RAINBOW ROBOTICS

RAINBOW ROBOTICS
Company Introduction
English

WE TOUCH THE CORE

www.rainbow-robotics.com

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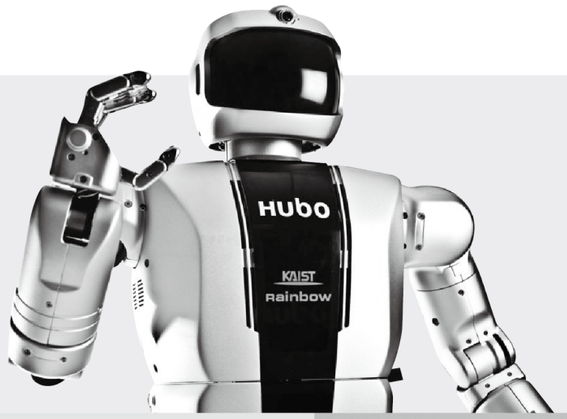

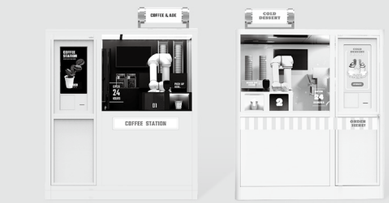

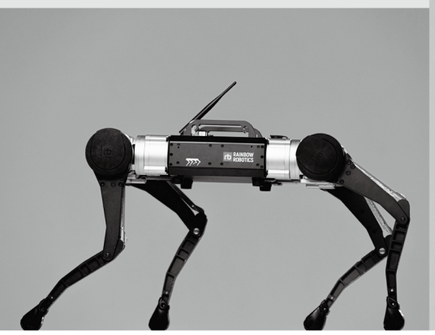

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Chapter

Introduction of Rainbow Robotics

Company Introduction

Rainbow Robotics is a robot platform specialist started by the researchers of HuboLab,
the Humanoid Robot Research Center of KAIST.
From the world's best disaster rescue robot to a collaborative robot developed in-house,
Rainbow Robotics strives to commercialize robots by securing unique technology from continuous R&D and introducing excellent cost-effective robots.

'We touch the core'

Rainbow Robotics strives relentlessly to become a leader in the robot industry through preeminent technologies.

CEO	Lee Jungho
Established date	02.10.2011
Publicly listed date	02.03.2021
Employees	75 people (as of June 30, 2023)
Address	10-19 Expo-ro 339beon-gil, Yuseong-gu, Daejeon
Website	www.rainbow-robotics.com

History

Rainbow Robotics leads changes driven by technology and robots to make life better.

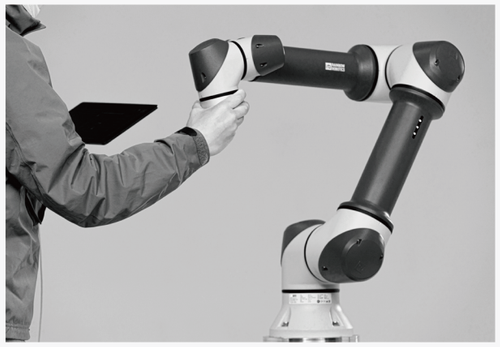
2011

2011.12
Exported six HUBO II units to MIT and others supported by U.S. NSF

2011.07
Signed a service agreement for MOUNT with the Korea Astronomy and Space Science Institute

2011.05
Established the company's R&D Center

2011.02
Established Rainbow Robotics Inc. (Originally Rainbow Co., Ltd.)



2013

2013.09
Exported two HUBO II units to Google Inc. in USA

2014

2014.01
Certified as a venture enterprise

2015

2015.12
Exported four units of DRC-HUBO+ to the Naval Research Laboratory, USA

2015.09
Operated MOUNT, the electronic and optical space object monitoring system by the Korea Astronomy and Space Science Institute

