



Robot Technology and The Future

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오준호 교수



'Killer robots': AI experts call for boycott over lab at South Korea university

Academics around the world voice 'huge concern' over KAIST's collaboration with defence company on autonomous weapons



▲ More than 20 countries have already called for a total ban on killer robots ahead of a UN meeting next week on autonomous weapons. Photograph: Stephen Curry for the Guardian

Benjamin Haas in Seoul

on the Korean peninsula worse. Toby Walsh, professor at University of New South Wales

... sparked fears of a Terminator-like situation and questions have been raised about the accuracy of such weapons and their ability to distinguish friend from foe.

Hanwha is one of South Korea's largest weapons manufacturers, and makes cluster munitions which are banned in 120 countries under an international treaty. [South Korea](#), along with the US, Russia and China, are not signatories to the convention.



▲ South Korea university demonstrates people-carrying robot - video

Walsh was initially concerned when a [Korea Times](#) article described KAIST as

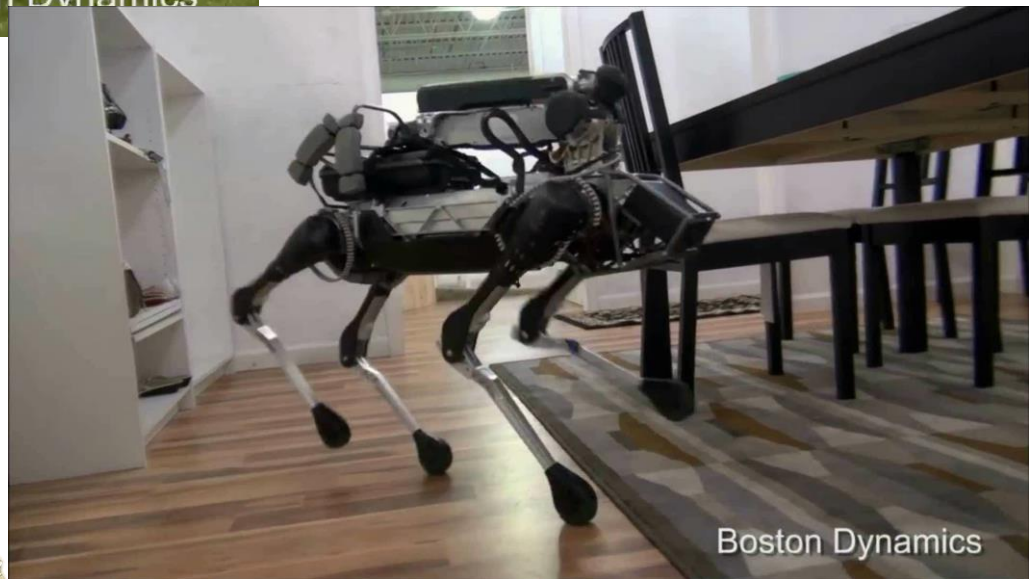


Hubo Lab, KAIST – Pyeongchang Olympic Torch Relay

| FX2



Boston Dynamics



로봇에 대한 기대

- 스마트 팩토리
- 노동의 대체
- 사회형 로봇
- 전문가 로봇



■ Smart factory

- 기존 산업용로봇의 효율적 운용
 - 네트워크로 연결
- 산업용 로봇의 사용범위 확장
 - 기타 제조영역에 로봇 투입
- 협동 로봇
 - 로봇과 작업자가 작업공간 공유
- 새로운 지능형 로봇
 - 빅데이터, 인공지능, 스마트센서 등을 활용한 상호작용형 로봇



■ 노동의 대체

■ 3D 업종

- 조선, 염색, 건설 등 전통 노동기피산업

■ 단순노동

- 계산대 점원, 단순 안내 등

■ 노동강도가 높은 분야

- 물류, 배달 등

■ 대면 서비스 – **COVID19**

- 로봇 카페, 병원 등



■ 사회형 로봇

■ **Smart speaker**

- 기가 지니, 빅스비 등 서비스 플랫폼과 결합

■ 안내로봇, 감성로봇, 서비스 로봇 등

- 인공지능, 감성인식 및 상호작용
- 소프트뱅크의 '페퍼 '

■ 전문가 로봇

■ 수술로봇

■ 외피로봇, 재활로봇 등

■ 복지로봇 등



글로벌 기업의 로봇참여



amazon



Kiva 인수
(12.3)



Prime Air 협력
(13.12)

amazon echo



14.12 시판

amazonrobotics

15.8 변경



Amazon Picking Challenge(15,16,17)

SoftBank



Aldebaran 인수
(12.2)



SoftBank Robotics
14.7 변경

Pepper 공개
(14.6)



Pepper와 Watson 협력



Boston Dynamics 인수

Google



로봇 기업
8개사 인수

autofuss

작업학습기술 발표
(16.3)



보행재활, 간병로봇



생활지원로봇



재활로봇 원격제어로봇

12

13

14

15

16

17



네이버가 '데뷰(Deview) 2017' 에서 공개한 9개 생활로봇

LABS
NAVER LABS



HYUNDAI
HEAVY INDUSTRIES HOLDINGS



어라운드
서점에서 고객이 본 책을 로봇에 올려놓으면 본래 자리로 반납해줌.

엠비덱스
인간 팔보다 가벼운 로봇 팔.
7개 관절이 움직여 인간과 거의 똑같은 움직임 가능.



퍼스널 라스트마일 모빌리티
4륜 구동 전동 스케이트 보드. 시속 40km의 고속 주행 가능.



M1
자율 주행하며 실내 입체 지도를 작성하는 로봇. 이 지도를 기반으로 다른 로봇들이 자율 주행할 수 있음.



에어카트
운반용 손수레에 근력 증강 기술을 접목해 80kg의 짐을 신고도 한 손으로 움직이게 함.



치타로봇3
등에 짐을 싣고 네 발로 걸거나 뛰는 로봇. 미국 MIT의 김상배 교수팀과 협력 개발.



점핑로봇
강아지 정도의 작은 크기로 장애물을 뛰어 넘어갈 수 있음.
터스크봇 바퀴를 달고도 계단을 올라갈 수 있는 운반 로봇.
티티봇 스스로 움직이며 여기저기 흩어진 공을 줍는 로봇.

