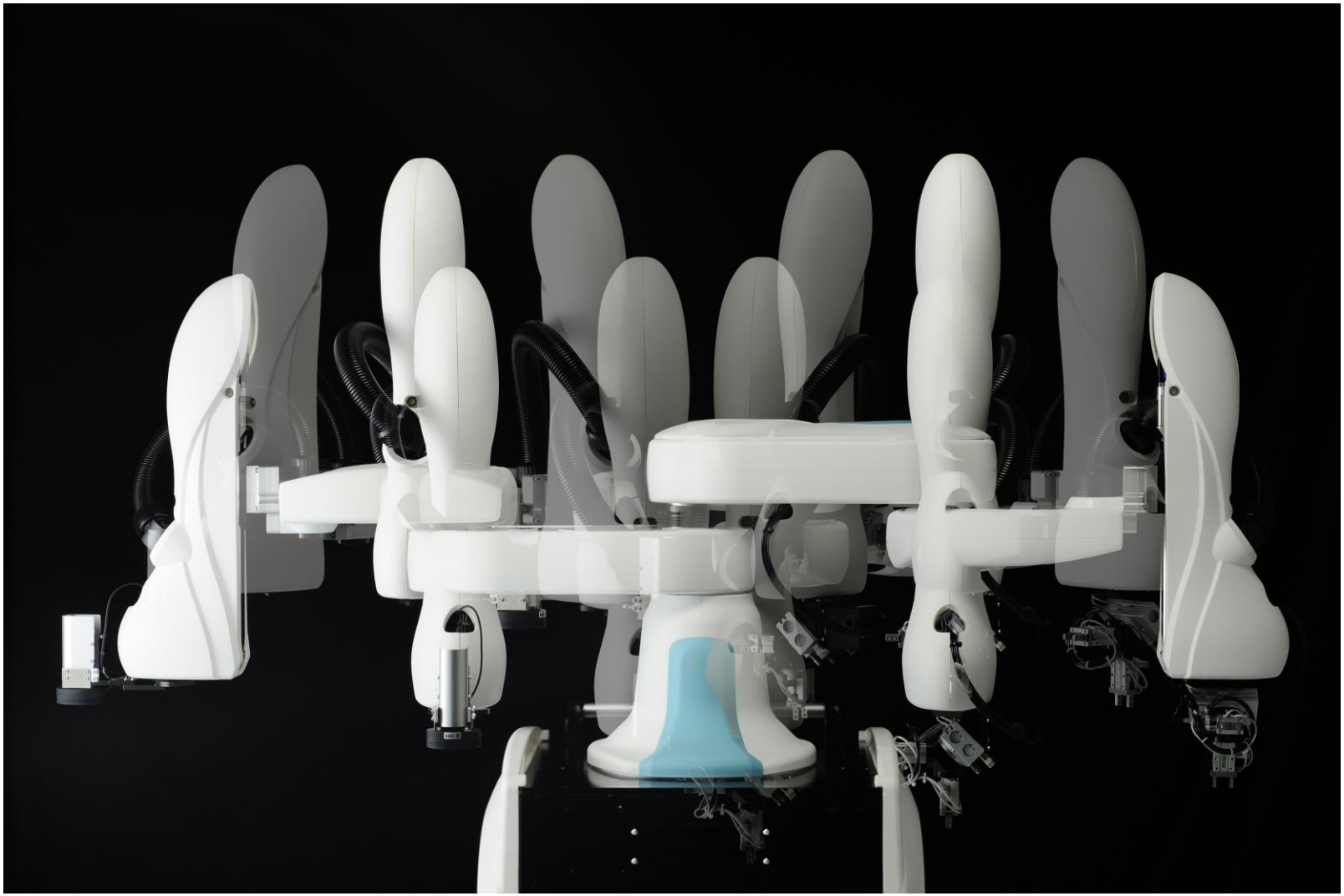
Kawasaki Robotics

31 bimu UCIMU
fieramilano
9 - 13/10/2018

ROBOTICA COLLABORATIVA e COOPERATIVA

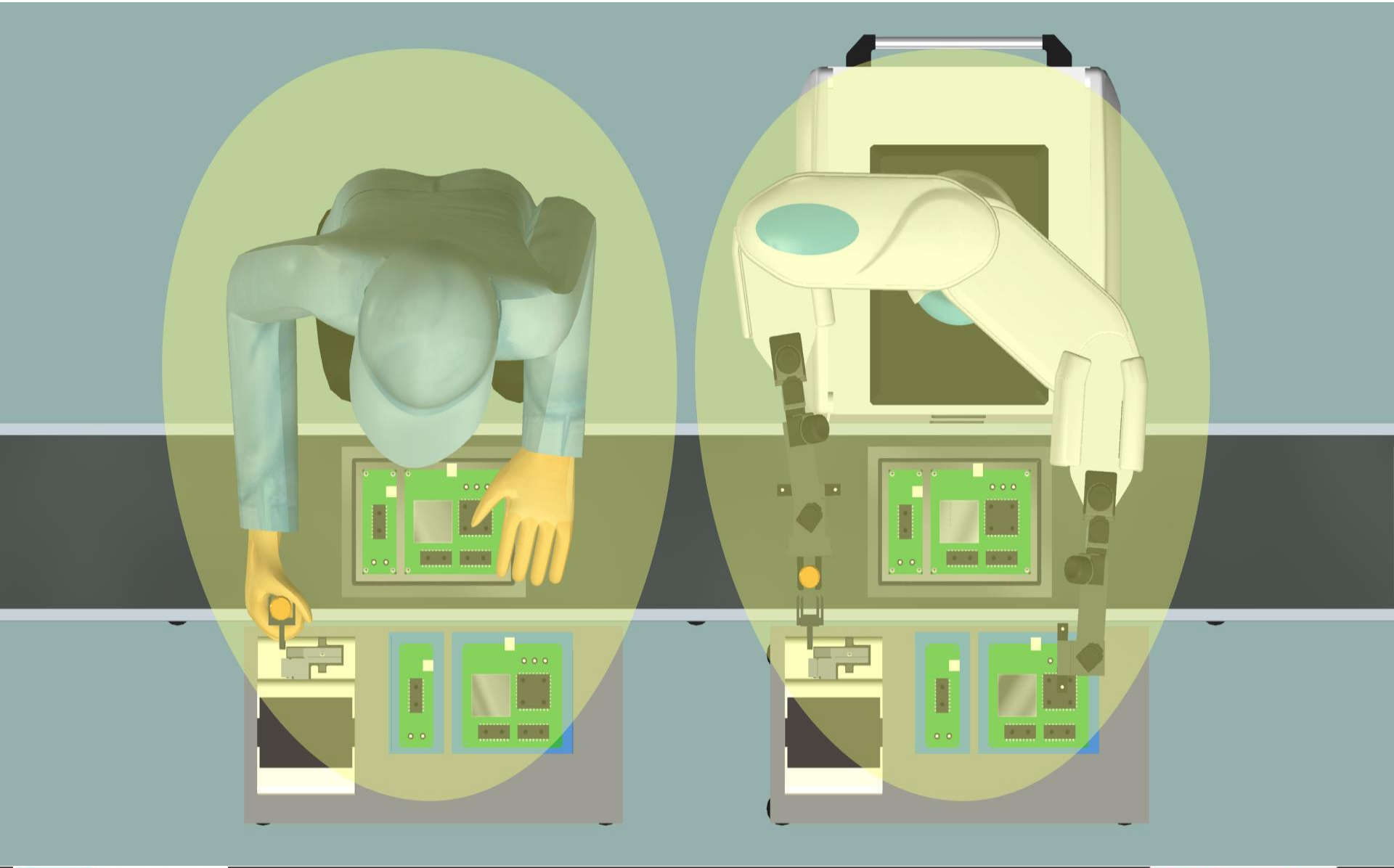
TIESSE ROBOT

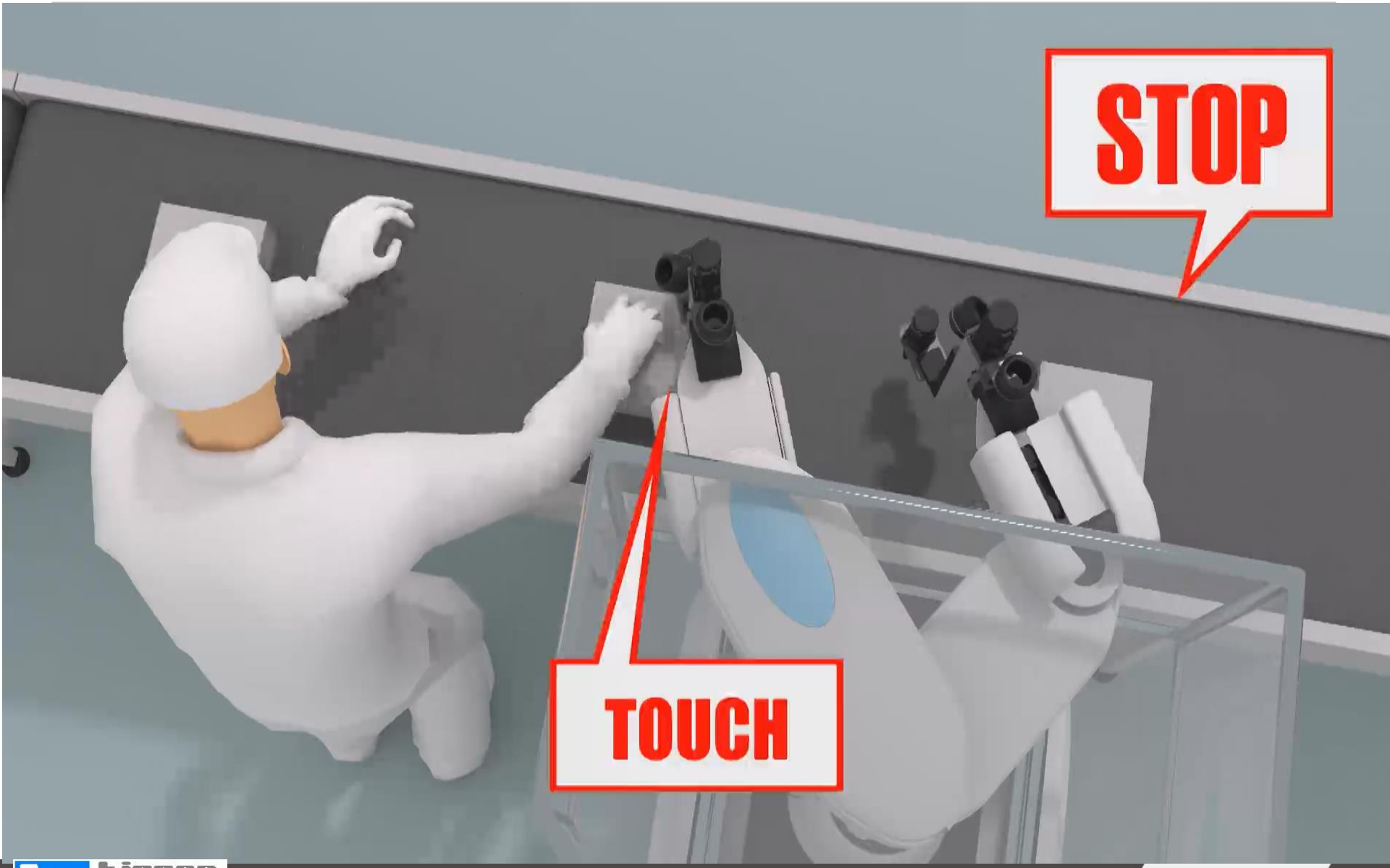
Fondata	**1976**
Capitale	**2.2 milioni Euro**
Sede	**Visano (Italy)**
Robot e Sistemi installati	**Oltre 5.500**
Dipendenti	**62**
Ufficio Progettazione	**9**
Fatturato 2017	**M€ 26**
Kawasaki Heavy Industry shares	**24,9%**

