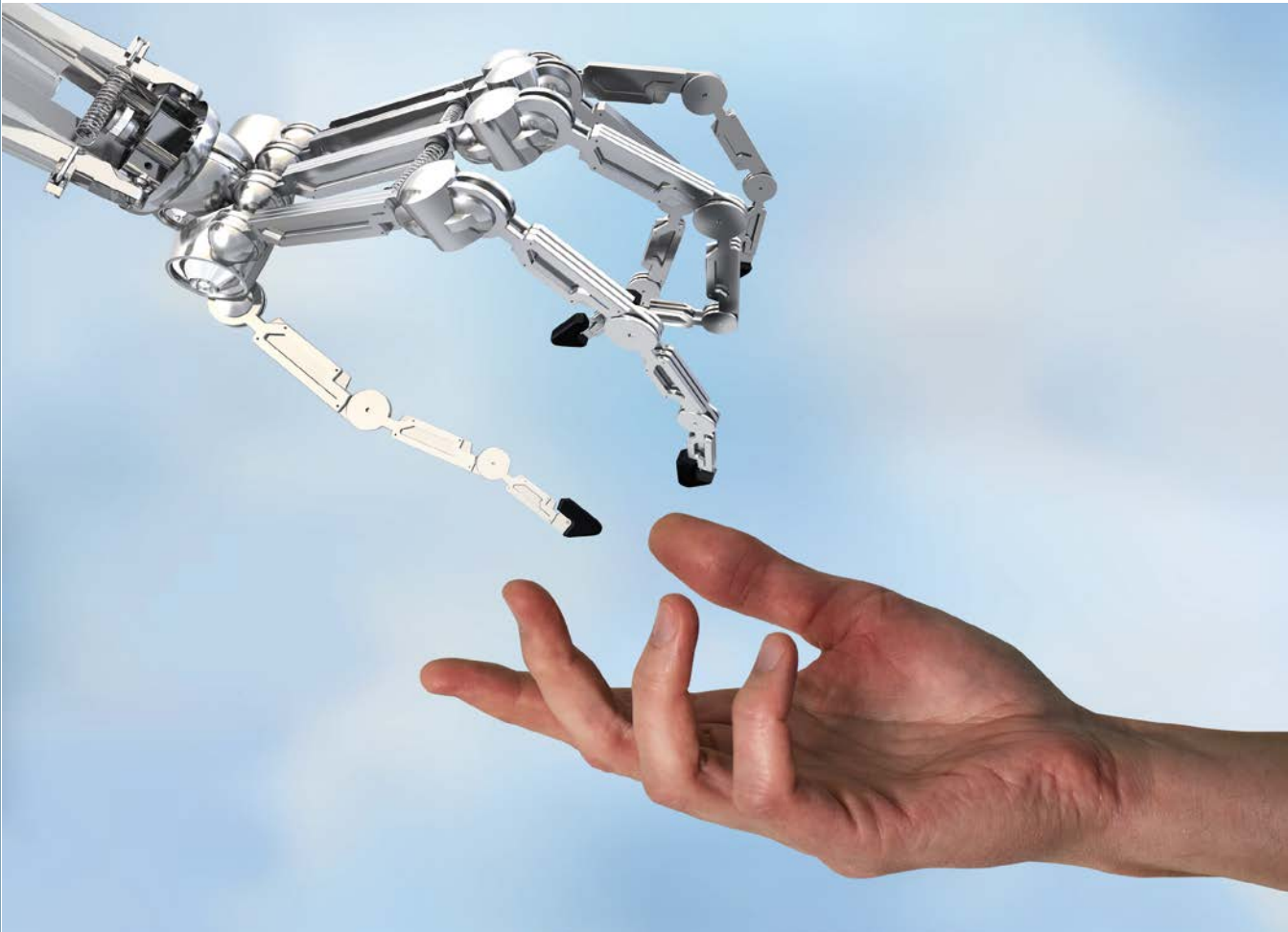


Collaborative Robots

Speed and Separation



Safe Applications

- Description
- Definitions
- Guidelines
- Design

“Human error is not a potential, it is a given.”

Description

In a speed and separation application, the goal is to **control** the separation distance.

The separation distance can never be below the **protective** distance.

The collaborative robot and the operator may be moving concurrently, with the robot's speed changing as the distance to the operator changes.

Information can be found in the Industrial Robots and Robot Systems – Safety Requirements standard, ANSI RIA R15.06-2012, which is harmonized with ISO 10218-1:2011 and ISO 10218-2:2011.

Detailed collaborative safety requirements will be available in the ISO/TS 15066 Technical Specification, which is expected to be available in late 2015 or early 2016.

Definitions

Collaborative Workspace

It is the space within the operating space where the robot system and a human can perform tasks concurrently.

Collaborative Operation

The purposely designed robot system and operator work within a collaborative workspace.

Safety-Rated Monitored Stop

The robot/collaborative robot stops before the operator enters the collaborative workspace.

With a traditional robot this may be achieved with a safety-rated control system that complies with the requirements in ANSI/RIA 15.06-2012.

With a collaborative robot this may be achieved through inherently-safe design.

Safety-Rated Space Limiting

A limit is placed on the robot's range of motion by a software or firmware based system having a sufficient safety-rated performance.

Guidelines for all Systems

These guidelines are applicable for collaborative robot systems. Detailed information can be found in the ISO/TS 15066 technical specification.

- The collaborative robot is required to have a safety-rated monitored speed function and safety-rated monitored stop function.
- The collaborative robot requires safety-rated soft axis and space limiting if operator safety is dependent on limiting the range of the robot motion.
- The maximum number of people allowed in the collaborative space is stated in the Information for Use.
- If the operator's safety is dependent on limiting the robot's range of motion, the application can use the robot's safety-rated soft axis and space limiting functions or other external safety-rated system.
- The robot is allowed to be moving when the operator enters the collaborative workspace.
- The collaborative workspace is defined as any area where the robot can move. In many cases this will be the same as the robot's defined workspace (including the end-effector and part).
- If an operator enters the collaborative workspace while the robot is moving, the robot shall maintain the minimum separation distance from the operator.

- If operator safety is dependent on the movement or location of the robot, the robot shall have a way to knowing its position.

Design

Some design consideration may include;

- Consider what happens if the robot stops and the operator continues moving towards and hits the collaborative robot system (including end-effector and workpiece).
- Clearly define the areas where the operator may be located.
- Verify the operator is able to clearly see within the entire operation area.
- Determine what happens if failures from parts of the control system other than the robot occur, and are they designed to go into a protective stop.
- If the separation distance is violated and causes the robot to go into a protective stop, under what conditions would the system be reset manually and when could it be done automatically.
- How the part size and shape variations can affect the separation distance .
- The worst case scenario is used to determine the maximum speed allowed.

Collaborative Robot Guidelines

Most collaborative robots are inherently safe by their design. This may include features such as force amplification, virtual safety zones, and tracking technologies. This guideline may not be applicable for traditional industrial robots

The transient contact chart in the annex of ISO/TR 15066 should be used to determine robot's maximum speed.

ISO 13855 should be used to establish the safe distance.

Note: Each application is unique and may include topics not listed.

Would you like to know more?

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Note: Specifications are subject to change

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