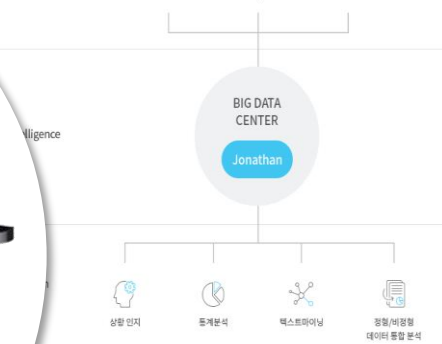


● SG로보틱스



● 아크릴

Data & Contents



● 로보티즈



● 로보스타





- 1 모닝워크
- 2 캐리봇
- 3 TSolution One Surgical System



Pre-Surgical Planning



Surgical Implementation



Implant placement



Intelligent Robot Application

- Home service robot
- Medical robot
- Military robot
- Robot in hazardous environment
- Entertainment robot
- Rehabilitation robot



Vecna Bear



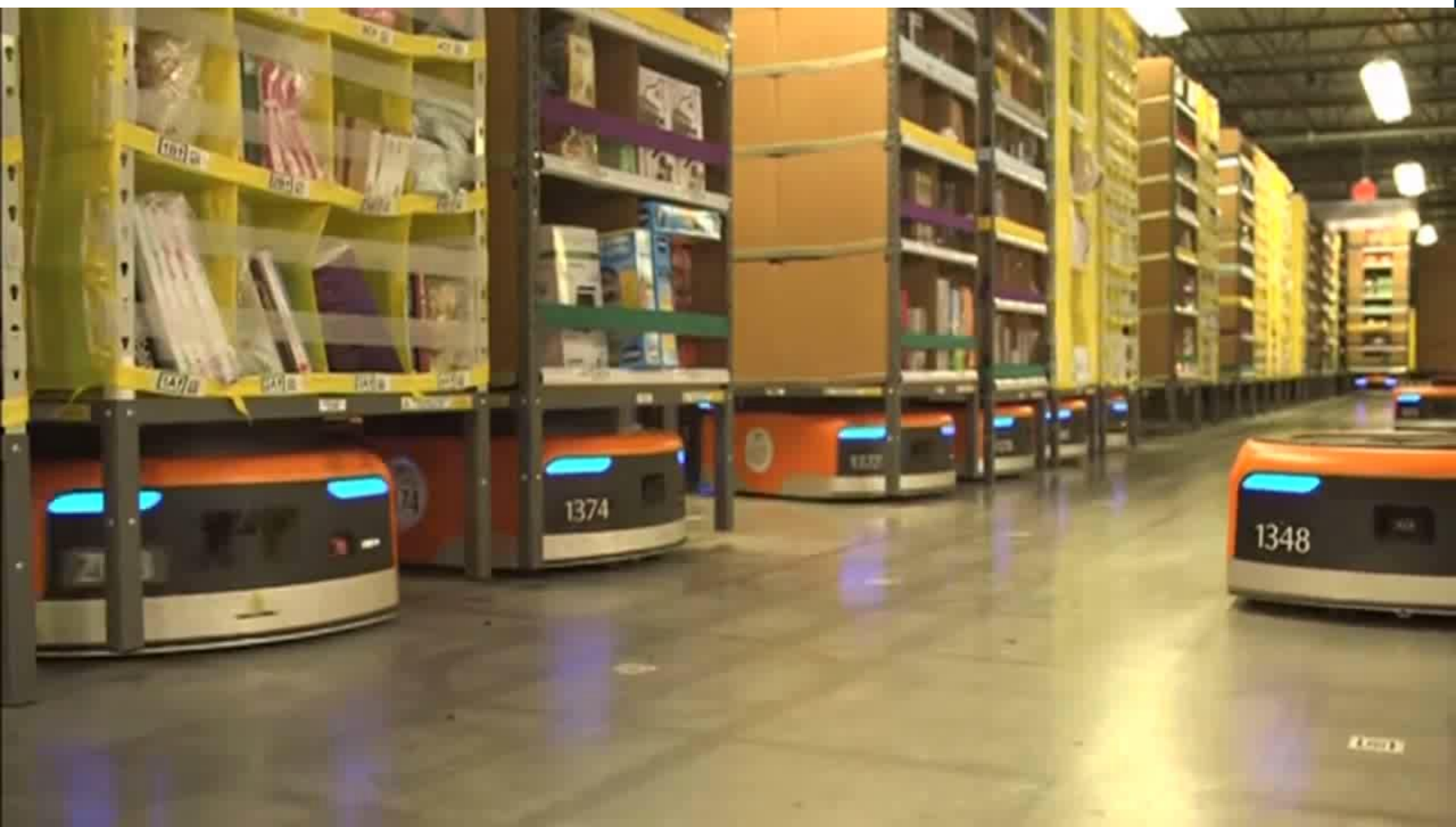
Social Robot, Pepper



**Bloomberg
Technology**



Logistic Robot



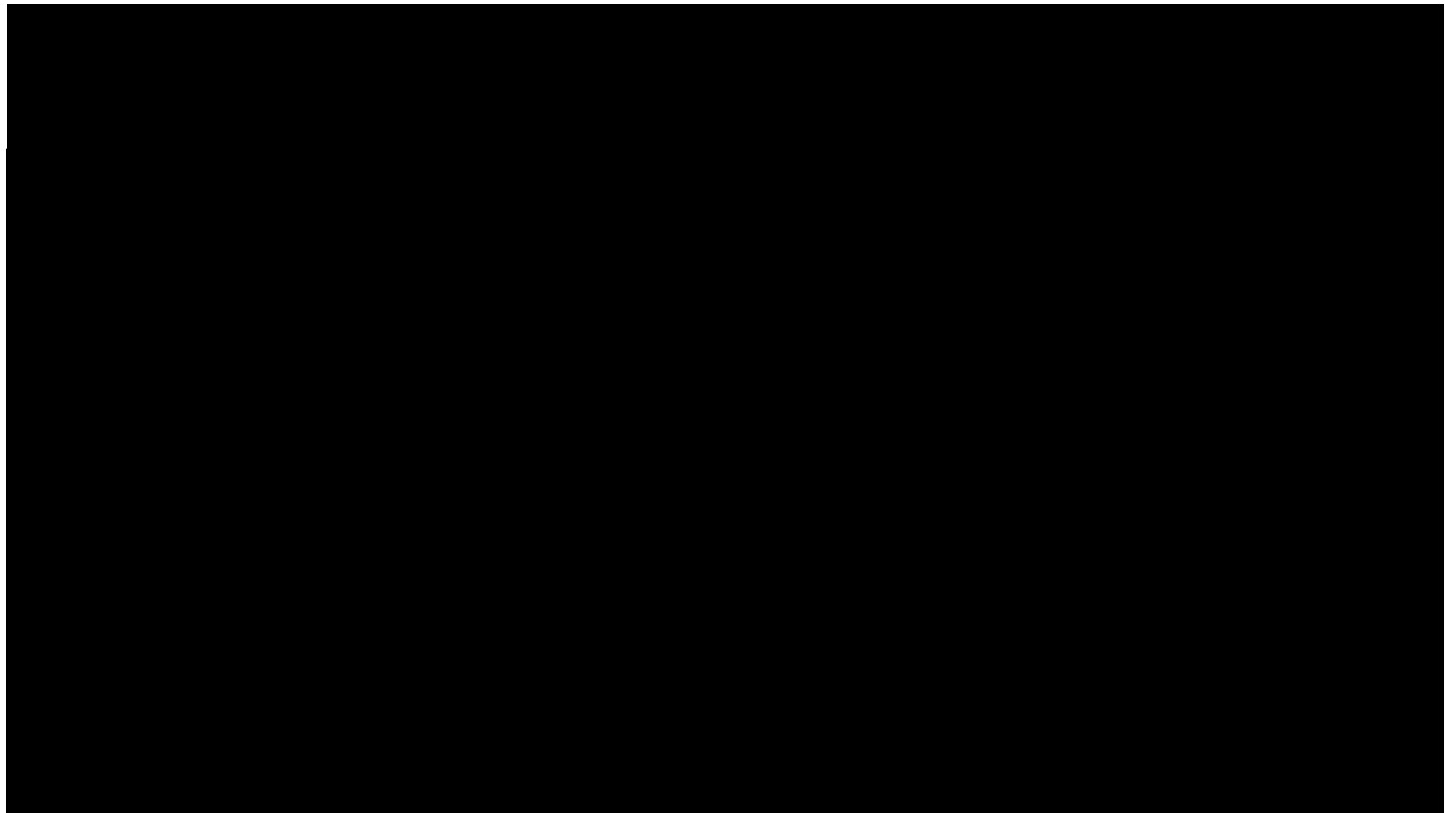
Introducing SaviOne





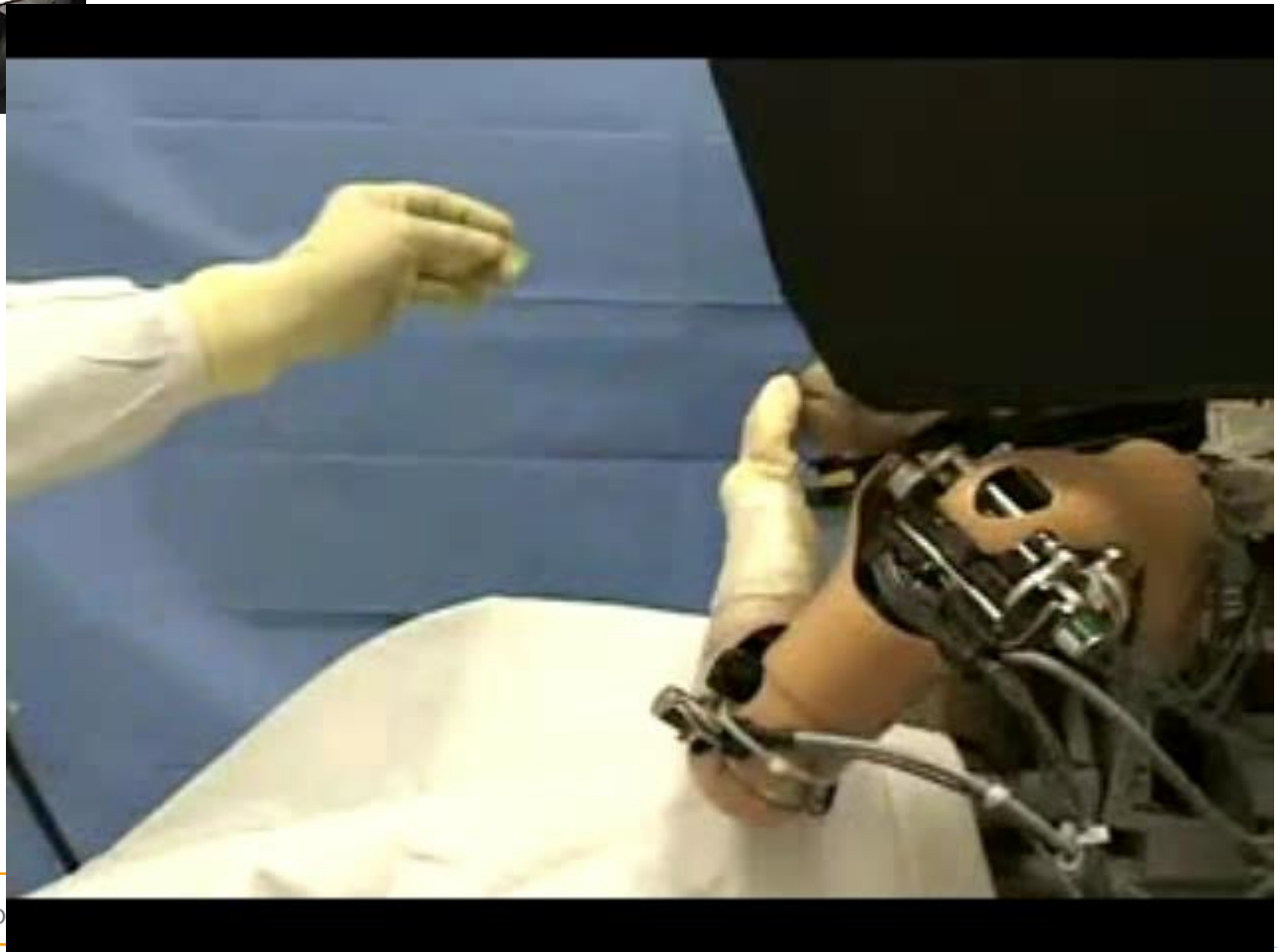
Giga Genie,
KT

JiBo



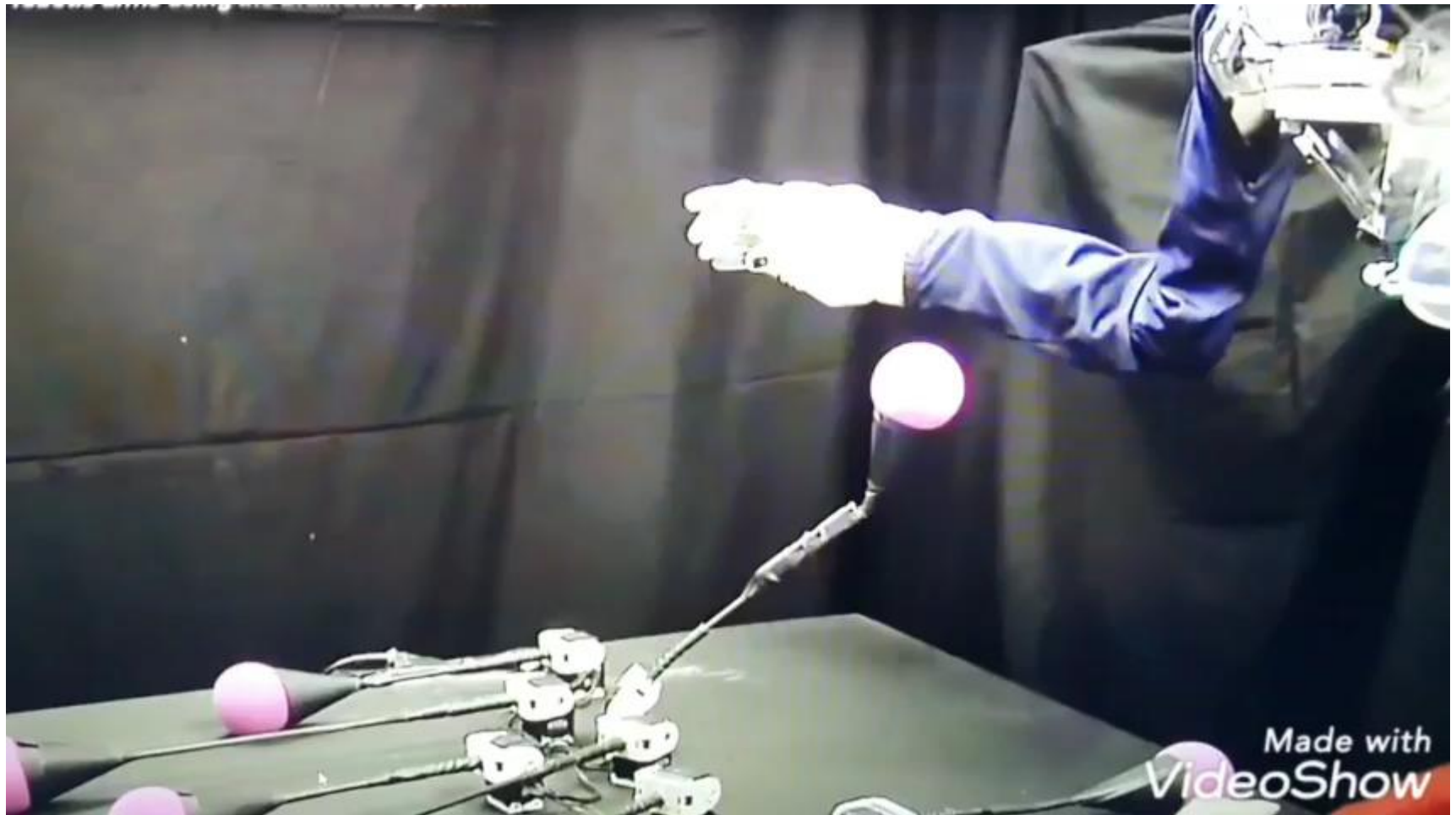