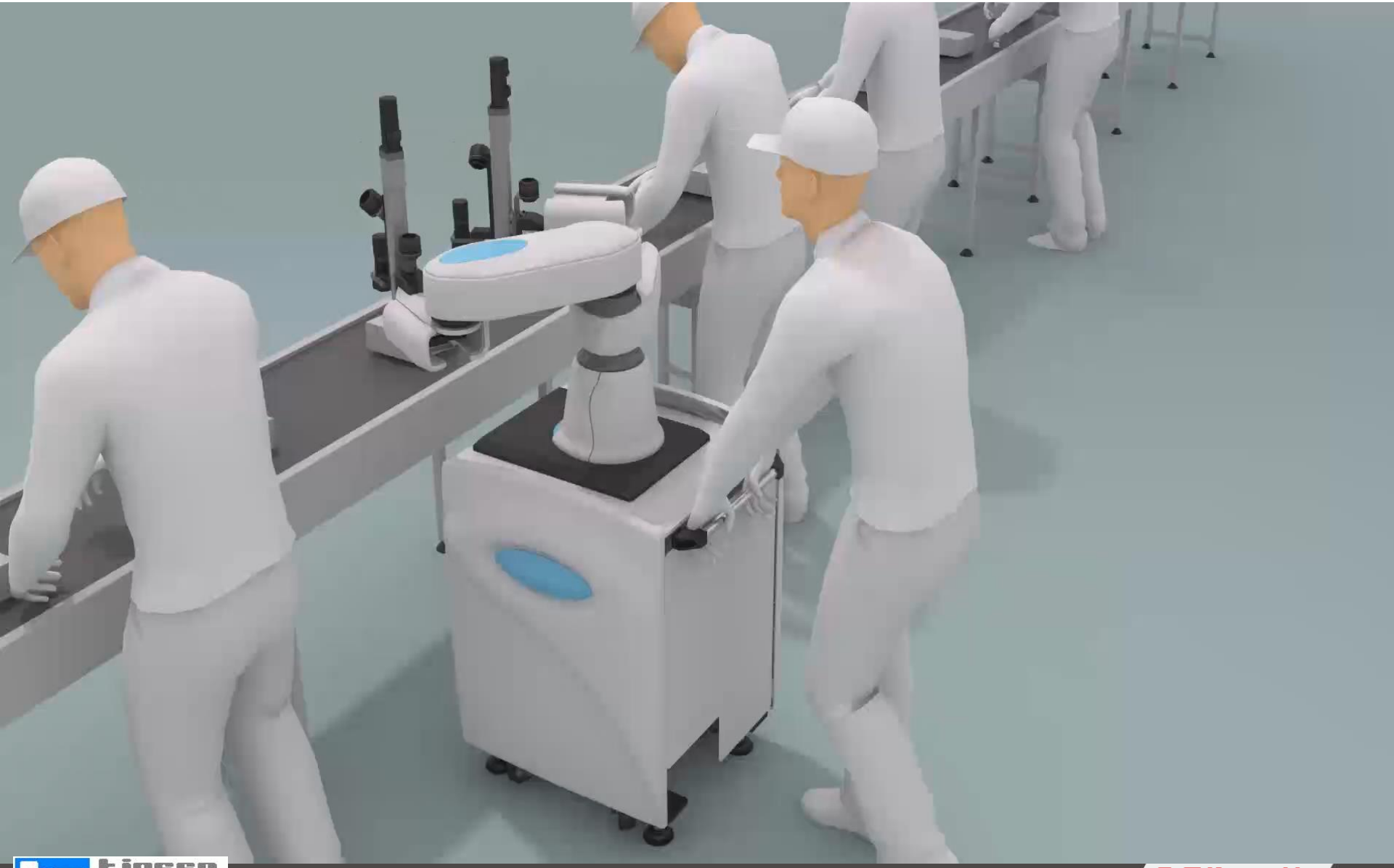


ROBOT UOMO-EQUIVALENTE

- DUE BRACCIA
- TRASPORTABILE
- COLLABORATIVO
- SEMPLICE
- VELOCE
- ECONOMICO







duAro

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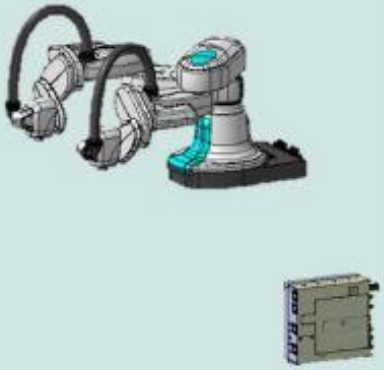
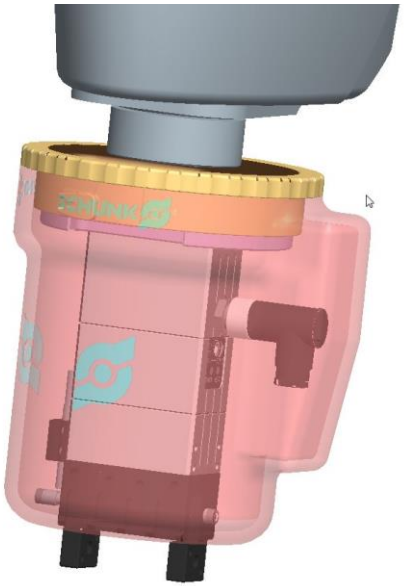
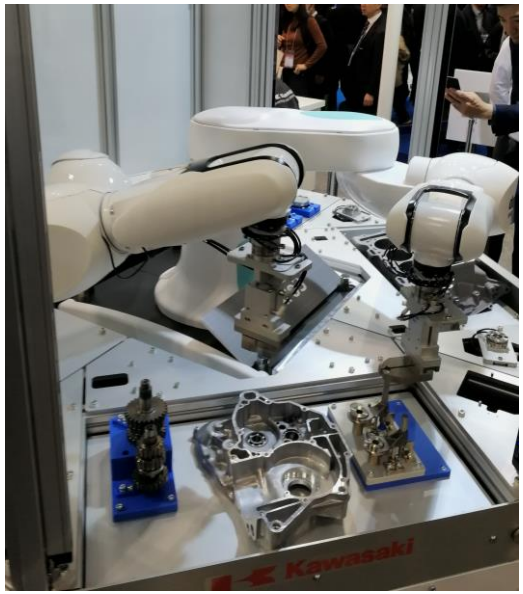
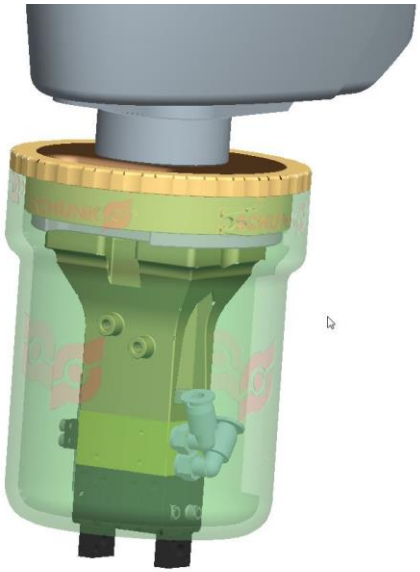
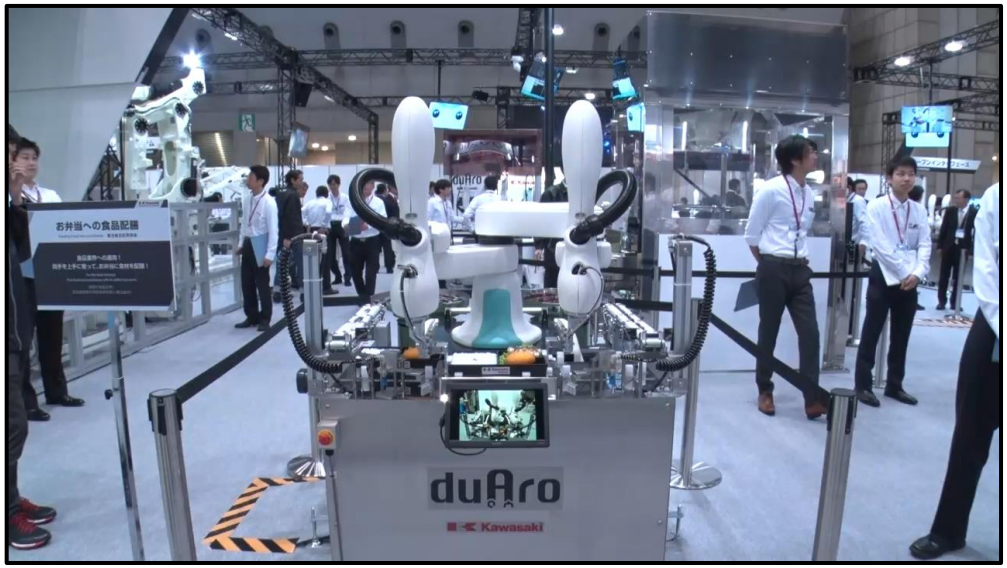
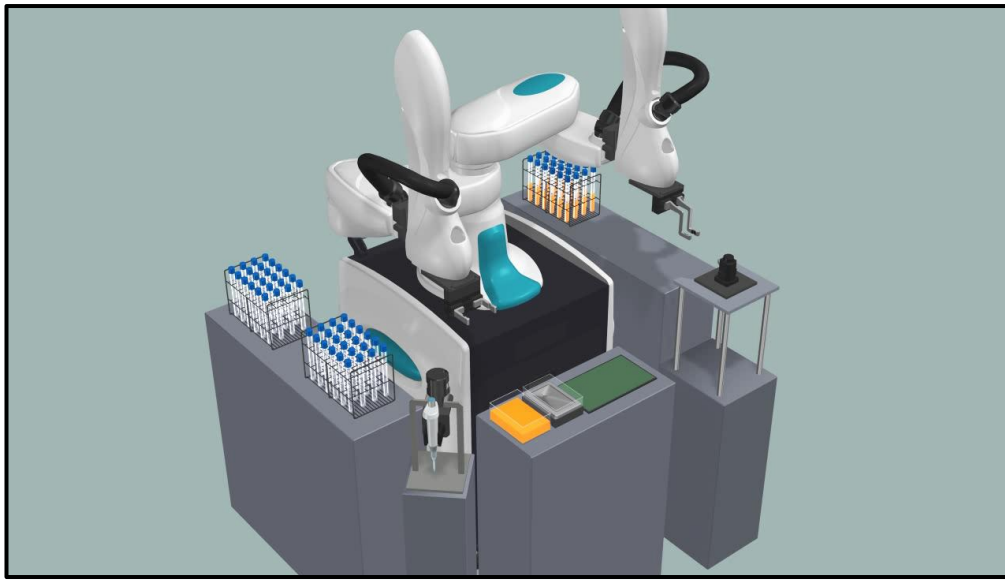
Model	duAro2 (Separated Type)	duAro2 (Whole Type)	duAro1 (Separated Type)	duAro1 (Whole Type)
Outview				











Human-Robot Cooperation Zone

Formatura cartone

Il robot si muove al comando vocale dell'operatore.

Convenience stores, (called konbini in Japan)

Reference: http://www.sej.co.jp

Onigiri (Rice Ball)

BENTO (Lunch Box)

Noodle (Pasta)

Human-Robot Cooperation Zone

Chiusura del bento boxes

Human-Robot Cooperation Zone

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Assemlaggio di Tablet

Remote Cooperation

Successor

