ΛΌΓΟΣ

DER SAMMLUNG WISSENSCHAFTLICHER ARBEITEN

DIE KUNST DES WISSENSCHAFTLICHE DENKEN

ZU DEN MATERIALIEN DER II INTERNATIONALEN WISSENSCHAFTLICH-PRAKTISCHEN KONFERENZ

GRUNDLAGEN DER MODERNEN WISSENSCHAFTLICHEN FORSCHUNG

12. AUGUST 2022 • ZÜRICH, SCHWEIZ

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ABSCHNITT XVII. INFORMATIONSTECHNOLOGIEN UND –SYSTEME

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A ROBOTIC PROSTHETIC A CONTROL SYSTEM AND A STRUCTURAL DIAGRAM DEVELOPMENT

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At the initial stage of prosthetic hand model design it is necessary to develop a structural diagram that will allow to consider the relationship and determine the principles of organization and work. To do this, it is proposed to use the classical approach to the development of automated feedback control systems [1], in our case, the control system will look as follows as shown in Figure 1.

The contraction signal of the “triceps muscle of the shoulder” as an EMG signal [2] will be received as an input signal, which is captured by the Sensor element and transmitted to the Control System. By analyzing the received signal level and comparing it with the previous one, the Control System affects the Actuating Mechanism, which will be the movers that will mechanically act on the compression or release of the fingers of the prosthetic hand. The feedback makes it possible to compare the force of contraction, which will make it possible to control the force of compression in the cycle depending on the level of the EMG signal and to avoid abrupt unclenching with the loss of the holding object.

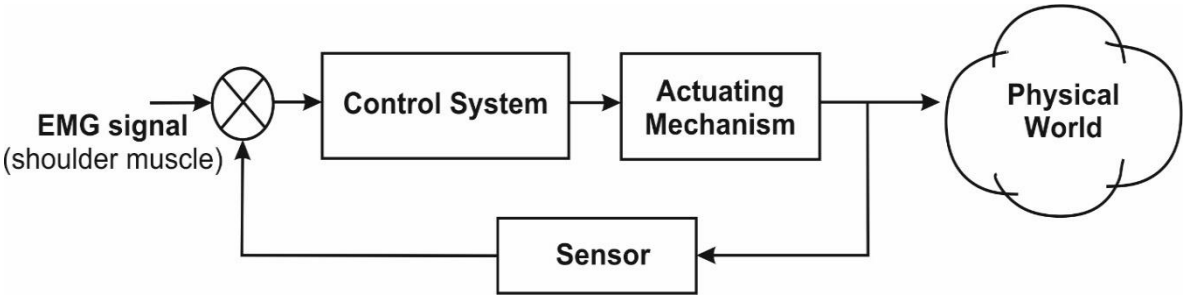

Fig. 1. **Control System**

On the basis of the developed control system, we can begin to develop a block diagram of the prosthesis model being developed, with details of the connections between the blocks. Let's add the following blocks to the structure:

- accumulators - control system and servomotors of the prosthetic arm power supply unit using accumulators;
- BMS moduls – battery charging and balancing control unit, with the possibility of recharging through standard interfaces (USB, Type -C);
- Sensor - sensor unit for reading the contraction of the "triceps muscle of the shoulder" as an EMG signal;
- Servo 1,…,Servo 2 – array of servo motors to realize compression flank fingers.

The developed prosthesis structural diagram is shown in Figure 2.

After developing a structural diagram of a prosthesis model based on muscle sensors, it is necessary to analyze and select hardware modules

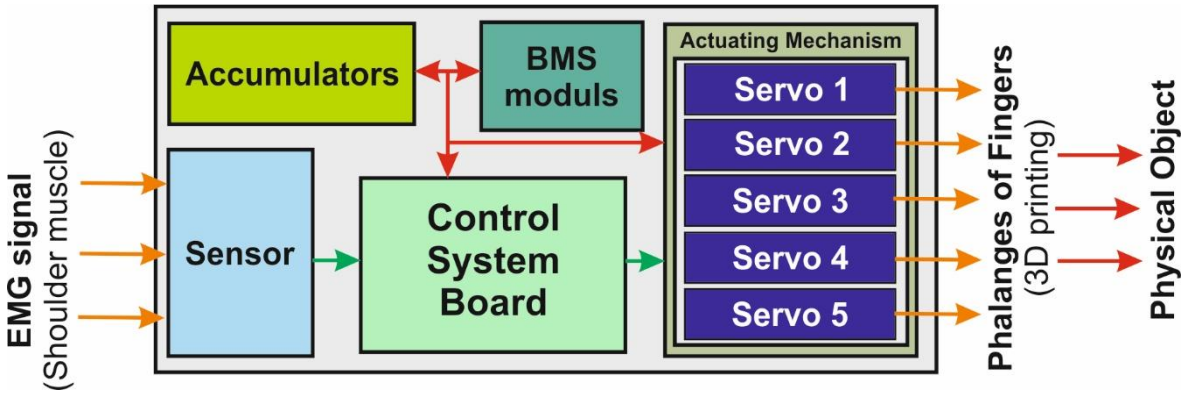

Fig. 2. **The Prosthesis Structural Diagram**

Based on the specifics of the layout and usage, it should have the following restrictions:

- the control system should not be large enough to fit inside the layout;
- the entire assembled control system with power supply should not exceed the price 500UAH;
- easy accessibility for quick repairs and adjustments.

Conclusions. The proposed prosthesis control system and structural diagram will allow to implement a power control system inside the prosthesis, with the possibility of fast charging. In the future, the authors plan to develop a prototype laboratory sample for research and further implementation.

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