Brain Machine Interface

Monkeys control robots with brain power, 2008
Univ. of Pittsburgh



Brain Computer Interface

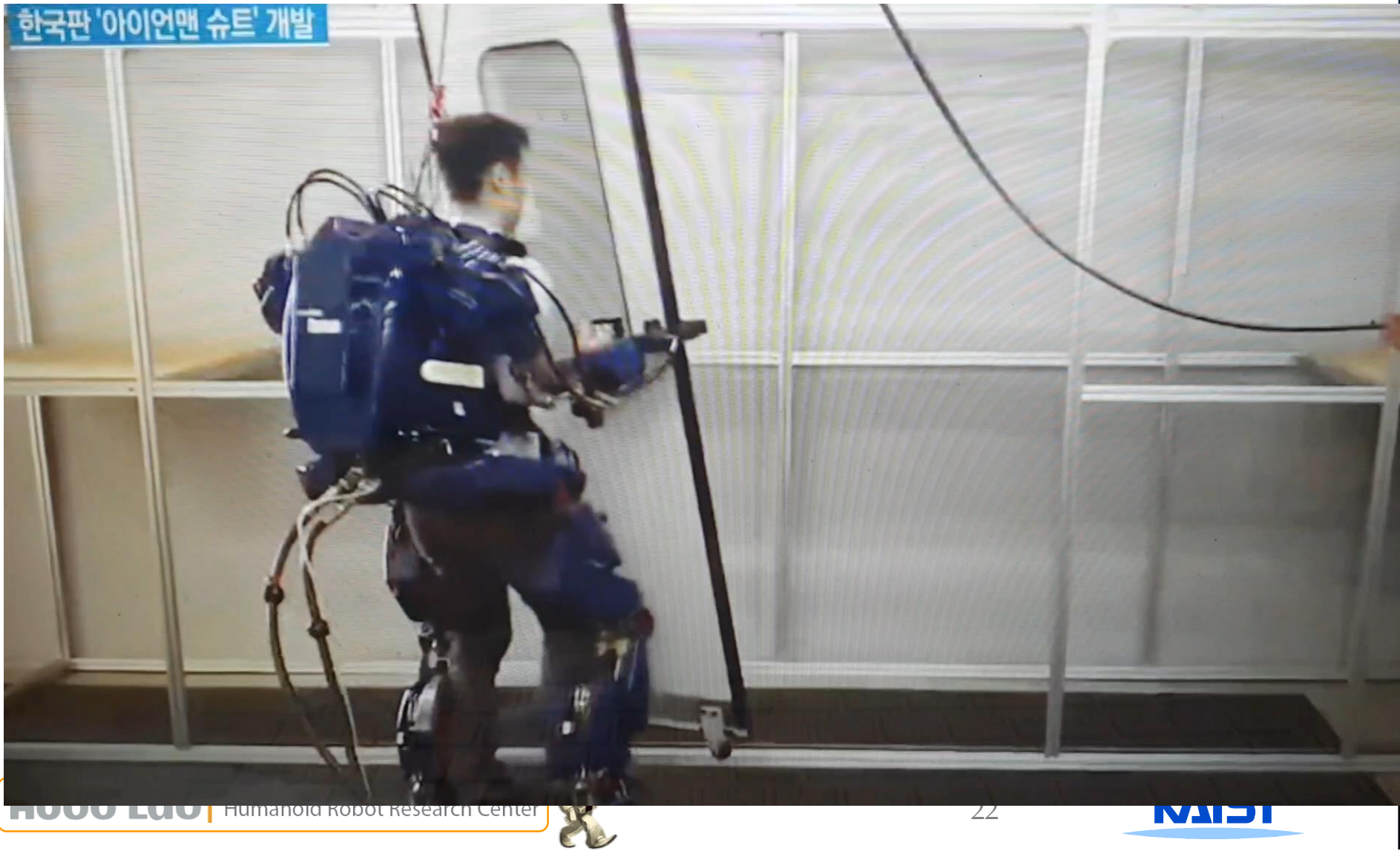
NIHNINDS, 2012



Wearable Robot

머니투데이, 2016

현대자동차 웨어러블 로봇



Wearable Robot

카이스트, 2019
엔젤로보틱스



Surgical Robot



Da Vici robot
USA, Intuitive Surgical Inc.