Decremento forza lavoro

Perdita di Skill professionale

duAro

Utilizzo robot collaborativi

Proposta robotica per recupero abilità operativa

Supporto medico per incremento vita media

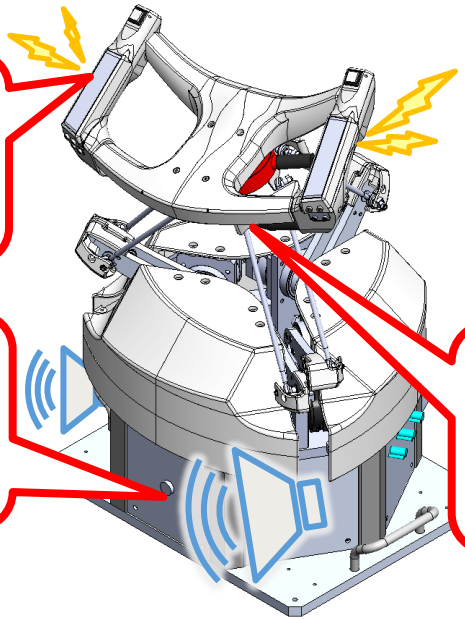
Proposte Robotiche

Dispositivo di comando remoto（Communicator）

Riproduzione dei sensi

Tocco
Vibrazione

Suono
percezione



Forza
Sensazione di impatto

Caratteristiche del Succesor (1/2)

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Con l'utilizzo del dispositivo comunicator che permette una cooparazione remota si realizzano:

- **Funzioni ibride**

- **Funzioni multicontrollo**

Caratteristiche del Successor(2/2)

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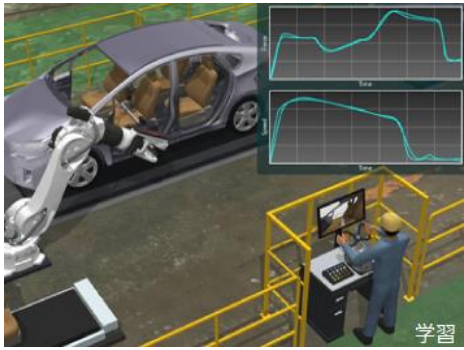
- **Conversione delle funzioni**

Il robot converte in operazioni automatiche quanto ricevuto da remoto.

- **Funzioni di intelligenza artificiale AI**

- **Funzioni di istruzione**

Il robot può trasferire le istruzioni ricevute a personale esperto ad altri operatori.