2015.06
Participated in the DARPA Robotics Challenge

2016

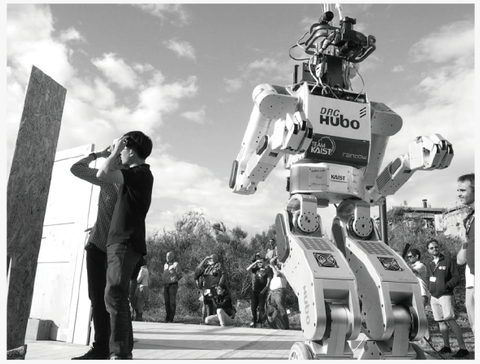
2016.02
Supplied mount drivers to LIG Nex1

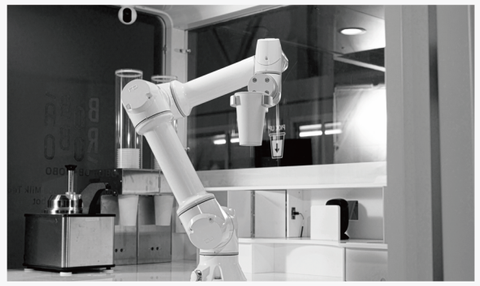
2017

2017.07
Attracting a venture capital investment of KRW 10 billion

2018

2018.02
Signed the service for the operation of humanoid robot experience services for the 2018 Pyeongchang Winter Olympic Games, the Korean Ministry of Trade, Industry and Energy





2019

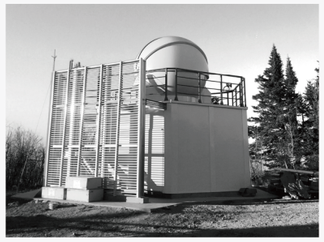
2019.07
Launched the RB series (collaborative robot)

2020

2020.08
Supplied an internal gimbal driving assembly and one other product to the LIG Nex1

2020.07
Signed a service contract to design a satellite monitoring telescope system with the Korea Astronomy and Space Science Institute

2020.04
Acquired the "ISO 9001:2015" Quality Certification



2021

2021.07
Completed Functional Safety TÜV certification (ISO 10218-1, ISO 13849-1, ISO TS 15066, IEC 61508, EN 62061, and IEC 61800-5-2)

2021.03
Acquired NSF Certification for the RB-N Series (NSF/ANSI 169)

2021.02
Listed on KOSDAQ (277810)

2023

2023.04
Established a branch company in Schaumburg, Illinois, U.S.A

2023.03
Samsung Electronics acquired 4.77 percent of Rainbow Robotics

2023.01
Samsung Electronics acquired 10.22 percent of Rainbow Robotics

Certification

1. RB Series

- Ensured robot stability by obtaining CE, NRTL, and KCs Safety Certifications through TÜV SÜD, a well-known overseas certification body (ISO 13849-1, PL d, Cat.3, & ISO 10218-1, ISO/ TS 15066)
- Systematization and procedure for quality assurance of corporate operations through Quality Management System Certification (ISO 9001)

Types of certifications	Subject	Application standard-certifying body	Proof of conformity
NRTL/CSA	Motor, drive-	UL 61800-5-1:2012/R:2021-02 CSA C22.2 No. 274:2017	TÜV SÜD
	Industrial Robot	CSA Z434:2014 UL 1740:2018/R:2020-11 NFPA 79:2021	
CE AOC (Autonomy Safety)	Motor, drive-	EN 61800-5-1:2007/A1:2017	
	Industrial Robot EMCD	EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-3-3:2013/A1:2019 EN 61000-6-2:2005 EN 61000-6-4:2007/A1:2011 EN IEC 61000-3-2:2019	
		EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-6-2:2005 EN 61000-6-4:2007/A1:2011 EN IEC 61000-3-2:2019/A1:2021	
	Industrial Robot MD	EN 60204-1:2018 EN ISO 10218-1:2011 EN ISO 12100:2010 Machinery Directive 2006/42/EC	
Functional Safety	Robot Safety Unit	IEC 61508-1:2010 (SIL 2) IEC 61508-2:2010 (SIL 2) IEC 61508-3:2010 (SIL 2) EN 62061:2005/A2:2015 (SILCL 2) EN ISO 13849-1:2015 (Cat. 3, PL d) EN ISO 10218-1:2011 ISO TS 15066:2016 IEC 61800-5-2:2016	
CE AOC (Autonomy Safety)	Motor, drive- Low voltage	EN 61800-5-1:2007/A1:2017	
NRTL	Motor, drive-	UL 61800-5-1:2021	
CE AOC (Autonomy Safety)	Industrial Robot EMCD	EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-6-2:2005 EN 61000-6-4:2007/A1:2011	
	Industrial Robot MD	EN 60204-1:2018 EN ISO 10218-1:2011 EN ISO 12100:2010 Machinery Directive 2006/42/EC	
	Motor, drive- Low voltage	EN 60034-1:2010 EN 61800-5-1:2007	
CE AOC (Autonomy Safety)	Industrial Robot EMCD	EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-6-2:2005 EN 61000-6-4:2007/A1:2011	TÜV SÜD
	Industrial Robot MD	EN 60204-1:2018 EN ISO 10218-1:2011 EN ISO 12100:2010 Machinery Directive 2006/42/EC	
KCs (Confirmation Report)	Industrial robots	-	KOSHA

