

## Editorial

By: Toshiya (Ted) Okuma, Associate Officer, Robot Business Division,

Kawasaki Heavy Industries, Ltd.



### Expanding Robot Market

The robot market has been steadily expanding since 2012, but the trend of robotization, which has been accelerated since 2017, has been further increased in the first half of 2018. However, some parts supplies for the robot production may have failed to catch up. In spite of that, in the second half, the economic slowdown in China, the largest market for robots now, has put a stop on the development. Not to the degree of a bubble burst or Lehman shock, but the robot market has also been affected. Since the beginning of 2019, trade problems between the US and China have continued to grow, and capital investment has been declining.

Although, the need for robots is surely increasing based on the aspect of labor shortage and the decline of the working population – due to the low birthrate and the aging population including developed countries – the demand for quality maintenance without mistakes, and the liberation from such aspects as heavy labor, simple repetitive work, and poor working environment.

Also, a large space was required for the installation of conventional robots for safety reasons. However, with the advent of collaborative robots, the installation becomes possible immediately next to the workers without any safety fences, and the installation hurdles regarding space are reduced. So the opportunities for robotization are increasing further.

### Robots and Humans Working Side by Side: Dual Arm Collaborative Robot “duAro”

Kawasaki's duAro series has also been developed as a collaborative robot that can operate right next to human workers, and its application range has been expanded by the ease of installation and the merits of simplifying peripheral devices due to the dual-arm SCARA configuration. The main feature of duAro is that the two coaxially arranged arms can work in the same space and manner as a person would.

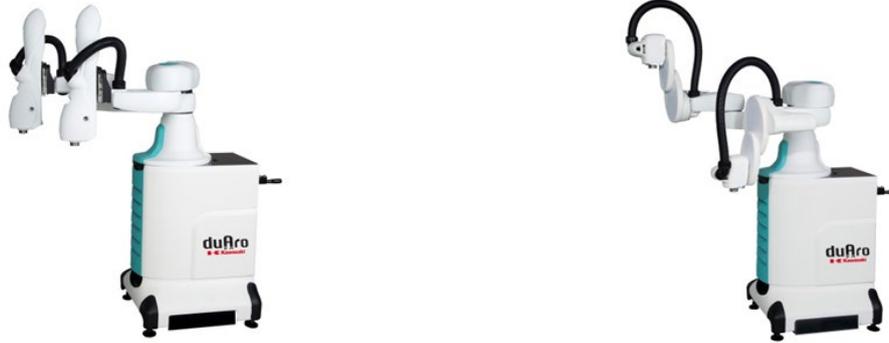


Figure 1: duAro1 (150mm vertical stroke)    Figure 2: duAro2 (550mm vertical stroke)

Coupled with the ease of installation and programming, duAro is often used in industries that are difficult to get enough labors for hard and boring tasks. Since the controller is integrated below the arms, it can be moved manually and the set up location can be easily changed without requiring a separate space for the controller.

The robot programming can also be easily taught with a direct teaching method: Simply maneuver the arm directly and operate it according to the menu displayed on the tablet PC.

The basic grippers and vision functions are also available as options and duAro is able to work in the same way as a human worker would – with both hands by utilizing several tools.

In addition, it is possible to use two arms for positioning and fixing an object with one arm while working on the object with the other arm, which also contributes to the reduction of system cost by simplifying peripheral devices without the necessity of external fixtures.

Rather than a large-scale full-automation, the ease of being able to easily incorporate robots into people's work environments as they are is not only a large benefit to large companies any longer: It also opens up the possibility of using robots in small to medium-sized enterprises (SME) – often in the form of semi-automation. The duAro could help SME which have limited investment opportunities, especially in cases of noticeable labor shortages.

### **Intuitive Remote Coordination Robot System: “Successor”**

On the other hand, the aging society is also affecting the skill transfer of skilled workers. “Successor” developed by Kawasaki is a revolutionary technology in which remote coordination work by a skilled worker can be passed on to the robot as it is, without the need for complicated teaching or programming.

Successor allows the robot to perform work on behalf of the skilled worker who executes tasks as intuitively as manual work – using a remote control device named

“Communicator” instead of a conventional teach pendant. The necessary haptic feedback for the worker’s sense that is essential for performing the task can be obtained from the Communicator.

At the same time, this remote operation also allows the worker to avoid dangerous or hazardous work environments.

Basically, the robot task is performed just as a human worker would by remote operation with the communicator. This way, the robot performance can be continued without major interruptions on parts with large variations or even different parts every time – making the automation extremely efficient and flexible at the same time.

Right now, painting work and polishing work are put to practical use, but in the future, many further applications are expected.



Figure 3: Robot with Communicator

Kawasaki is also focusing on the continuous development of a humanoid robot, named “Kaleido” through means of an industrial-academic collaboration.

A humanoid robot is often considered to be the ultimate form of a robot. If the robot is the same size as human, being able to act and move in the same way as we do, it provides the advantage of being able to use all human products (such as various gears and tools) available.

In the future, it is expected for humanoid robots to contribute to human society and to carry out necessary tasks instead of humans – for example in difficult areas where people cannot go easily, such as disaster sites, space, deep sea, etc.

Kawasaki, using element technologies cultivated with industrial robots and technologies to realize durability and reliability, offers an extremely robust humanoid robot hardware at low cost for research institutes such as universities and venture companies. Kawasaki continues to support the advancement of the evolution of humanoid robots through open innovation.



Figure 4: Humanoid Robot “Kaleido”

### **Future Direction of Robotics**

Robots are often met with concerns, such as them taking away labor opportunities from human workers. However, the actual substitution of people currently is extremely low. Nevertheless, it can be said that robots have the potential to make life easier for us, by carrying out work that is unsuitable for people and through cooperation and collaboration with human workers.

Kawasaki Robotics aims to evolve “From Industrial to Fully Integrated Robot Manufacturer”, and continues development, thinking that “we want to contribute to the rich life of the people of the world and the future of the global environment”.

“Kawasaki, working as one for the good of the planet.”