Operare e monitorare vari impianti da remoto

Network/IoT

Robot + AI

Plants in USA

Plants in Europe

Plants in Asia

Plants in Japan

Esempi di possibile applicazione del SUCCESSOR

Painting of large structures

Painting of ships and other large structures

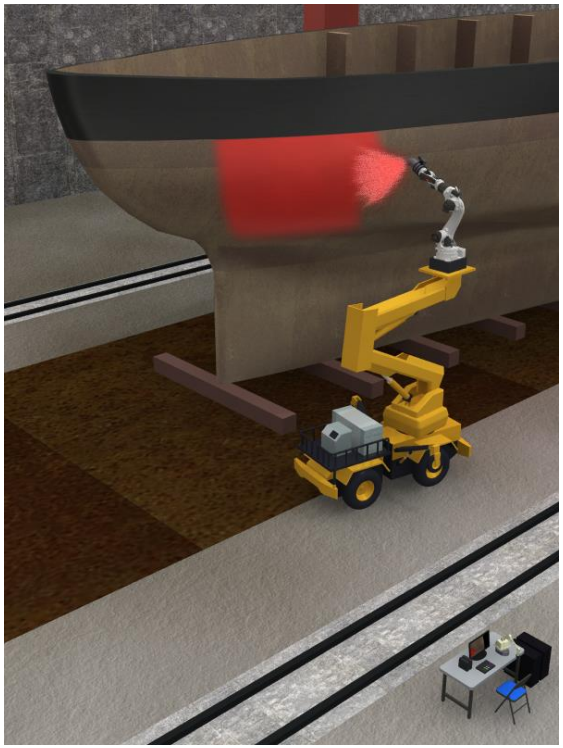
Human paints wide range.

High skill is required for difficult painting area (corner, bottom).

Painting of large structures

Painting of ships and other large structures

Landmarks indicated on a monitor screen

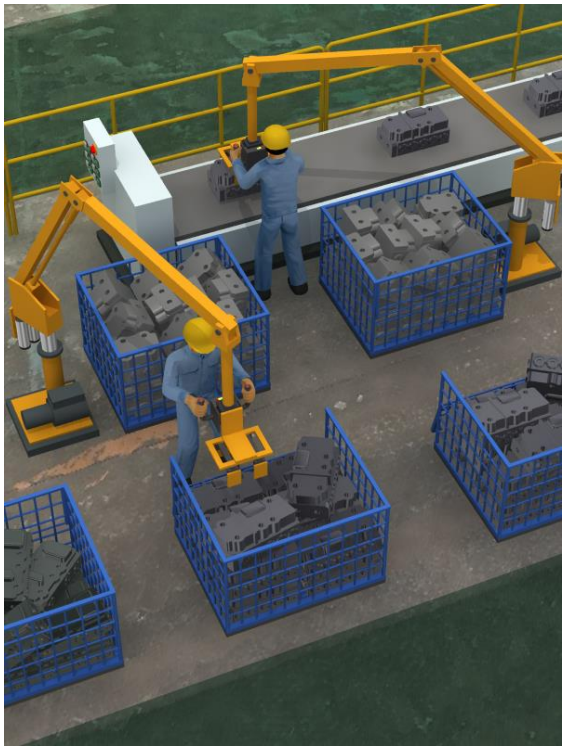


Automatic painting by KCONG information

Difficult sections are painted by remote operation

Handling and picking of heavy objects

Picking of valve casing → transfer → conveyor loading



Current operations

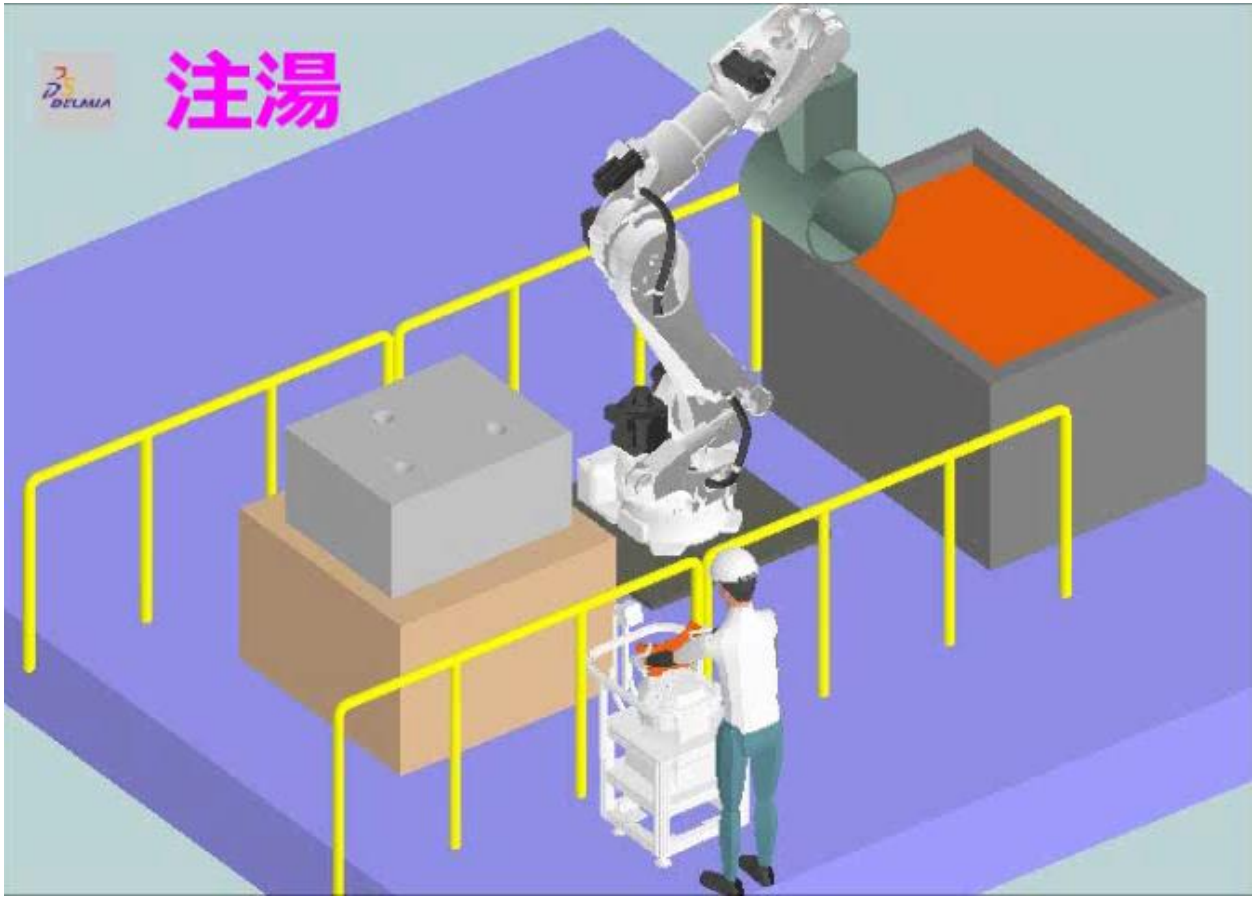
by human

Manual operations only for gripping
Automated operations for transfer and loading
(Semi-automatic)

Learning remote operation data and vision data
→ Full-automation

Casting process

Casting process (Pouring)



