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HAND PROSTHESES

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Bionic and biotechnological prostheses have long allowed people to replace their lost limbs with new ones. Modern developments of bionic prostheses combine robotics and prosthesis osteosynthesis. The essence of this direction lies in the fact that the supporting part of the titanium prosthesis fuses with the bone base of the stump, and the sensors are implanted and connected directly to the nerve endings. This will make it possible to use the prosthesis permanently without removing it. Direct attachment of sensors to the nerve endings of the stump will make it possible to control movements in the prosthesis more subtly and accurately, and will make it possible to transmit tactile sensations, which will significantly improve the quality of life of people with an amputated limb [1].

At the moment, bionic prostheses are divided into two types: 1) Single-grip: an artificial replacement for an amputated or damaged body part, controlled by various mechanisms and designed to perform special actions and / or recreate the appearance of the user's limb, equipped with at least one motor, which in its operation provides a grip. 2) Multi-grip: a bioelectric prosthesis with several types of grip, as well as a motor for each finger. Due to this, the prosthesis is able to perform many grips or gestures, and also has several types of closing and opening of the fingers. The number of gestures is programmable according to the user's wishes.

All modern hand prostheses, with the exception of mechanical prostheses, implement an open-loop control principle. Mechanical prostheses in the active

loading mode implement the principle of feedback control both in position and in force, which makes such a prosthesis actually sensible.

Recently, research has been actively conducted on the use of muscle amplifiers of the bioelectrical signal. The method requires special surgical intervention to isolate groups of muscle fibers and attach to them the nerve endings that previously controlled the muscles of the large joints of the hand. To control the actuators of the prosthesis with the help of overhead electrodes, bioelectric signals are taken. In fact, it is supposed to form a complex movement of a prosthetic hand on the basis of the stereotype of movement of a natural limb that has already developed in the centers of the brain. This system differs not only in the complexity of the surgical intervention, the complexity of the technical implementation, but also in the complexity of teaching a disabled person. The control principle here remains open, and the problem of implementing feedback with the bioelectric control method has no fundamental solution. The preferred and most realistic at present is the formation of a system for simultaneous control of the movement of the links of a multifunctional prosthesis of the arm, which does not require surgical intervention, using the copying method and organizing feedback with the control body on position and force [2].

References

1. Бионические протезы в Германии. [Electronic resource] – Mode of access: https://www.rusmedserv.com/prostheticlimbs/BionicprosthesesGermany/. – Date of access: 14.04.2023.

2. Я. Я. Абу Хания. Метод и система управления интеллектуальным протезом руки / Я. Я. Абу Хания // Автореф. …диссертации на соискание уч. степени канд. тех. наук. – Санкт-Петербург, 2010.