2. RB-N Series

- The RB-N Series robot is certified by the National Sanitation Foundation (NSF) for safe and hygienic use in the F&B market, and is designed for use as a single product without installing a jacket or supplementary devices on it.

Types of certifications	Subject	Application standard-certifying body	Proof of conformity
NSF	Collaborative Robot Arm	NSF/ANSI 169: Special purpose food equipment and devices	NSF International

RB Series

RB-N Series

Patents

- An intellectual property management company that differentiates itself in peforming intellectual property management activities
- 17 domestic patents and 12 pending patents, 36 foreign patents, 12 pending trademarks, 11 domestic trademark registrations, and 7 foreign trademark registrations

Major patents in S. Korea and other countries

Name	Registration no.
REAL-TIME CONTROL SYSTEM, REAL-TIME CONTROL DEVICE AND SYSTEM CONTROL METHOD	US 11,135,719 B2
REAL-TIME DEVICE CONTROL SYSTEM HAVING HIERARCHICAL ARCHITECTURE AND REALTIME ROBOT CONTROL SYSTEM USING SAME	US 10,857,672 B2
GPOS-CONNECTED REAL-TIME ROBOT CONTROL SYSTEM AND REAL-TIME DEVICE CONTROL SYSTEM USING SAME	US 10,864,635 B2
STATOR COIL WINDING MACHINE	US 11,368,075 B2
SERIES ELASTIC ACTUATOR, METHOD FOR CONTROLLING SERIES ELASTIC ACTUATOR AND SYSTEM THEREOF	US 11,431,222 B2
DEVICE FOR BRAKING DRIVE SHAFT	EP 3756837 B1
リアルタイム制御 システム、リアルタイム制御装置及びシステムの制御方法	JP 6836585
GPOS連動型リアルタイムロボット制御システム及びこれを用いたリアルタイムデバイス制御システム	JP 6771027
階層的なアーキテクチャを有するリアルタイムデバイス制御システム及びこれを用いたリアルタイムロボット制御システム	JP 6938473
实时控制系统、实时控制装置及统控制方法	CN 108025436 B
具有分层架构的实时设备控制系统及利用其的实时机器人控制系统	CN 108136578 B
스테이터 코일 권선 장치	KR 10-2235169, 10-2256187, 10-2280446, 10-2280447, 10-2280448
구동축 브레이킹 장치	KR 10-2235169
계층적 아키텍쳐를 갖는 실시간 디바이스 제어 시스템 및 이를 이용한 실시간 로봇 제어 시스템	KR 10-2235168
스텝 기반 실시간 디바이스 시스템 제어 방법, 디바이스 시스템 제어 장치 및 스텝 기반 디바이스 제어 시스템	KR 10-2235167
실시간 로봇 시스템, 로봇 시스템 제어 장치 및 로봇 시스템 제어방법	KR 10-2235166

Awards

- The following cases represent public recognition of Rainbow Robotics' R&D outcomes.