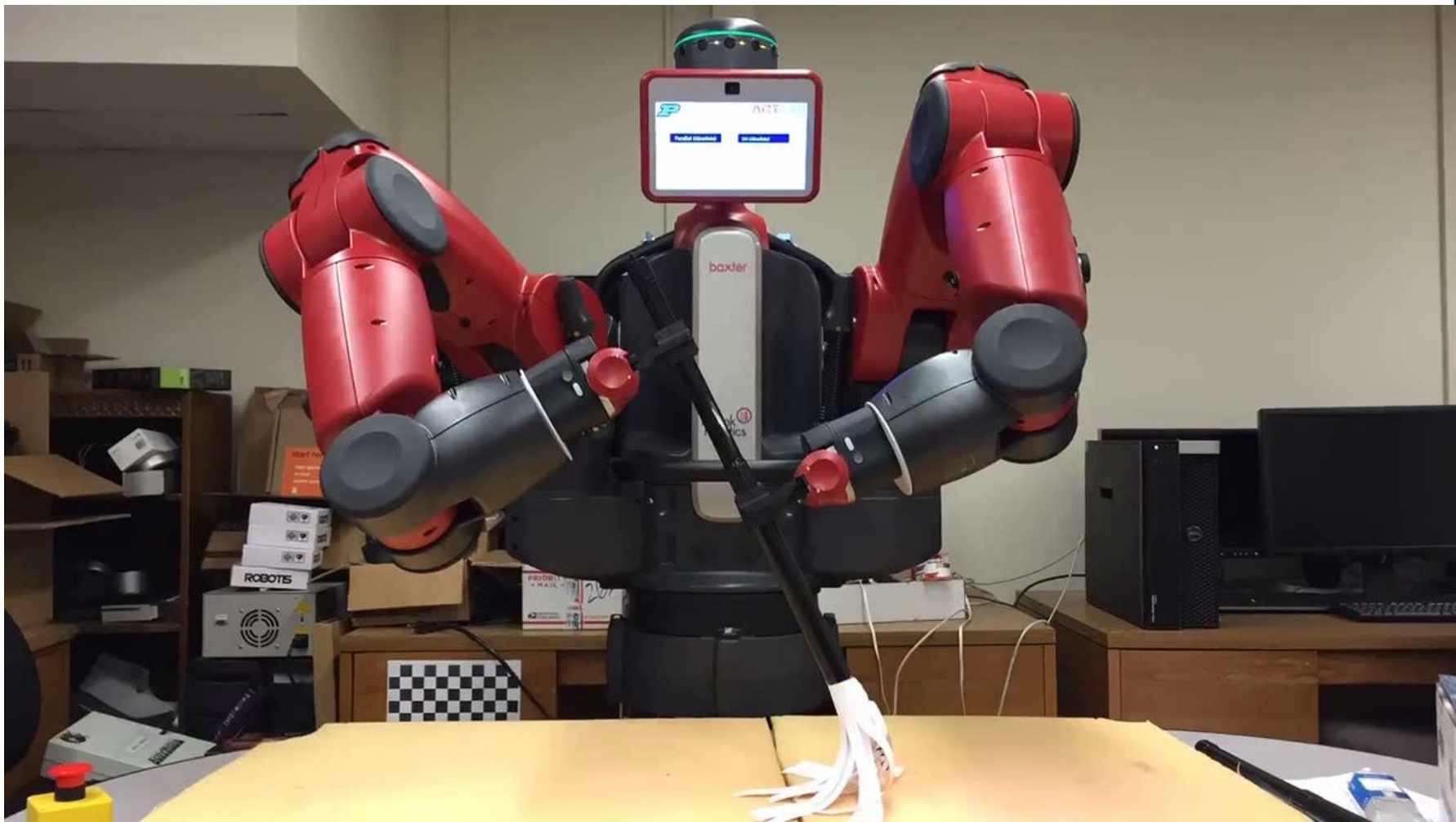
Industrial Robot



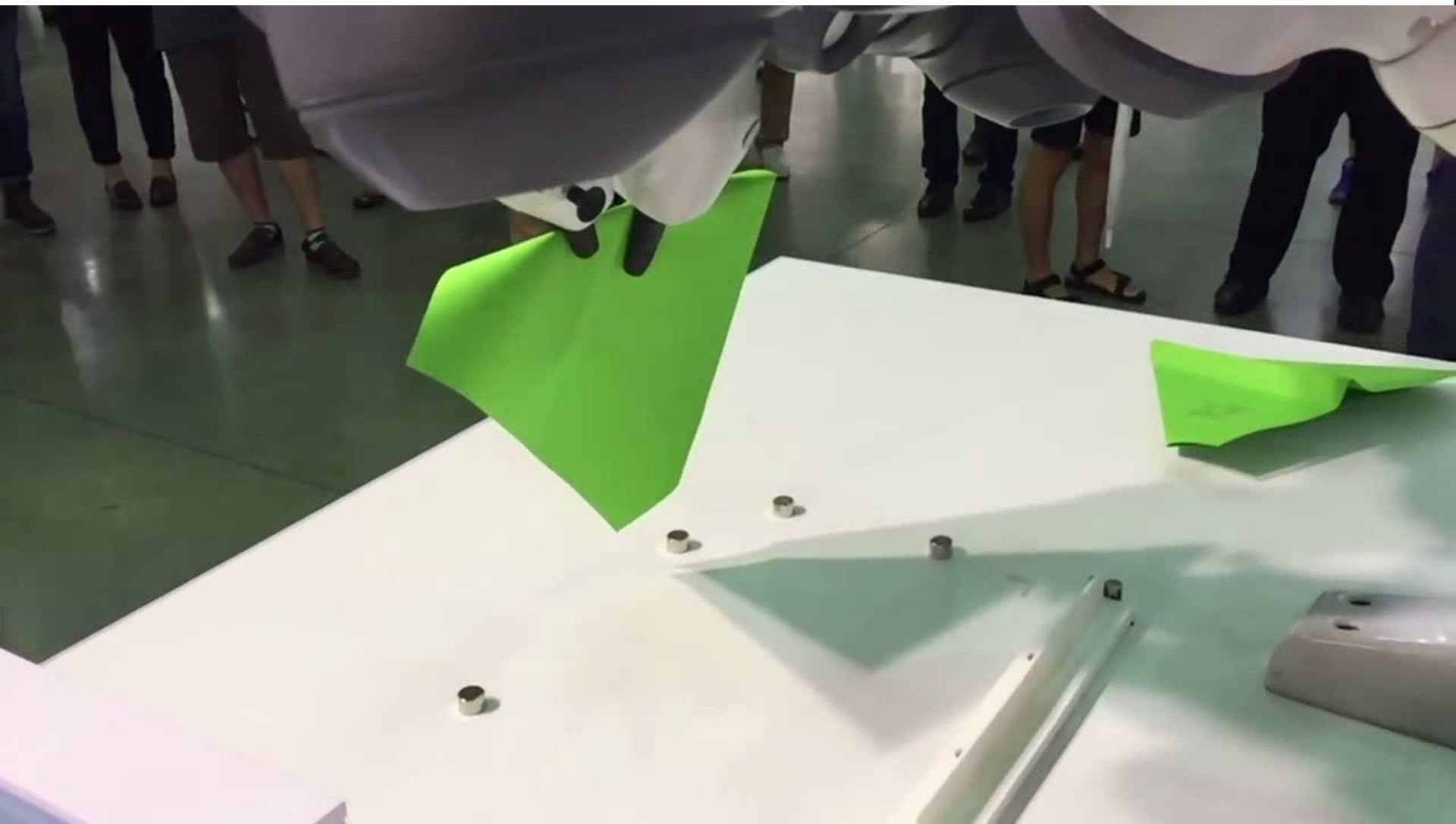
Human labors in industry



Soft works, Bexter



Soft works, YUMI



Collaborative Robot



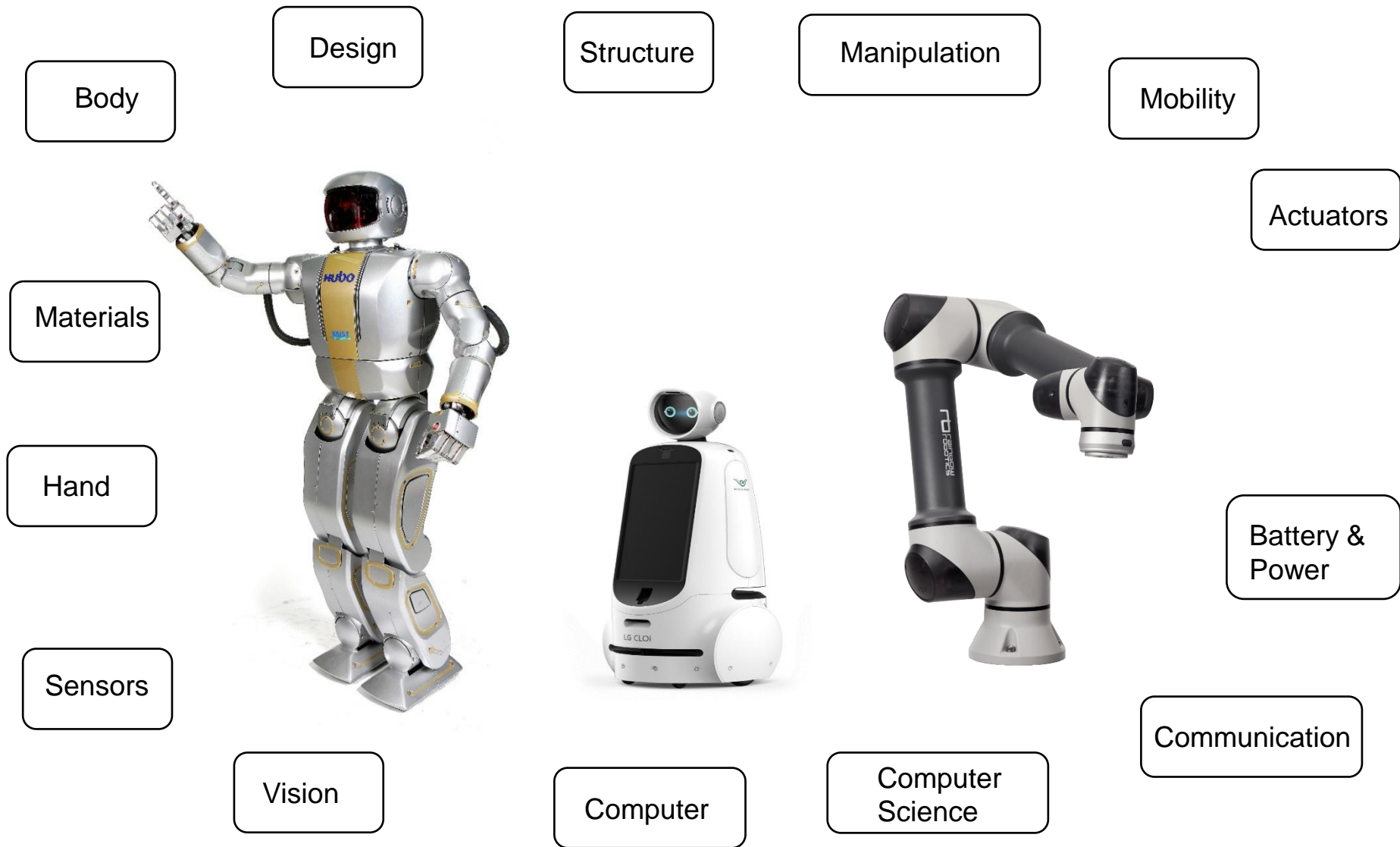
Collaborative Robot



Rainbow Robotics
RB5



Technologies in Robots



Physical Components

- **Mechanism**
- **Reduction gears**
- **Actuator**
 - *Hydraulic, Pneumatic, Electric*
 - *Non-conventional and Emerging*
- **Sensors**
 - *Vision, Lidar, Radar, IR, Ultrasonic, Inertia, F/T*
 - *Skin, tactile, Ranging, etc*
- **Communication**
 - *WiFi, LTE, Bluetooth, IR, Laser, etc*
 - *Cloud and Networking*
- **Computer**
 - *Quad-core, GPU, etc..*



Sensing and Autonomy

- ***Vision Recognition***
 - *Deep Learning*
 - *Feature based*
 - *Special*
- ***3D***
 - *RGB-D camera, Stereo camera, Structure pattern*
 - *2D Lidar, 3D Lidar,*
- ***AI***
 - *Deep learning, etc.*
 - *Cloud computing & data,*
- ***SLAM & Navigation***
 - *GPS, IMU, Vision*
 - *Indoor GPS, Dead Recon, Lidar, etc*



■ *Dynamics and Kinematics*

- *Traditional Control theory – PID, Optimal, Computed torque...*
- *Trajectory Planning – Manipulation and Navigation*
- *Posture stabilization*
- *Advanced control theory – MPC*

■ *Computing Efficiency*

- *Efficient Algorithms, FPG, GPU, etc..*
- *Internal and/or External Communications*
 - Ethernet, CAN, RS485..
 - PROFI bus, Devise net, Mod bus, Ethercat...
- *Real Time Control - RTX, RT Linux..*
- *User Interface and UX*