Operatore non è in area pericolosa

Cutting process

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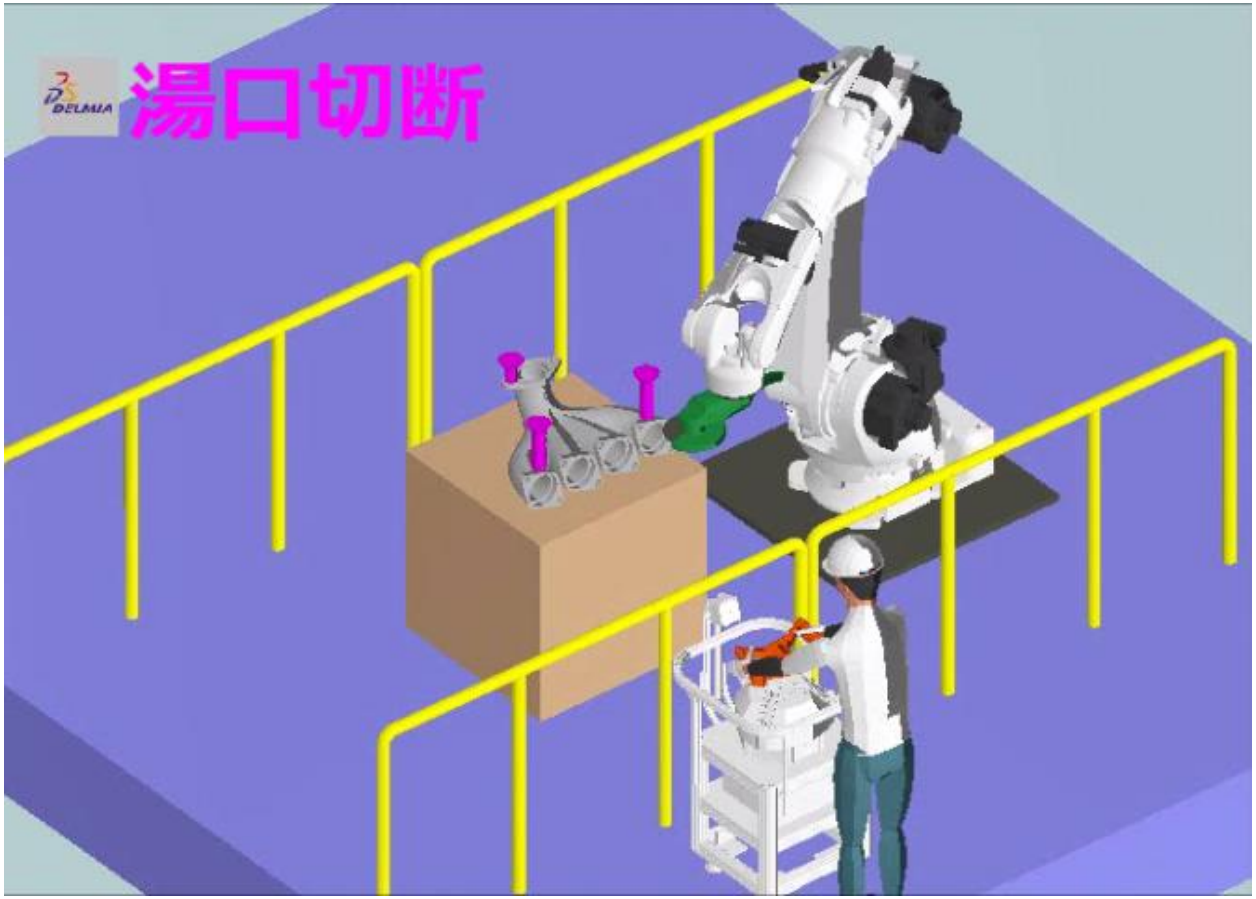
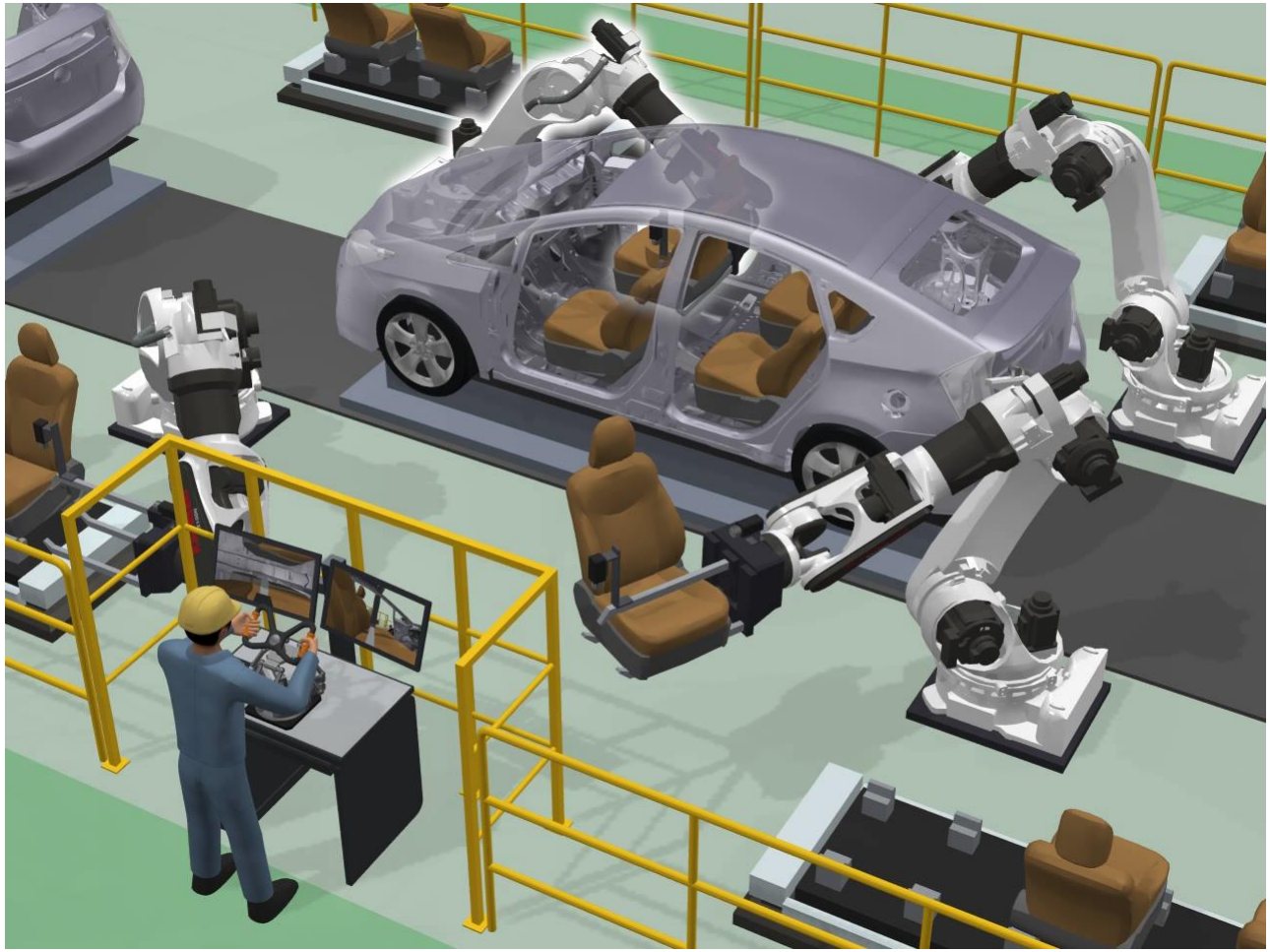
Gate cutting



Operatore non è in area pericolosa

Automotive industry

Assembling /outfitting process（Sheet）



Automotive industry

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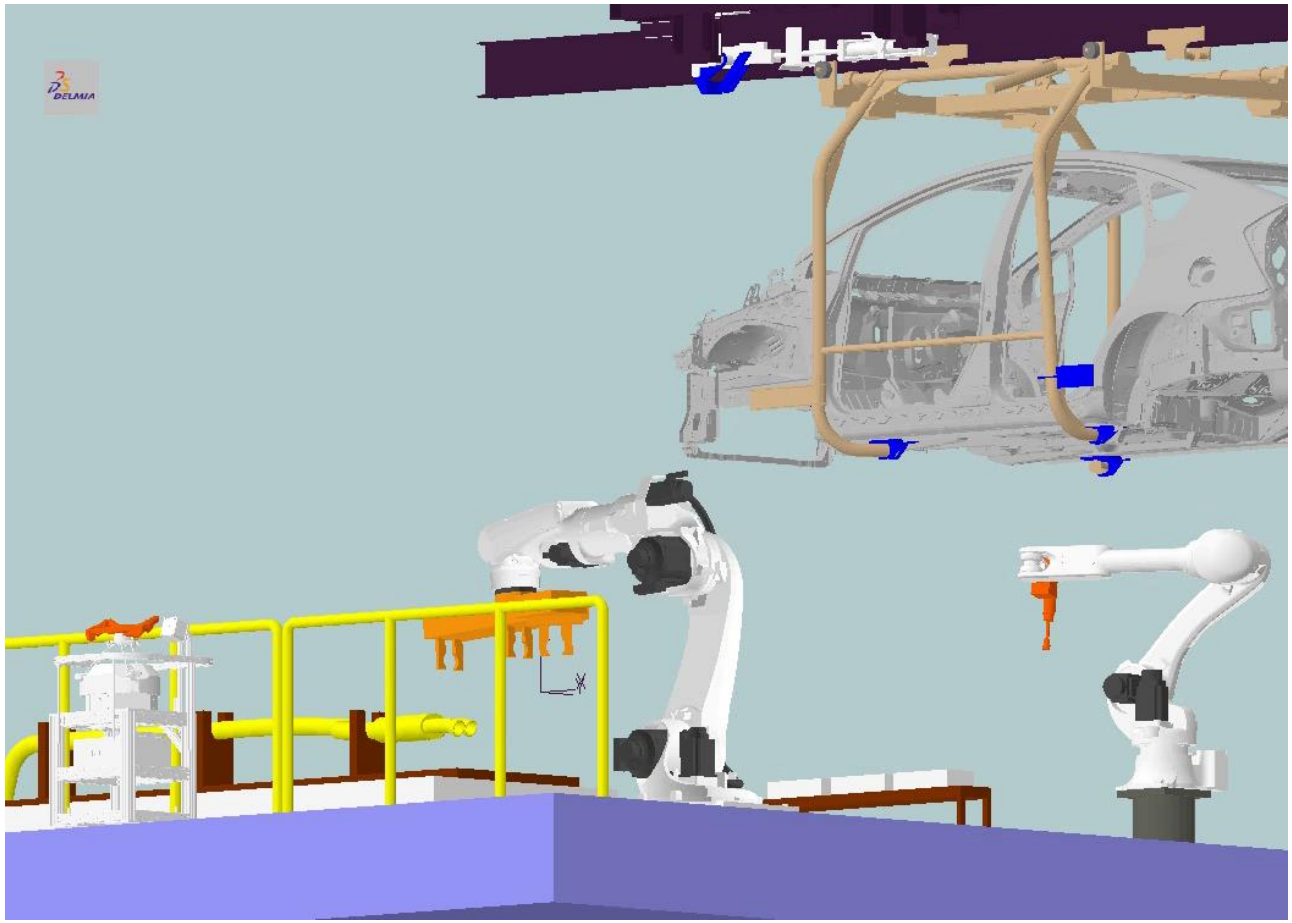
Assembling /outfitting process （Exhaust pipe）



