Scientists develop self-learning arm controlled by thought

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Scientists from Tomsk Polytechnic University are developing a robotic arm prototype and its control algorithm using myoelectric signals. The mechanical limb will independently recognize the motions of its owner and be able to perform all the same motions like a healthy arm. The scientists estimate the final cost of the device of 600 - 1,000 USD.

According to the developers – fellows at the Laboratory of Medical Instrument-Making, the Institute of Non-Destructive Testing – Mikhail Grigoriev, Nikita Turushev and Evgeniy Tarakanets, the manufacturing of human prosthetic limbs has been available for a few decades. But to make them functional, translate them into a full replacement of a lost body part is still impossible.

"To date, there are quite available traction prostheses. Their motions are carried out by means of traction belts which are superimposed from the repaired arm across the back as loop around of the healthy shoulder. That is the prosthesis performs by motions of a healthy arm. The drawbacks of this type are in need of unnatural body motions to control it," says Nikita Turushev.

The algorithm being developed by the polytechnicers will save people from having to wear traction belts. Sensors on the prosthesis will pick up myoelectric signals. Human brain sends signals to muscles making them to perform the necessary actions. The system will analyze commands coming to the healthy arm part and "guess" what motion the prosthesis should do.

"Initially, software will be universal, but we will adapt it to each specific artificial arm. Further, a machine learning algorithm will copy its host wearing the prosthesis: to fix myoelectric signals and choose required motions," says Mikhail Grigoriev.

Now the young scientists are "teaching" the algorithm different signals and their meanings. Initially, they will examine at least 150 people with healthy limbs. "Remembered" the signals and following them meanings the software will produce them at the stage of medical trials.

The polytechnicers gained the grant of the Russian Foundation for Basic Research on the development in 2015. In two years they should present the prosthesis prototype and software for its operation support.

More information: N.V. Turushev et al. Electroneuromyograph, *MATEC Web of Conferences* (2015). DOI: 10.1051/matecconf/20152806005

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