Year	Awards	Awarding Organizations
2022	USD-One Million Export Tower 2022 Korea Engineering Prize (Director Oh Jun-ho) 17th Korea Robot Award (CEO Lee Jeong-ho) 29th Korea Impact Award (World's first NSF-certified collaborative robots, RB-N Series)	Ministry of Industry, Trade and Energy Korean Academy of Science and Technology Ministry of Industry, Trade and Energy Ministry of Science and ICT
2018	Selected as Top 100 Future Technology Stars to lead S. Korea (CEO Lee Jeong-ho)	Korean Academy of Science and Technology
2016	Ho-Am Prize (Director Oh Jun-ho) Changjo Medal of Order of Science and Technology Merit (Director Oh Jun-ho)	The Ho-Am Foundation Ministry of Science, ICT and Future Planning
2015	DARPA Robotics Challenge Finals 1st	DARPA

Chapter 2

Business Domain and Main Products

Core Technology

1 **Real-time operating system**
Controlling all of the robot's movements to achieve the objective

2 **Imaging sensors to detect the external environment visually**
Sensors in autonomous vehicles

3 **Inertial sensors to measure the inclination of the ground and robot**
Measuring and detecting motion

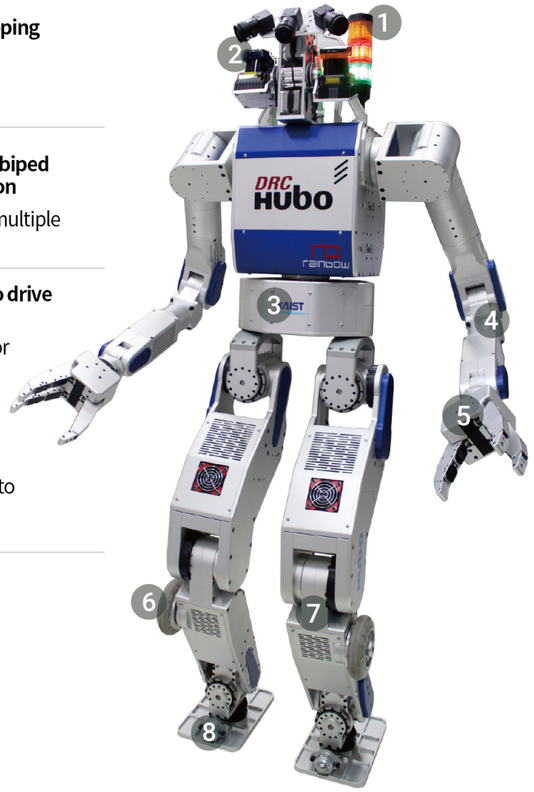
4 **Redundant robot arms to perform various tasks**
Able to be operated even in an undefined environment with more than 6 degrees of freedom

5 **Adaptive robot hands capable of gripping various objects**
Gripping any object shape

6 **Transformable robot legs capable of biped walking/ wheel driving transformation**
A ground vehicle capable of achieving multiple purposes

7 **Drive controller and speed reducer to drive each joint**
Internalization of motor and decelerator technology, which are the main driving components

8 **Real-time operating system**
Controlling all of the robot's movements to achieve the goal



Business Domain

As a company specializing in robot platforms with preeminent technology, Rainbow Robotics devotes steadfast efforts to commercialize robots by securing innovative technology with continuous R&D and selling cost-effective excellent robots.


Collaborative robots


Precision pointing mount

Legged robots

Collaborative Robots Working with Humans

RB Series

Rainbow Robotics' RB series cobots feature 6-axis robotic arms, developed using our exclusive technology. With multiple options available(RB3-730, RB3-1200, RB5-850, RB10-1300 and RB16-900), these cobots cater to diverse needs in various work environments. Our RB cobots undergo thorough testing and inspection by TÜV SÜD, a globally renowned certification body. They are certified with NRTL, CSA, CE and KCs, meeting the following standards.