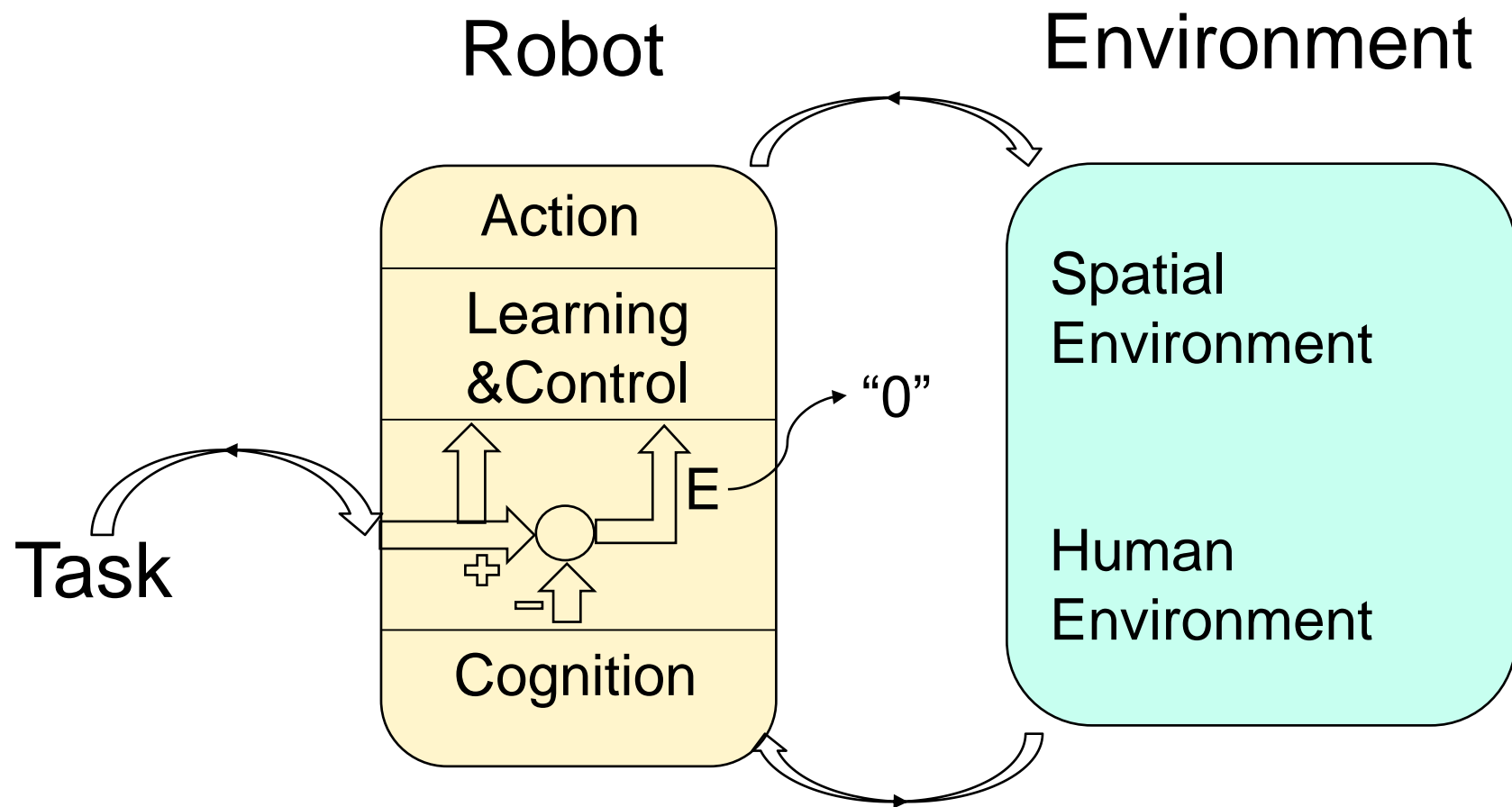
■ *End Effector*

- *Gripper and Hand*
- *Customized Effector*

■ *System Integrations*

- *Safety and Certification*
- *Task Oriented Approach*





Industrial Robot:
Deterministic
Robot

AI Robot:
Self Surviving
Robot

