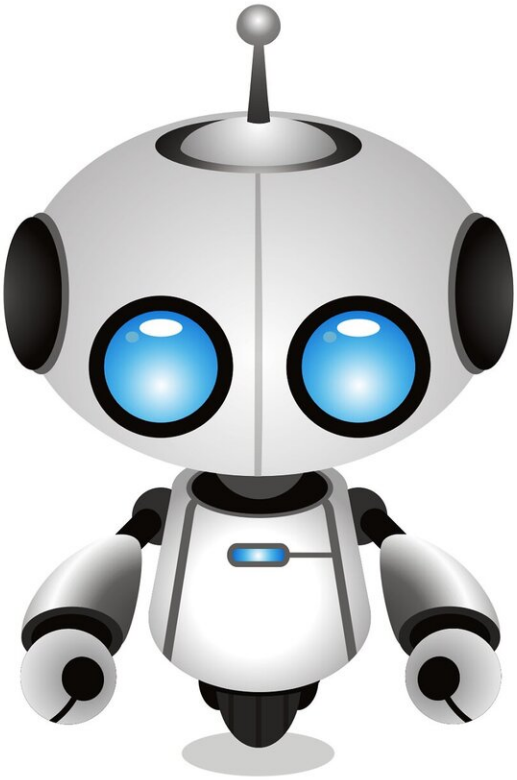
Making industrial robots smarter and more versatile

December 17 2020, by Cécilia Carron



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EPFL spin-off Aica has developed AI-based software that makes industrial robots easier to program and more capable of adapting. The software is designed in a modular format so that operators can build a customized application based on their needs. Aica's advancement expands the range of tasks that robots can perform while cutting implementation costs.

Industrial robots are used for a variety of tasks that require a great deal of precision and agility, such as assembling high-precision parts, executing tasks that change repeatedly (such as for manufacturing customized prosthetics), and polishing miniaturized components (like watch crystals). The robots must be able to factor in variables such as an object's size, exact shape and the maximum force it can withstand before being scratched or breaking. Programming these robots so that they perform reliably can take several weeks—and accounts for up to two-thirds of their total implementation cost. In order to lower these costs and make industrial robots more versatile, EPFL spin-off Aica has developed a modular software application that lets operators select programs for exactly the tasks they need from a vast program library.

More affordable automation

The software is made up of preprogrammed tasks that operators can select based on their requirements. The robot can then adapt to variations, such as a change in size when working on a new batch. The robot automatically adjusts its movements to account for the new parameters. "An estimated 80% of industrial tasks are not automated because they are too complex or because setting up a robot would be too expensive," says Lukas Huber, a cofounder of Aica. He sees the software as a way of making automation more widespread and of leveraging artificial intelligence to enable new tasks to be automated and

implemented. Their software can also evolve: if a task becomes too complicated for the robot, the program will automatically search the database for a solution.

Aica's system was designed with collaborative robots in mind, too. These robots can detect interactions with their environment and with plant operators. The software teaches the robots to be more flexible and to better respond to operators' movements, so that they can work together more effectively. And the system includes integrated force and torque sensors in order to detect changes in the operating environment. "With our system, robots can switch between different tasks instantly based on a simple physical interaction," says Baptiste Busch, Aica's other cofounder. Operators can show robots new tasks, which they will then be able to perform on their own under similar conditions. The programmed robots are also capable of working with other robots to handle large parts or carry out other tasks requiring several "hands."

Aica's artificial intelligence modules and flexible control algorithms were developed through years of research at EPFL's Learning Algorithms and Systems Laboratory. The entrepreneurs have received startup funding from programs such as Venture Kick, Innogrant and EPFL Enable, and will take part in the IMD EMBA startup program starting in 2021. Their turnkey software has been tested at companies for the past year and has promising applications in a range of industries, including medtech, watchmaking and the automotive industry.

Provided by Ecole Polytechnique Federale de Lausanne

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