Collaborative or cooperative - Which type of robot suits your application best?

Robots are becoming increasingly easy to use, more economical and suitable for a higher number of industrial applications. As human operators and robots increasingly share a common space in the manufacturing environment, the choice between a collaborative or cooperative machine is naturally being given more consideration.

Barry Weller, Product Manager at Mitsubishi Electric, looks at the key features of collaborative and cooperative robots and how to quickly identify the best system for an intended application.

Collaborative and cooperative machines are both designed to share a workspace with humans, interacting with them without the need for physical safety guarding systems. Collaborative robots, or cobots, such as Mitsubishi Electric's latest MELFA RV series Assista articulated arm robots are specifically designed to implement safe human-robot collaborations. Cooperative robots, on the other hand, are industrial robots equipped with safety features such as Mitsubishi Electric's SafePlus safety system that use proximity sensors to safeguard personnel entering the operating space.

Based on these features, 'cooperative' industrial robots have generally been associated with applications where durability, high speed, payloads, accuracy and high repeatability are the ultimate requirements. Programming is not performed by the operator and set routines don't change frequently. Easy decision then, cooperative is the answer.

Recent advances in collaborative robots however have started to blur the line when it comes to applications that require the same accuracy but payloads are lighter and batch sizes are smaller. When a robot can be 'taught' quickly by the operator to adapt or initiate a new routine, then collaborative can be the better option. There are many examples such as fine assembly work or sample transfers in bio-tech applications where a robot might be the solution and the fact that there is now a crossover between a dedicated cobot and an adapted industrial robot using a safety sensing system is relevant, because the accuracy and repeatability is now comparable.
Service lives are also similar, which creates a new set of questions for end users.

**Defining the task, with a new set of operating parameters**

The first aspect that businesses should consider is the ultimate automation goal they would like to achieve. Knowing this would help them determine the type of contact expected between human operators and robots. In some cases, humans and robots have to work together on a common task. In this case, the workspaces of humans and robots overlap both spatially and chronologically to combine the strengths and advantages of both parties.

In these situations, cobots would provide the best option. For example, cobots are ideal when machines need to handle and hold parts while humans work on them. The ergonomics of a cobot arm are very different to that of a human; reach and repeatability are better, as is holding still for long periods. In this situation it can make a task far more comfortable for a human to complete, using robot assistance. This not only improves the working environment but is also a benefit for quality and productivity.

On the other hand, if human operators and robots only briefly interact with each other, cooperative solutions would suit the application best. This may be the case for environments where humans are not working alongside the robot but require regular access to the robot cell. Packing, palletising, loading machine tools, filling etc are obvious examples.

In addition, it is important to consider the payload and cycle time requirements. When these aspects are not relevant, both collaborative and cooperative robot systems can be used. However, heavy components or fast processes can only be handled effectively by cooperative robots.

**Inner space**

Another consideration is the space available for the automation equipment. It is possible to set up adjustable safety zones for cooperative systems, where position, speed and torque of the robot can be limited or stopped as the human approaches. This is ideal for packing stations where for example, a forklift has to come into the area to remove a pallet, however for assembly tasks where the operator is constantly working close to a robot arm, the arm would spend too long at a slow speed or stopped. If the task requires manipulation of a low payload and is located in a compact working space, then collaborative solutions offer improved efficiency.

End users also need to determine the level of flexibility in their automated processes in order to define which robotic solution would best address their needs. Collaborative robots can easily add flexibility to assembly processes that need to make lots of highly individualised products, in low volumes over short batch cycles. Conversely, cooperative robots are more suited for high-volume production of items that may feature small variabilities. ROI is very often the deciding factor and this can be difficult to calculate, especially for new applications with lots of variables, however talking to an expert robot integrator is always a good place to start.
Image captions:

**Image 1:** As human operators and robots increasingly share a common space in the manufacturing environment, the choice between a collaborative or cooperative machine is naturally being given more consideration.

[Source: Mitsubishi Electric Europe B.V.]

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**Note to Editor:** if you would like the text in another language please contact Carolin Heel at DMA Europa – carolin@dmaeuropa.com.

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The role of Industrial Automation – UK Branch is to manage sales, service and support across its network of local branches and distributors throughout the United Kingdom.

*At an exchange rate of 111 Yen = 1 US Dollars, last updated 31.03.2019 (Source: Tokyo Foreign Exchange Market)

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