- ISO 13849-1, Cat.3, PL d
- ISO 10218-1
- ISO/TS 15066

RB3-730 RB5-850 RB16-900 RB3-1200 RB10-1300

RB series lineup

- RB3-730
- RB5-850
- RB16-900
- RB3-1200
- RB10-1300

Range of Applications

- Packaging
- Welding
- Assembly
- Quality inspection
- Adhesion spreading
- Picking and placing
- Laser marking
- UT welding
- Injection molding
- Photography and video shooting
- CNC machine tending
- 3D scanning

Main features

- Securing a high performance and price competitiveness by internalization of core components
- Collaborative robots with built-in humanoid robot technology
- User-friendly software

Options with built-in pneumatics (A1, A2, A3)

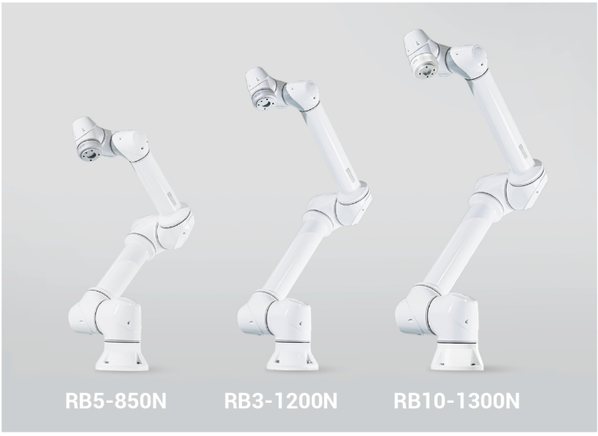
Model Name	Pneumatics lines	Signal lines
RB5-850A1	4EA(4Ø tube)	N
RB5-850A2	5EA(4Ø tube)	12Pin(AWG28)
RB3-1200A1	4EA(4Ø tube)	N
RB3-1200A2	5EA(4Ø tube)	12Pin(AWG28)
RB10-1300A1	1EA(8Ø tube)	N
RB10-1300A2	1EA(8Ø tube)	12Pin(AWG28)
RB10-1300A3	4EA(4Ø tube)	N

※ Some specifications may be changed to improve performance.
※ When applying the option, it is necessary to check the operating scope and environment.

The world's first NSF-certified collaborative robots,

RB-N Series

The RB-N Series robot is certified by the National Sanitation Foundation (NSF) for safe and hygienic use in the F&B market and is designed for use as a single product without installing a jacket or supplemental devices on it. The RB-N Series consist of 3 types: RB5-850N, RB3-1200N, and RB10-1300N Series and can be appliedin various food and beverage industries, such as deep fryers using high-temperature oil and espresso machines that extract high-pressure steam.



RB5-850N RB3-1200N RB10-1300N

RB-N Series lineup

- RB5-850N
- RB3-1200N
- RB10-1300N

Range of Applications

- Unmanned cafe platform (Coffee, aid, milk tea and cocktails)
- Soft cone ice cream robot
- Waffle-making robot
- Chicken cooking robot
- Kitchen utensil washing robots, etc.

Key Features

- NSF Food Sanitation Safety Certification
  - Safety certification for food processing equipment and related parts for particular purposes (NSF/ANSI169)
  - Qualification by NSF for production facilities
- Cooking robots that are harmless to the human body
  - Using special paint that does not emit harmful substances
  - Ensuring a safety level to cook the food twice, even if it comes into contact with the robot
  - Passed a crash test (proof that foreign matter such as paint materials occurring in the event of a collision is non-hazardous to human health)
- Use of durable fasteners
  - Using special SUS fasteners that do not cause rust
  - Using coupling rings with proven high temperature, high strength, high rigidity, low moisture absorption rate, fatigue resistance, creep resistance, and hygiene
- Increased user convenience
  - 6-axis robot arms with IP66 waterproof and dustproof rating
  - A single robot product that can reduce the hassle of switching jackets and be cost-effective

A robot cafe platform created by a collaborative robot manufacturer,

Rainbow Robot Cafe

The Rainbow Robot Cafe, developed in-house by the collaborative robot manufacturer Rainbow Robotics, provides an optimized operating system featuring a compact platform. It is equipped with a collaborative robot certified by the U.S. NSF to be operated more safely and conveniently.
Experience an unmanned robot cafe platform where you can enjoy various drinks anytime, anywhere.

Robot cafe product lineup

- Coffee & ade refreshement
- Ice cream & slushies

Range of Application Sites

- Rest areas
- Cafes
- Enterprises
- Government offices
- Hospitals
- Hotels
- Building lobbies
- Libraries
- Large exhibition halls
- Commercial facilities such as department stores & shopping malls
- Cable cars, observatories, observatories, aquariums, etc.