Esempio di applicazione di funzioni di intelligenza artificiale AI

Successor AI Function

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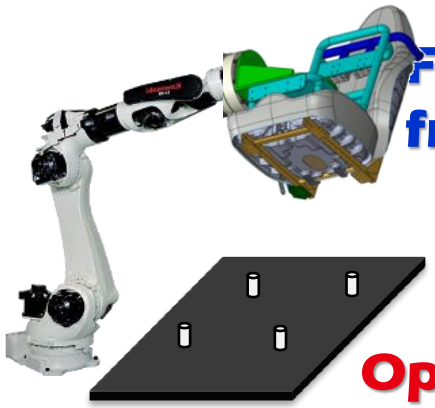
A I Function

Conversion to automatic operation by AI technology

Example of seat assembly

- The Assemble position is different for each work.(Unevenness)
- Operator is feeling pushing force during remote operation, searching assemble position.

Successor AI Function



Feedback pushing force and friction force to the operator

Operation to move the sheet

Operation according to the feedback force

Successor system can collect the time-trend data of feedback force and human operation as the operational record.
AI would learn the decision logic of the human operator with the human reaction via the various condition of the contact task.

Successor AI Function

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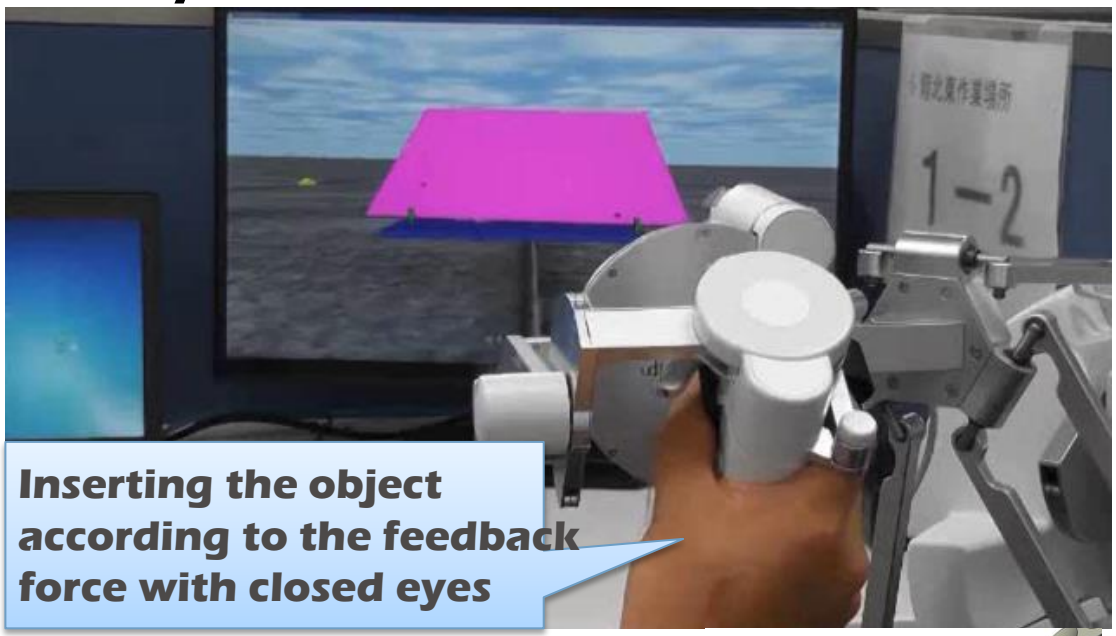
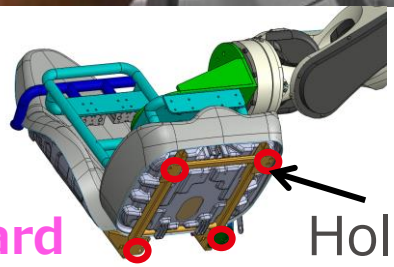
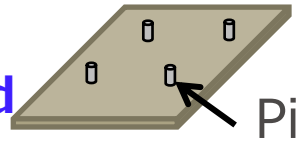
Test of learning algorism using the virtual simulation (in case of sheet assembly)



Collection of operational records





Successor AI Function

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Test of learning algorism using the virtual simulation

Step1:Learning by records for 22 times

↓

automatic operation

↓

Success rate 90%(27 of 30 times)

↓

Step2: Additional learning of the failure case.

↓

automatic operation

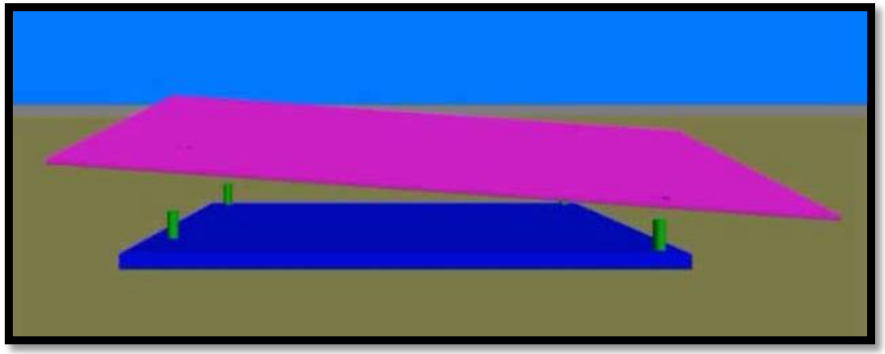
↓

Success rate 100%

- **Learning in small operation cases.**
- **Learning can be corrected on site.**

