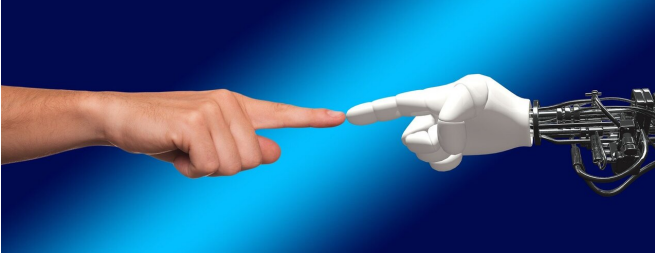


# Scientists train robots to make independent decisions in a changing environment

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A team of scientists from the School of Engineering of Far Eastern Federal University and institutional collaborators has developed software for industrial AI robots with technical vision to set out and adjust the movement trajectories of their tools in real time without reduced precision.

The team from FEFU developed and implemented a new principle for smart industrial robot control—the management of program signals by which robots are able to set and adjust the trajectories and regimes (speeds) of tools movement on their own while processing details under uncertain conditions and in a changing working environment. The new software achieved around 0.5 mm precision in the operation of robotic tools (including the actions that require additional force application). However, many high-accuracy operations require precision within the 0.2-0.1 mm range.

"The issue lies in the imprecise technology used to manufacture the robots themselves, and it hasn't yet been resolved anywhere in the world. We've already developed a method to eliminate this defect based on special test movements. It proved to be efficient in models, and now, we are working to implement it in practice. If we obtain positive results, it would be a breakthrough in the practical application of robots in general. And if not, we'd

continue to work until we have a positive result. Generally, this is a working method," said Professor Vladimir Filaretov, a Ph.D. in Technical Sciences.

Using a technical visual system, a machine forms a virtual image of its workspace, recognizes each piece, and determines its exact position. A robot can also identify deformations in large pieces that occur in the course of operation. Based on the virtual image, it determines the trajectories of its working tools.

"It's important to emphasize that the methods, algorithms and software are of universal nature. They can be used to control almost any types of [robot](#): industrial robots, underwater devices, unmanned ground vehicles, flying, and many promising agricultural robots. They only require minor adjustments that are already included into the [software](#) and take into account their specific features. Our developments, including smart VR-based control, maximize on the capabilities of modern technologies and are able to increase the efficiency of technological processes by several times while preserving the quality of the products," added Professor Filaretov.

The new smart control method has already been implemented at the Dalpribor plant (Vladivostok) and is currently being tested and adjusted in view of the recent industrial challenges. The most recent update of the technology was presented at the IEEE International Conference on Control, Automation and Diagnosis 2019 (ICAAD'19) in Grenoble and got special recognition.

Provided by Far Eastern Federal University

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