

Subject-Light Environment as a Platform for Implementation of Universal Design Principles

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Abstract

The present article analyzes the possibility of introducing principles of universal design into the design process of objects, the designs of which provide for the presence of light elements. Compliance with the principles of universal design will allow to fill the environment with more sophisticated design objects that will be convenient and accessible to people regardless of their features. At the same time, the designer often uses a light, or light medium in his work. Light environment can be considered the configuration of light fluxes and objects creating them, transmitting, reflecting and scattering. Such objects can be both of artificial and natural origin. If we consider questions of the interaction of light medium with objects and their aggregates (we can talk both about objects that serve as a source of light and about objects interacting with light), then we can talk about the object-light medium.

Keywords: *Universal Design Principles, Optimization, Topology*

1. Introduction

With the help of design, a person solves diverse tasks: he forms the habitat and various objects with which it is filled [1,2]. The main groups of objects that the designer is working on are individual objects and whole spaces, therefore it is customary to say that the designer forms a subject-spatial environment. At the same time, the designer often uses a light, or light medium in his work. Light environment can be considered the configuration of light fluxes and objects creating them, transmitting, reflecting and scattering. Such objects can be both of artificial and natural origin. If we consider questions of the interaction of light medium with objects and their aggregates (we can talk both about objects that serve as a source of light and about objects interacting with light), then we can talk about the object-light medium. In this respect, it is proposed to use the following definition:

The subject-light environment is a set of objects of design that provide the functional, psychophysical solutions, and other tasks to ensure comfortable and safe human activity. Subject-light environment takes into account the light elements as a necessary component.

The following examples can be cited as objects of the object-light environment: household appliances and electronics, artificial lighting systems, art objects, installations.

Among the various design objects that can be attributed to the objects of the object-light environment, we can distinguish the following approaches to the use of light elements:

1. Light as the main (and often the only) functional element of the design object. An example is various types of interior and exterior lighting.
2. Light as a special functional element: an indicator, without which the interaction between man and the device will not be possible, because understanding of the principles of operation of the device will not be complete or absent. Examples - light indication of the control panel of a washing machine (mode

selection, timer, additional options); light indication of the laptop (power mode from the network, battery level, etc.); light indication sandwich toaster (on / off mode).3. Light as an additional functional element, without which interaction between a person and an instrument is possible, since in this case, the light only emphasizes certain properties of the object (for example, aesthetic) or makes its use more comfortable. Example - electric kettles with water level lighting.

2. Research method

As a method of research of the subject-light environment, an approach is applied that assumes consideration of the subject from the standpoint of universal design. Universal design (barrier-free, inclusive design) - a wide range of ideas and solutions involving the modification of existing objects, as well as the creation of new ones that will be available and understandable to all groups of the population, regardless of their features. Universal design implies that a design object corresponds to a complex of ergonomic and aesthetic requirements, thanks to which a design object will be comfortable and accessible in its operation to all, or at least to most people [3].

3. Results and analysis

Thanks to the development of universal design, new industries are gradually emerging and the demand for innovative design solutions necessary to meet specific human needs is emerging. Much attention is paid to the accessibility of the environment [4,5]. Of course, an accessible environment is very important for the integration of people with disabilities, to improve their quality of life by changing the level of accessibility of infrastructure [6], but a universal environment (an environment designed with the principles of universal design) can provide more opportunities for all people from their features. Thus, a universal environment is

aimed at everyone, not just people with disabilities.

Let us analyze the object-spatial environment from the standpoint of universal design. As an example, take the terminal of the unified medical information and analytical system EMIAS (Fig. 1).

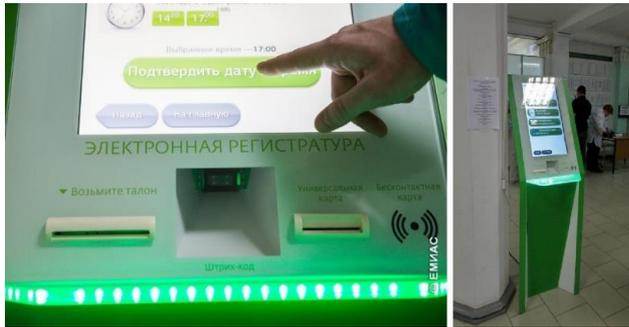


Fig. 1: EMIAS terminal [7]

The terminal of the EMIAS system has a touch control and light elements (some of them are visible all the time, some light up at certain moments). Light elements of the terminal ensure its compliance with the basic principles of universal design:

- Intuitive use: the convenience of interacting with the terminal does not depend on the experience, knowledge and concentration of the user's attention. Light elements at a certain point attract attention to the area of the terminal where you need to attach a document identifying the patient's identity.

- Easy perception of information: all the necessary information is effectively delivered to the user, regardless of his communication capabilities. Light elements at some point attract attention to the area of the terminal, from where you need to get a coupon to see a doctor.

- Emotionality: the perception of the design by the user must be positive or neutral. Light elements of the terminal have a green backlight color, which is a positive signal encouraging action.

But the possibilities of light and color, as well as the touch control of the terminal may not be enough, and therefore it is necessary to provide alternative ways for the user to interact with the terminal. For example, limited sensory perception affects the use of the terminal in the following way: it is likely that you will not get through the right button or, due to certain diseases, will not provide the necessary pressing force. To prevent such problems of user interaction with the terminal, voice control can be implemented, which is consistent with such universal design principles as flexibility in use and low physical effort (i.e., efficiency and ease of use do not depend on the user's physical capabilities). Another direction in the development of universality may be the use of tactile zones at the terminals. Currently, such zones are being created on the near screen space, but thermal or tactile interaction with the screen itself is still being inhibited due to insufficient engineering study of the issue, although scientific approaches have already been found. But these channels of the interface (communication with objects) are secondary in relation to the main one - the light one, therefore the spatial-light environment is the platform for the introduction of universal design.

Many problems of interaction between the user and the design object can be avoided if one considers the principles of universal design in advance, at the design stage.

4. Conclusion

The role of light elements in the formation of a subject-light environment may be a key role, or it may be insignificant, but, in any case, designers need to consider the role of light in designing such objects, improving their work, and also be guided by the principles of universal design. Universal design is a dynamically

developing area of human activity. Compliance with the principles of universal design will allow to fill the environment with more sophisticated design objects that will be convenient and accessible to people regardless of their features.

Thus, the subject-light environment can become a platform for the introduction of the principles of universal design into the design process: this possibility is analyzed in the article.

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