Failure case

・Unknown situation that did not be included at the operational records of Step1

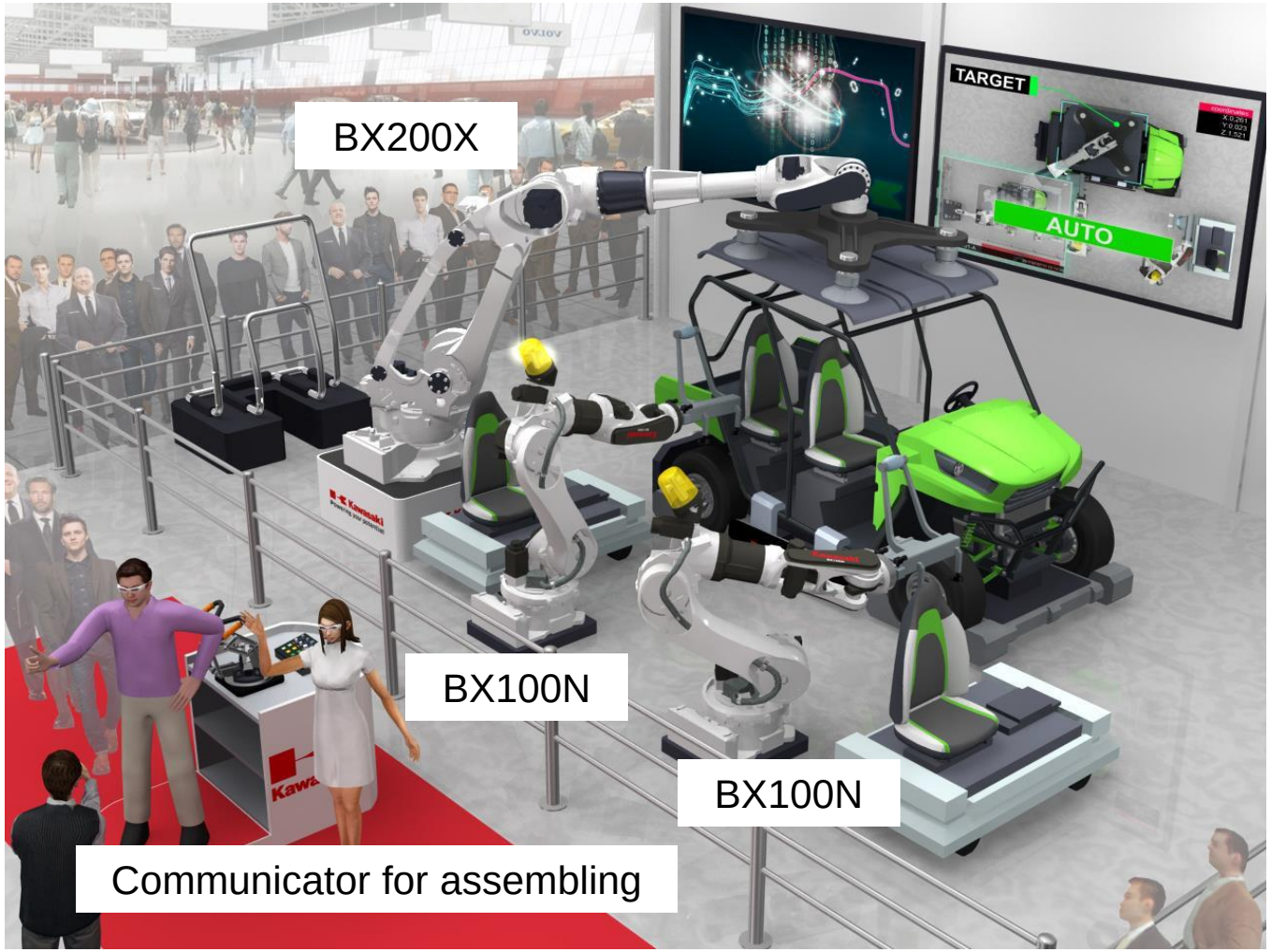


Automated control by AI function

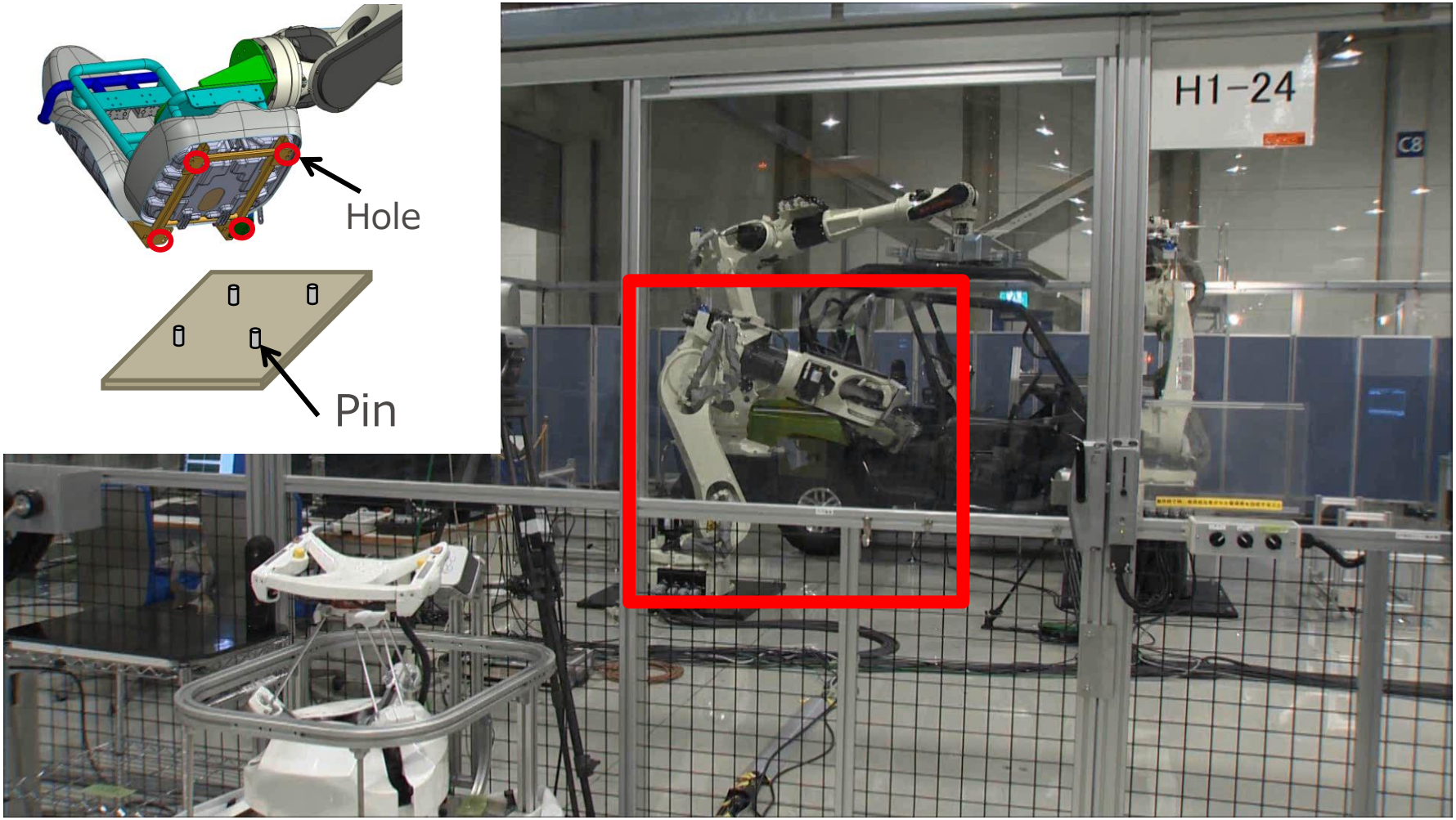
SUCCESSOR:

