Each attribute can determine the parameters or characteristics of the object on which depend achieving the main goal, as defined by its purpose. The basic principle of the method of morphological analysis is a systematic analysis of all possible options arising from the laws of the structure (morphology) of perfected object.

Garments may be regarded as a system, ie set of elements, structurally, functionally and technologically interconnected. The elements of such system would be the parts and components of products, decoration, style, etc. In the case of shoulder products morphological characteristics can be divided into individual attributes, such as a silhouette ( $P_1$ ), the division lines ( $P_2$ ), the cut of the sleeves ( $P_3$ ), optional parts ( $P_4$ ), the method of processing the neck hole ( $P_5$ ), structural and decorative elements ( $P \dots$ ), type of material ( $P \dots$ ) and group attributes – type of clasp ( $P_6$ ), functional and decorative elements ( $P_7$ ) and coloristic design ( $P_8$ ) (figure 1). Morphological analysis of the object involves a multilevel study of characteristics and options for their performance, adequate for the specific exploitation conditions of clothes.

For example, a single morphological attribute of "P<sub>1</sub> silhouette " can have two options:  $P_1^1$  straight silhouette and  $P_1^2$  trapezoid; and the attribute "P<sub>3</sub> cut sleeves" may be characterized by five options:  $P_3^1$  - classical,  $P_3^2$  - integral,  $P_3^3$ -raglan,  $P_3^4$  - combined or  $P_3^5$  - sleeveless, etc. Clasp, as groups attribute  $P_6$  contains five sub attributes:  $P_{61}$  - location,  $P_{62}$  - length,  $P_{63}$  - position of the lines the sides,  $P_{64}$  - processing and  $P_{65}$  - accessories. In terms of location ( $P_{61}$ ), the clasp can be located on the main elements of the product ( $P_{61}^1$  back,  $P_{61}^2$  front,  $P_{61}^3$  sleeve) or in areas overlapping the back, and shelves (shoulder seam  $P_{61}^4$ , side seam  $P_{61}^5$  and armhole seam  $P_{61}^6$ ).



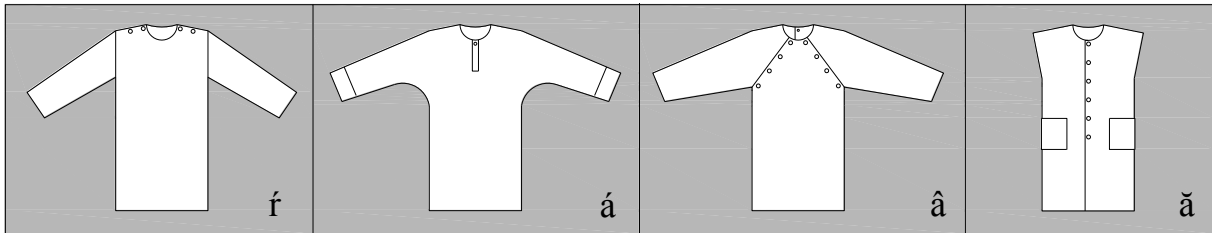
**Figure 1:** Morphological analysis of clothing (general scheme)

So for the analysis have been developed two matrices corresponding to the shoulder and waist products.

## 2. RESULTS

A variety of clothing is achieved through a combination of morphological attributes variants. Figure 2 shows the versions of men's shirts hospital clothes straight silhouette  $P_1^1$  and  $P_5^5$  without changing the neck hole with a different cutting of sleeves and clasps.

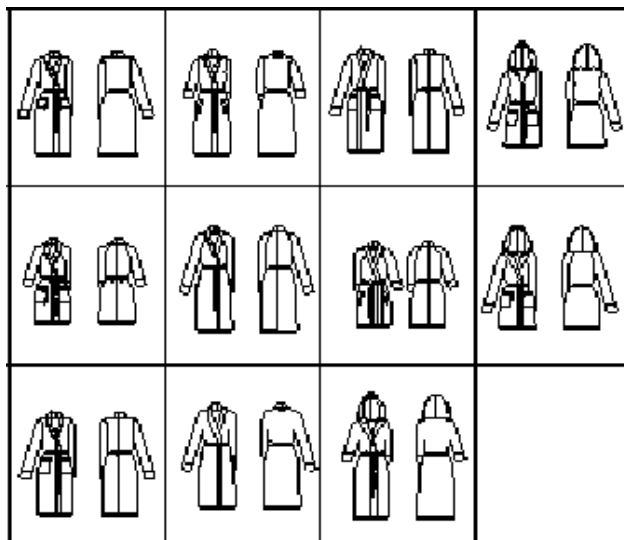
*Option a* - classical sleeve  $P_3^1$ , clasp: in the shoulder seam  $P_{61}^4$ , the entire length of  $P_{62}^1$ , with the imposition of lines the sides  $P_{63}^1$ , as accessories - buttons, *Option b* - integral sleeve  $P_3^2$ , P6 clasp on the front  $P_{61}^2$ , a partial length of the  $P_{62}^2$ , with the imposition of the boards  $B_3^7$ , plate  $B_3^8$ , accessories - button  $B_1^9$ ; *Option e* -  $P_3^3$  raglan sleeve, clasp in the sleeve seam  $P_{61}^6$ , the entire length of  $B_{61}^6$ , with superimposed of the boards lines bots  $P_{63}^1$ , accessories - buttons. *Option r* - sleeveless  $B_5^3$ , clasp:  $P_2^5$  at the front, the entire length of the details  $P_{62}^1$ , with superimposed lines of the boards  $P_{73}^1$ , buttons) pockets  $P_{11}^1$ : lateral  $P_{11}^1$ , rectangular  $P_{11}^2$ .



