



Principles of Universal Design on the Example of Assistive Devices for Specific Groups of Invalids

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Abstract

The present paper considers an auxiliary device for the safe movement of visually impaired population in an urban environment, which is based on the use of acoustic and tactile sensations for orientation in space.

Keywords: Assistive Devices, Invalids, person's life, Developed Device, disability

1. Introduction

The subject-spatial environment in which a modern person lives determines the quality of that person's life. Modern principles of designing elements of the environment, aimed at improving comfort in all aspects and forms of activity without exception, are the object of research and work of various specialists, and, industrial, landscape and graphic designers play an important role in these processes. Today one of the top priorities in formation of the surrounding space can be considered a universal design, the main idea of which is to provide equal opportunities for people of various categories. In the conditions of a space organized according to the principles of universal design, people of different gender, age, social status, as well as of various physical capabilities and limitations, should feel equally comfortable and confident. A universal design is aimed at designing and creating objects, products, infrastructures, devices, instruments, and services of programs initially adapted for use by all members of society without the need to restructure them and make any special social changes. [1,2]

In general, the principles of universal design are mostly aimed at developing an accessible environment, primarily for people with various physical disabilities.

The very concept of developing an affordable medium in the second half of the last century was first formulated by S. Goldsmith in the book "Designing for the Disabled". One of his most significant ideas, brought to life, and still considered a standard requirement when planning and shaping an architectural environment, is creating an understated curb.

As for the term "universal design" itself, it was first introduced by architect Ronald L. Mace to describe the design of any products and environment from the standpoint of aesthetics and affordable use. [7]

There are seven basic principles of universal design.

1. Equality of use
2. Flexibility to use
3. Simple and intuitive design
4. Easily perceived information
5. The admissibility of the error.
6. Low physical effort.
7. Size and space for access and use.

The use of these principles in practice will create an environment for comfortable use by all categories of citizens. [4,6]

2. Purpose of developed device

For a competent design of the environment, it is important for the designer to take into account the peculiarities of other groups of the population, with which space will be built. A separate category is represented by people who, due to various circumstances, were deprived of one of the external senses. So, people with vision limitations often have serious problems with independent movement outside the room. It is not only about city blocks and streets, but also about various specialized areas for walking and recreation.

Moving along the park streets or city sidewalks for the visually impaired category of citizens or citizens who are blind, unfortunately, is still not an easy task. The intersection of the sidewalk with the roadway is undoubtedly a threat to the health and life of people who are blind.

Recent studies show that in people who are deprived of sight, the inactive visual areas of the brain are connected to the performance of the functions of the organs of hearing. That is, they take part in determining the sources of sound. Five people out of twenty subjects were able to determine the sound source with an accuracy of 15 degrees, even when they closed one ear during the test. For sighted people, such results turned out to be impossible. [5]

Tactile sensations are a complex set of feelings:

- Tactile sensations (touch and pressure)
- Temperature sensations (thermal and cold)
- pain sensations.

These sensations arise when the outer covers of the body come into contact with the surface of objects. The result of such a contact is the emergence of sensations in the brain, reflecting the diverse properties and signs of objects [8-10]. In addition, skin sensations form the signal basis of active touch which is the leading type of perception of the blind. Complete or partial loss of vision leads to the fact that a number of surrounding objects and phenomena that are perceived visually become objects of tactile perception, and their properties and signs turn into tactile stimuli. In this connection, there is a sharp increase in the activity of the distal parts of the body, especially the hands, in the cognitive and

work activity of the blind, which naturally gives the effect of sensitization - an increase in tactile sensitivity. [2]

3. Description of developed device

The study of research data suggested development of an acoustic-tactile track for people who have lost their sight. This path can be equipped with specialized educational institutions located in urban infrastructure, as well as walking areas, and areas of approach to public transport. It will allow people with visual disabilities to intuitively orient themselves in the zone in which they are located, using their stronger external feelings, which will greatly reduce the difficulties that they usually have to face.

The use of metal pipes of different diameters in the construction of the track will allow changing the pitch of the sound when tapping with a cane, which will signal that the user is approaching a certain part of the zone he is passing (Figure 1).

The high frequency of sound determines the user's position in the safe zone, that is, along it passes a path from a tube of small diameter. A lower frequency, a tube with a larger diameter, signals an approach to a hazardous or demanding area. Also, the track is equipped with stop sectors, announcing an approach to the roadway, or a pedestrian crossing. Thus, the track allows you to move along it, not only with the help of auditory sensations, but also tactile.

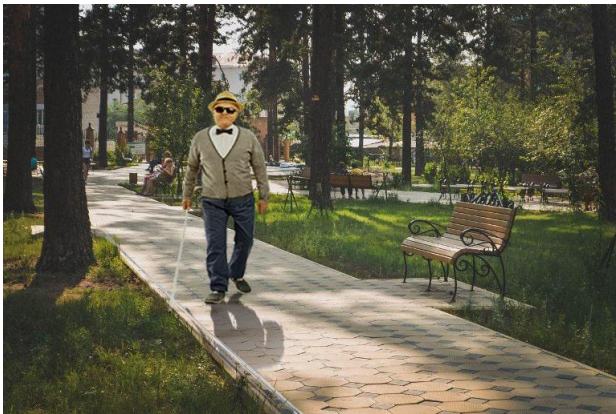


Fig. 1: An example of the location of the acoustic-tactile track in the park area

Easy installation allows you to dismantle the track in the winter season, its compact design will not cause inconvenience to others. Being installed on a small level, such a path will not become an obstacle for movement and it can be easily stepped over (Figure 2).



Fig. 2: Sketch assistive device

4. Conclusion

The described device will give people, who by coincidence or as a result of illness, were deprived of their sight and become dependent on someone's help, a guide and hint for their further actions, and accordingly minimizing accidents.

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