Dimostrazione di assemblaggio

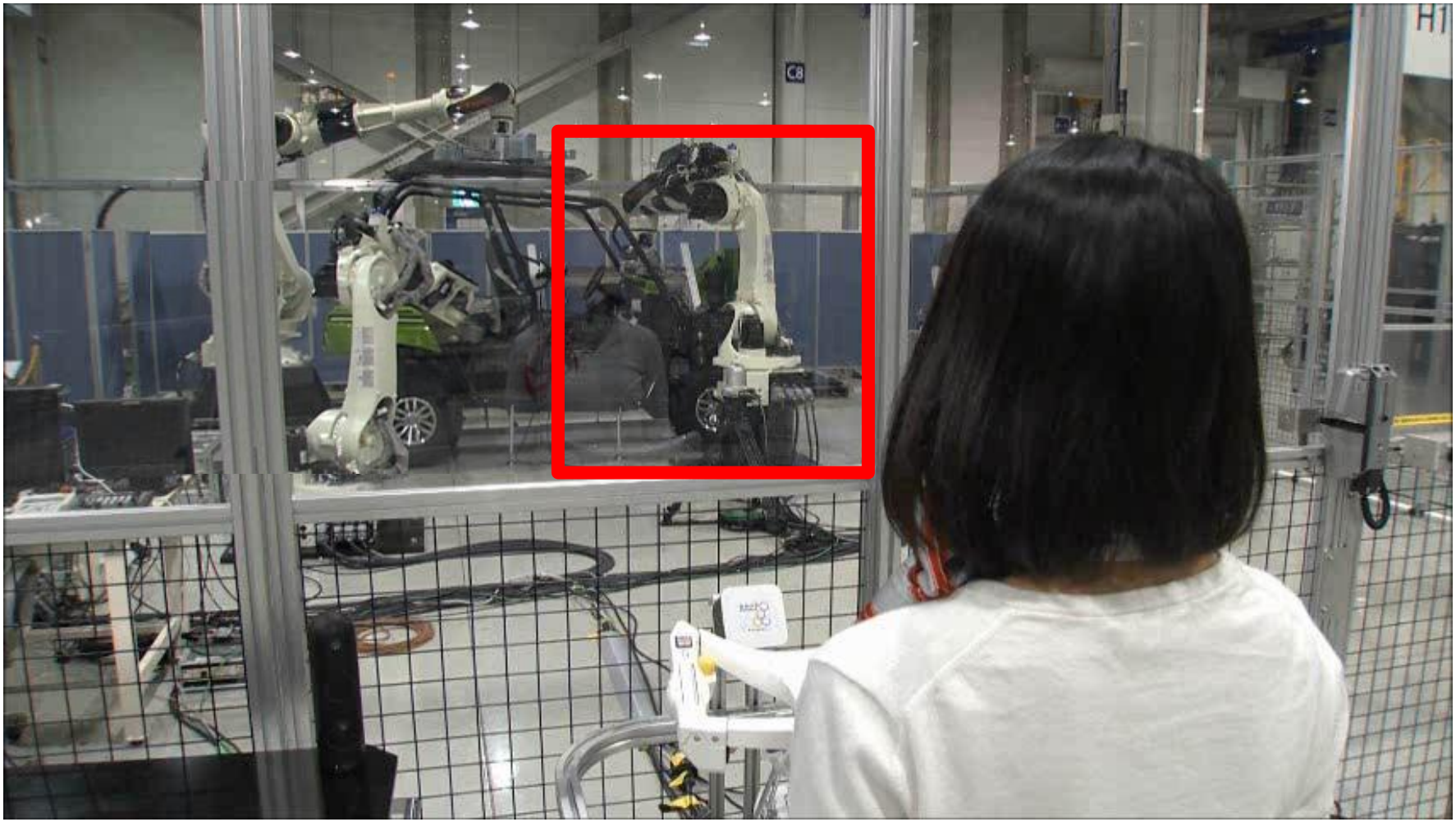
Assembling / outfitting process



Assembling / outfitting process



Assembling / outfitting process

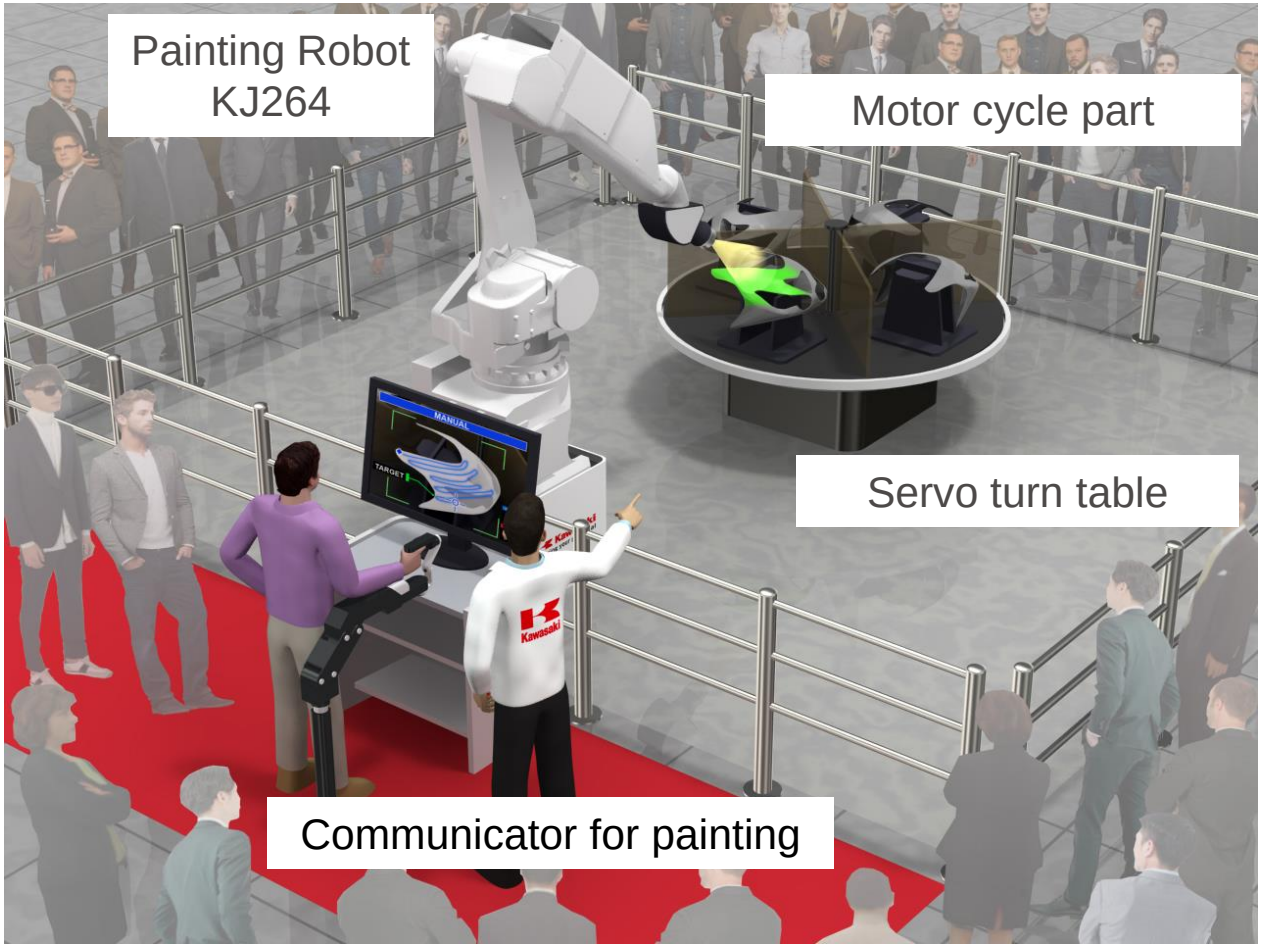


Assembling / outfitting process

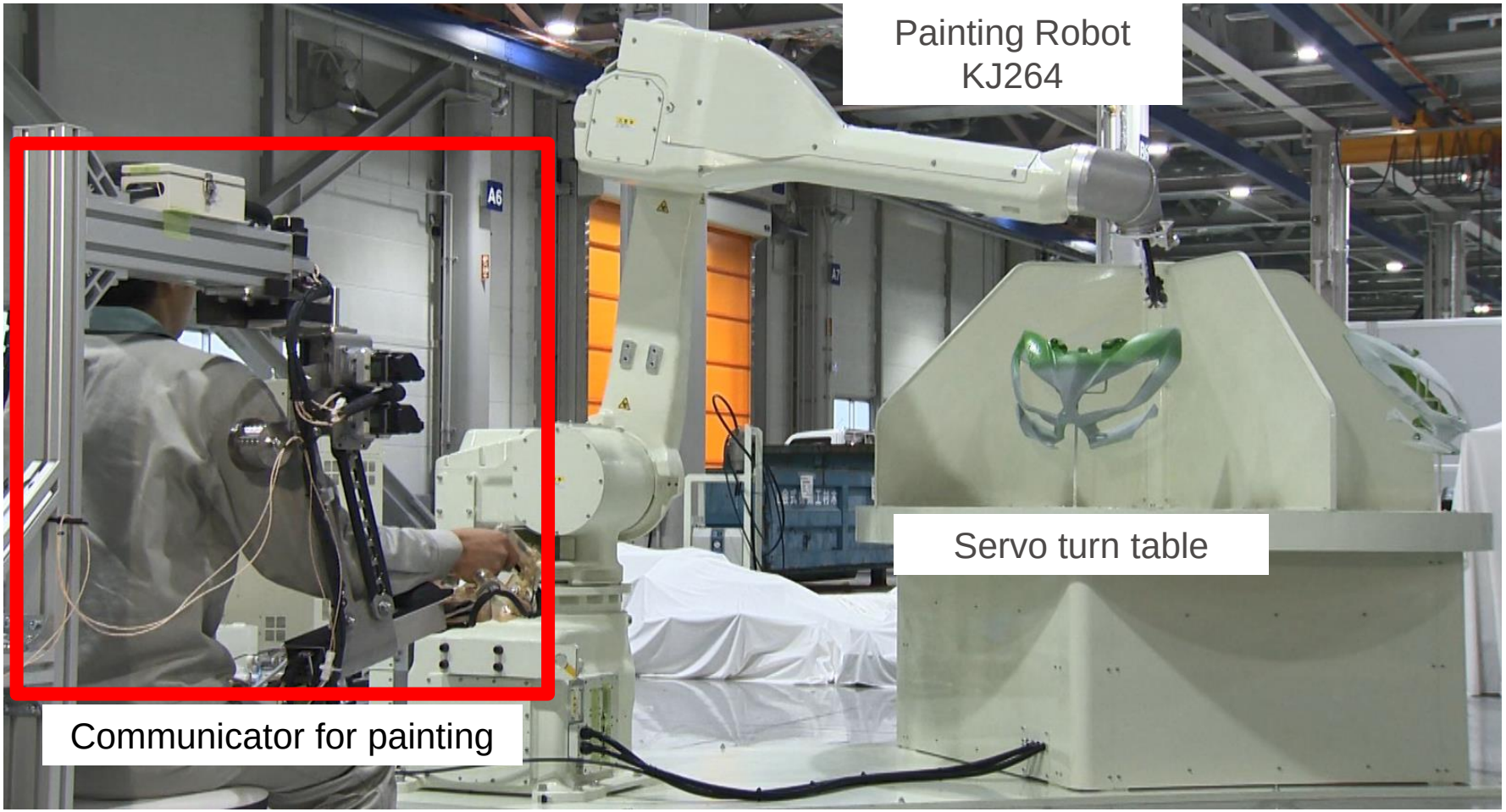
Assembling / outfitting process

SUCCESSOR:
Dimostrazione di vernicitura

Painting process



Painting process



Painting process

GRAZIE DELLA ATTENZIONE
E
BUONA VISITA ALLA FIERA