**Figure 2:** Options for men's shirts of hospital clothes straight silhouette  $P_1^1$ , without changing the neck hole  $P_5^5$  with a different cutting sleeves and clasps.

## 3. DISCUSSION

Building-block design was carried out according to the principle of access to specified areas body of the patient, as well as on the compatibility of the individual elements together. Sets of hospital clothing have been developed for male and female, consisting of three items: shirts, pajamas and dressing gown. Hospital dressing gown is seen as outerwear, the patient needed to go beyond the department during the passage of medical procedures. Therefore, the gown model particularities are more in its appearance and convenience of the patient, without solving the problem of providing access zones. Shirt and pajamas, in contrast, are the first layer of clothing should provide direct access to the body for several procedures.

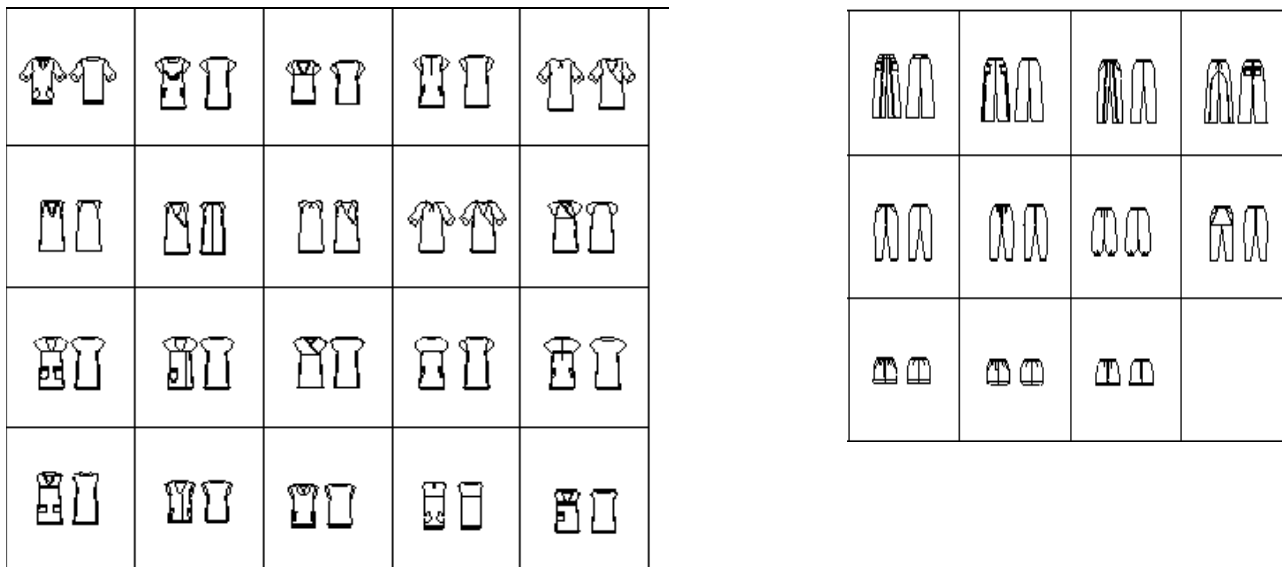


**Figure 3:** The ordered collection of gowns (fragment)

Hospital set for men made in beige - brown color, and solves several problems, providing access to the shoulder, arm zones, arm and hand, so it was chosen design solution the detachable shoulder seam. Shirt is designed with a dropped shoulder line, sleeveless and length to knee. Pajamas, also has a detachable shoulder seam, V - shaped neckline, patch pockets, interior and exterior are arranged symmetrically. The system of internal patch pockets in pajamas is required for fixing medical devices, such as the collector. In the fold-up pants plastron, clasps are in the front seam in the middle of pants, which provides access to any

part of feet, without removing pants, a belt of fragmented elastic band is used. In addition, a removable hinged pocket for the reservoir, which is attached at the waist with a special fastening system, and on the foot with straps. As for the accessories clasp it was used textile braid with plastic buttons.

For sets of women's hospital clothes selected peach and blue colors. To ensure free access to topographic zones, recommended the following design elements: shirt with the trans yoke reclining on the breast, sleeve classic short free, clasp at the back of the neck hole, so that the item of back is double. Such a deep superposition easy to use in the case of patients with varying volumes of the body, insuring freedom in moving. Pajamas with straight silhouette, design elements on front and back are an incision in the side seams, button clasp at the side seams, sleeve classic, the overhead internal pockets for fixation of medical devices. Pants used in structural elements: plastron, clasp in the front middle seam, which provides access to any part of his legs, not removing trousers, accessories buttons on textile braid, is used in a fragmented elastic waist band.



**Figure 4:** The ordered collection of pajamas for woman (fragment): blouse and pants

#### 4. CONCLUSIONS

Thus, a systemic approach to the design of hospital clothing will develop ergonomic design clothing for the patients, which is an actual task facing the sewing industry professionals in the modern conditions of production.

Creation of comfortable and aesthetic hospital clothing with functional design elements that facilitate the conduct of medical procedures allowing for the occurrence of diseases will not only treat and rehabilitate patients, but also will increase the level of social protection and quality of life of each person during the illness, which determines particularly relevant study of scientific problems.

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