Main Features

24-hour unmanned operation	Collaborative robots enabling unrestricted operation round-the-clock-, 7 days a week
Cost-effective price	Collaborative robot manufacturer Rainbow Robotics directly develops and provides all solutions cost effectively.
Compact size	The compact size allows for operation in minimal space occupied. (1500 x 1700 x 1950 mm)
The average drink-making time of 50 seconds	Many beverages can be manufactured in a short time.
Non-face-to-face ordering and payment	The automated manufacturing and order/ payment system enables providing non-face-to-face services.
Maximizing income generation	Income generation is maximized through minimized labor costs with a complete unmanned system.
The world's first NSF-certified robot	The only robot in S, Korea that has received international sanitary safety and quality certification can manufacture beverages hygienically.
Built-in kiosk	The built-in kiosk only requires installing one platform without taking up extra space.
Easy management system even for laymen/ novices	Remote management solutions can check and manage remaining beverage levels, payment errors, etc.

Astronomical observation equipment with precision robot control technology

Astronomical observation mount

An astronomical observation mount is an ultra-precision pointing device for observing outer space objects, i.e. planets, stars, and satellites, from the ground. Rainbow Robotics has developed an astronomical mount based on humanoid robot technology, and unlike conventional mounts, it does not use weights, offering excellent portability.

A lineup of mounts for astronomical observation

- RST-135
- RST-135E
- RST-300

Range of Applications

- Mobile observation
- Remote observatory
- Educational observatory
- For defense industry
- satellite tracking, etc.

Main Features

- No need to add weights
- Ultra-light and compact
- Wave gear reducer (harmonic drive)
- CNC machining
- Wi-Fi
- GPS receiver
- Built-in home sensor

	RST-135	RST-135E	RST-300
Body weight	3.3 kg (7.3 lb)	3.4 kg (7.5 lb)	8.5 kg (18.7 lb)
Size	14.4x13.1x19.5cm	14.4x13.1x20.5cm	18.3x17.5x27.9cm
Mount weight (with no weight)	13.5 kg (30 lb)		30 kg (66 lb)
Mount weight (with weight)	18 kg (40 lb)		50 kg (110 lb)
Maximum speed	1,800x (7.5 deg/sec)		1,200x (5deg/sec)
Output stage encoder	X	Built into the rightscension axis Product by UK-based Renishaw	X
Cycle error	-	±2.5 arcsec	-
Input power	DC 12V ~ 16V		
Recommended telescope	Up to 8-inch or 5-inch reflector		Up to 14-inch or 7-inch refractor

A quadruped walking robot made with indigenous, in-house technology

RBQ Series

The RBQ series is a quadrupedal robot that can perform a variety of tasks in an unstructured and complex environment. It is a platform that allows you to walk through both rough and wild areas, and it can be equipped with various sensors such as LiDAR and cameras. It can also be used for crime prevention patrol, detection of dangerous goods, transportation of goods, and safety inspection.

Product Specifications

RBQ-3

- Size: 400 X 600 X 500 mm
- Weight: 25 kg
- Payload: 3 kg
- Operating hours: Up to 3 hours when fully charged (2 hours of continuous walking)
- Maximum speed: 7.2 km/h

RBQ-10

- Size: 945 X 440 X 565 mm
- Weight: 37 kg
- Payload: 10 kg
- Operating hours : Up to 3 hours when fully charged (1 hour and 30 minutes of continuous walking)
- Maximum speed : 4 km/h

Special Features

- External impact-resistant walking control algorithms
- Easy operation using a remote control
- To be equipped with various sensors such as lidars and cameras
- Up to 20 cm stairs (based on RBQ-10)
- Battery detachable (based on RBQ-10)
- Waterproof IP 65 grade (based on RBQ-10)

Scope of Applications

- **Military sector**
  - Surveillance, reconnaissance, dangerous object detection, etc.
- **Fire-fighting safety**
  - Detecting survivors and dangerous goods, transporting goods through narrow passages, etc.
- **Safety inspections**
  - Safety inspection of piping, narrow passages, etc.
- **Security patrols**
  - Constant patrol, risk detection, and alarms
- **Convenience functions**
  - Convenience functions such as serving and guidance
- **Logistics functions**
  - In-plant parts transfer, last-mile logistics within an apartment complex, etc.

