SCIENCE

New software allows industrial robots to achieve touch sensitivity and precision close to human hands

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NTU Singapore Assoc Prof Pham Quang Cuong (proper), co-founder of Eureka Robotics and Dr Hung Pham (left), co-founder and Chief Expertise Officer of Eureka Robotics discussing their Dynamis expertise applied on a Denso Wave robotic. Credit: Nanyang Technological University

Eureka Robotics, a tech spin-off from Nanyang Technological University, Singapore (NTU Singapore), has developed a expertise, known as Dynamis, that makes industrial robots nimbler and nearly as delicate as human fingers, capable of manipulate tiny glass lenses, electronics parts, or engine gears which can be simply millimeters in dimension with out damaging them.

This proprietary pressure suggestions expertise developed by NTU scientists was beforehand demonstrated by the Ikea Bot which assembled an Ikea chair in simply 20 minutes. The breakthrough was first revealed in *Science* in 2018 and went viral on the web when it might match the dexterity of human fingers in assembling furnishings.

NTU Affiliate Professor Pham Quang Cuong, Co-founder of Eureka Robotics, mentioned they've since upgraded the software program expertise, which might be made out there for a lot of industrial robots worldwide by Denso Wave, a market chief in industrial robots, which is a part of the Toyota Group.

Shoppers buying the newest robots offered by Denso Wave may have an choice to incorporate this new expertise as a part of the pressure controller, which reads the pressure detected by a pressure sensor on the robotic's wrist and applies pressure accordingly: Apply too little pressure and the objects is probably not assembled accurately whereas making use of an excessive amount of pressure might injury the objects.

Mastering contact sensitivity and dexterity like human fingers has at all times been the holy grail for roboticists, says Assoc Prof Pham, because the programming of the pressure controller is extraordinarily sophisticated, requiring lengthy hours to good the grip only for a specific task.

"Today, Dynamis has made it easy for anyone to program touch-sensitive tasks that are usually done by humans, such as assembly, fine manipulation, polishing or sanding," explains Assoc Prof Pham, who can also be the deputy director of the Robotics Research Centre at NTU's Faculty of Mechanical and Aerospace Engineering.

"These tasks all share a common characteristic: the ability to maintain consistent contact with a surface. If our human hands are deprived of our touch sensitivity, such as when wearing a thick glove, we would find it very hard to put tiny Lego blocks together, much less assemble the tiny components of a car engine or of a camera used in our mobile phones."

Hiroyasu Baba, FA/Robotics Enterprise Unit Product Planning Division, Supervisor of Denso Wave, mentioned: "As a consequence of its excessive fundamental efficiency and openness, DENSO robots are the popular selection by corporations and universities with superior initiatives within the discipline of robotics. NTU Singapore and Eureka Robotics have additionally been utilizing DENSO robots because of this.

"Because of this relationship, joint development began naturally, and we were able to launch this product smoothly. The technology, which will be installed in DENSO robots, is a technology for force feedback, which is becoming more and more important in the practical use of robotics. Thanks to the development capabilities of Eureka Robotics, the system is advanced, yet easy to use and light enough to be integrated into our standard robot controllers."

How the brand new software program works

Generally known as Pressure Sensor Sturdy Compliance Management, the brand new software program powered by Dynamis requires solely a single parameter to be set—which is stiffness of the contact, whether or not it's delicate, medium, or laborious.

Regardless of its easy set-up, it has been proven to out-perform standard robotic controllers which required an unlimited quantity of experience and time to fine-tune.

Dynamis is a posh synthetic intelligence (AI) algorithm developed by Assoc Prof Pham and his former Ph.D. scholar, now Co-founder and CTO of Eureka Robotics, Dr. Hung Pham.

This spine expertise was additional improved and was first deployed in Eureka's custom-built robots, similar to Archimedes, which may deal with fragile optical lenses and mirrors with human-like dexterity, now utilized by a number of corporations worldwide.

Present robots out there have both excessive accuracy however low agility (the place robots carry out the identical actions repeatedly similar to in a automotive manufacturing facility), or low accuracy however excessive agility (similar to robots dealing with packages of various sizes in logistics).

By deploying this expertise, robotics engineers can now imbue robots with each Excessive Accuracy and Excessive Agility (HAHA) on a big scale, paving the best way for industrial functions that had been beforehand very troublesome or unattainable to implement, similar to dealing with and meeting of delicate, fragile objects similar to optical lenses, electronics parts, or engine gears.

To be geared up with the Pressure Sensor Sturdy Compliance Management functionality, the big variety of robots already working on Denso Wave's RC8 controllers will solely be required to carry out a easy software program replace from December 2021 onwards, whereas newly shipped RC8 controllers will come full of the software program out there for activation.