Chapter 3

Applications

Applications

Collaborative Robots

CNC machine tending
- CNC operation
- Input and discharge of processed products, etc.

Welding
- Arc welding
- Pulse welding
- Weaving welding
- Specimen welding, etc.

Packaging
- Automated packaging process
- Product/ box packaging, etc.

Injection molding
- Automated injection process
- Collection of injection products, etc.

Assembly
- Plastic, wood, metal, furniture assembly, etc.

Picking and placing
- Manufacturing automation process
- Loading/ unloading, etc.

Quality inspection
- 3D scanning
- Machine vision inspection
- Defect inspection, etc.

Adhesive/ application
- Application of adhesives, finishes, adhesives, chemicals, etc.
- Quarantine system

Logistics
- Logistics automation
- Transport and loading
- Palletizing

F&B
- Unmanned cafe platform
- Soft ice cream
- Kitchen cooking
- Waffle making
- Cleaning kitchen utensils

For research/ education
- R&D
- Training at educational institutions, etc.

Photographing
- 3D facial scanning
- Video and photo shooting

Precision Pointing Mount

for military purposes
- Satellite observation and tracking
- Close-range defense system
- High-resolution image acquisition
- Radar for collecting information

For astronomical observation
- Unmanned stargazing
- Astronomical photography

Biped walking robot

for research and education
- R&D, educational institutions, etc.

For exhibitions and entertainment
- Science museum exhibition/ demonstration, etc.

For disaster rescue
- Surveillance, reconnaissance, dangerous object detection, etc.

Quadruped walking robot

Military sector
- Surveillance, reconnaissance, dangerous object detection, etc.

Fire-fighting safety
-Detecting survivors and dangerous goods, transporting goods through narrow passages, etc.

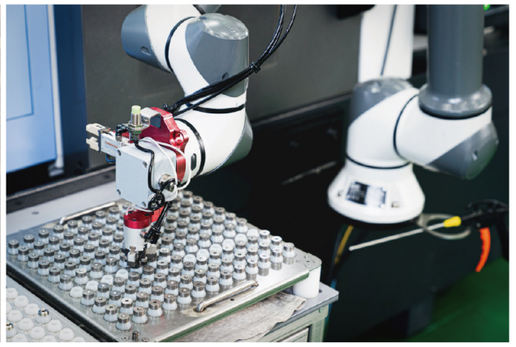
Safety inspections
- Safety inspection of piping, narrow passages, etc.

Security patrols
- Constant patrol, risk detection, and alarms

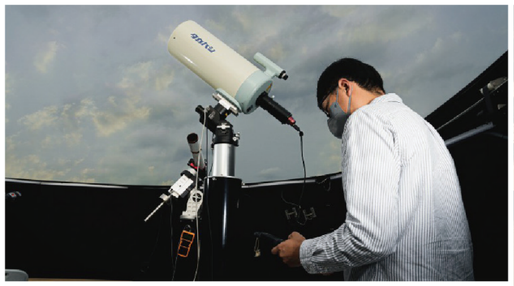
Convenience functions
- Convenience functions such as serving and guidance

Logistics functions
- In-plant parts transfer, last-mile logistics within an apartment complex, etc.

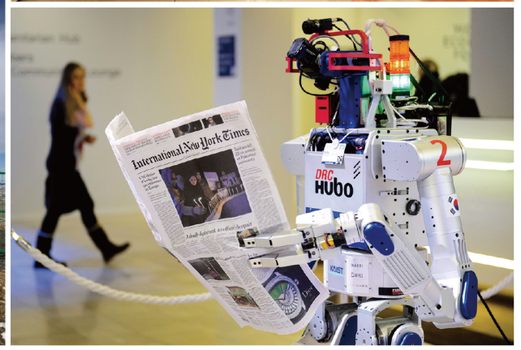
Collaborative Robots

Precision Pointing Mount



Biped/Quadruped Robots

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RAINBOW
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