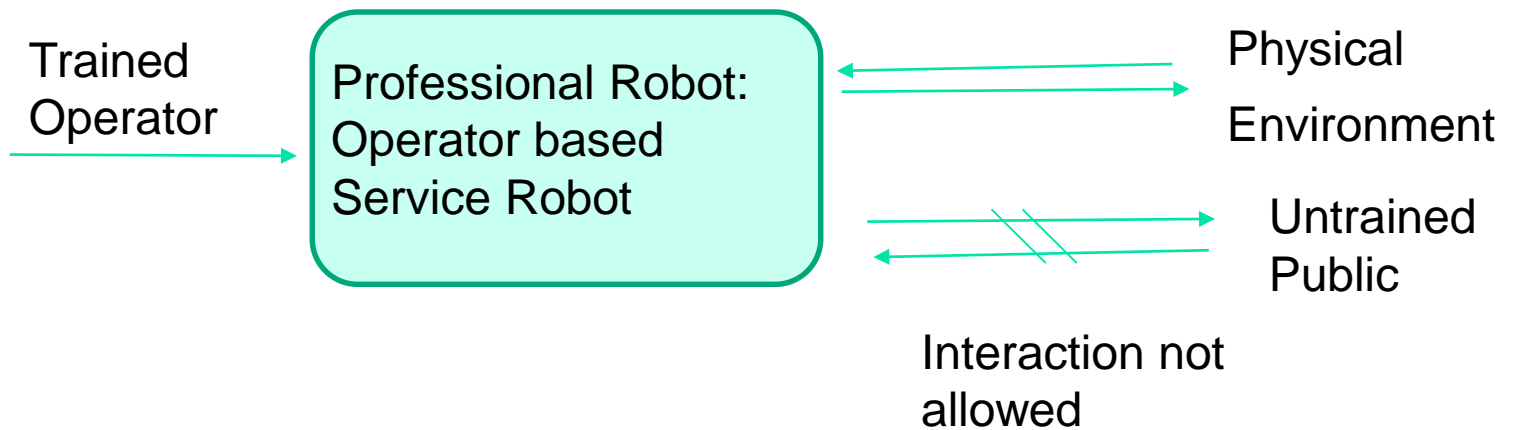


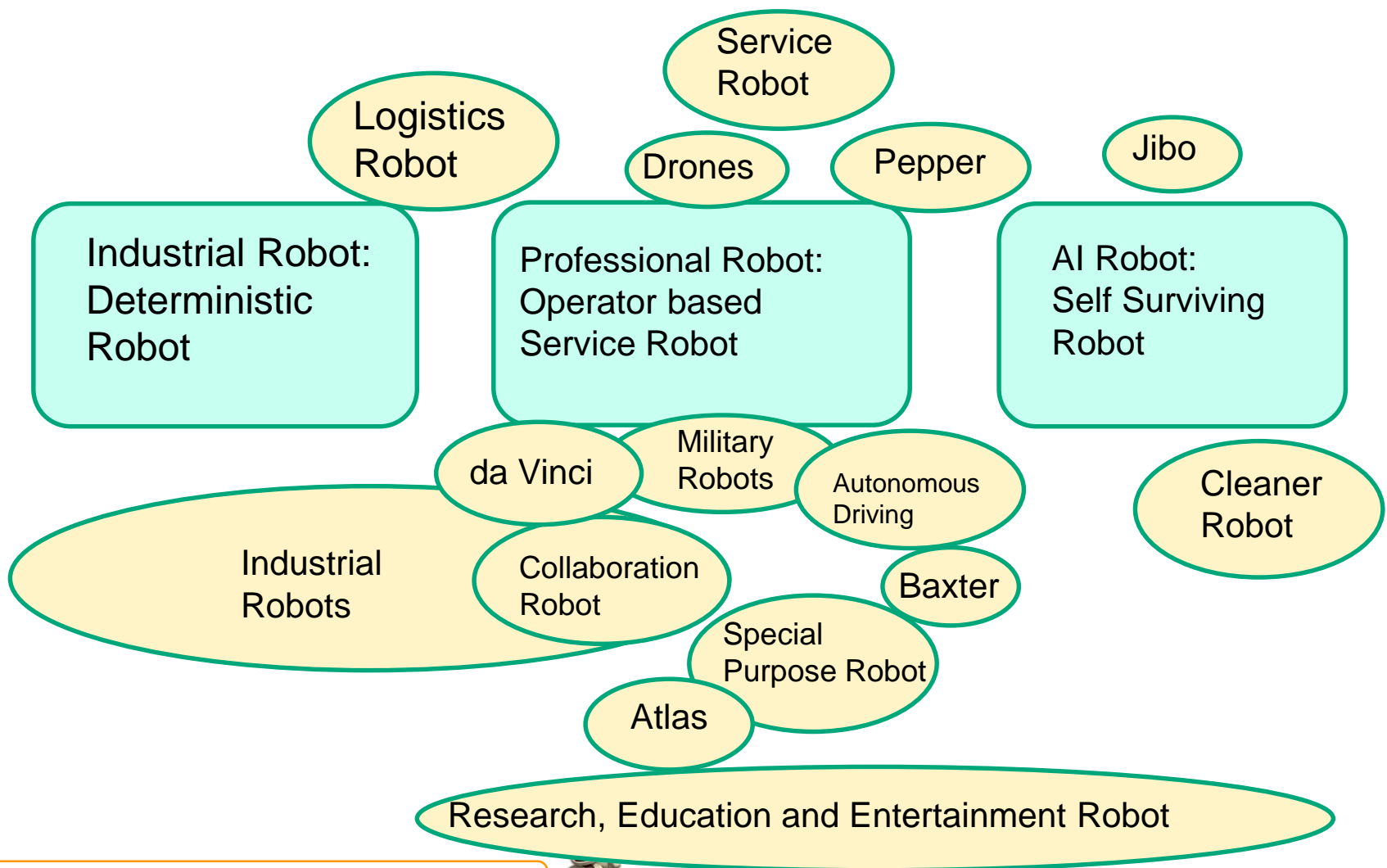
Industrial Robot:
Deterministic
Robot

Professional Robot:
Operator based
Service Robot

AI Robot:
Self Surviving
Robot







Evolution of Robot

Industrial Robot (1960's)

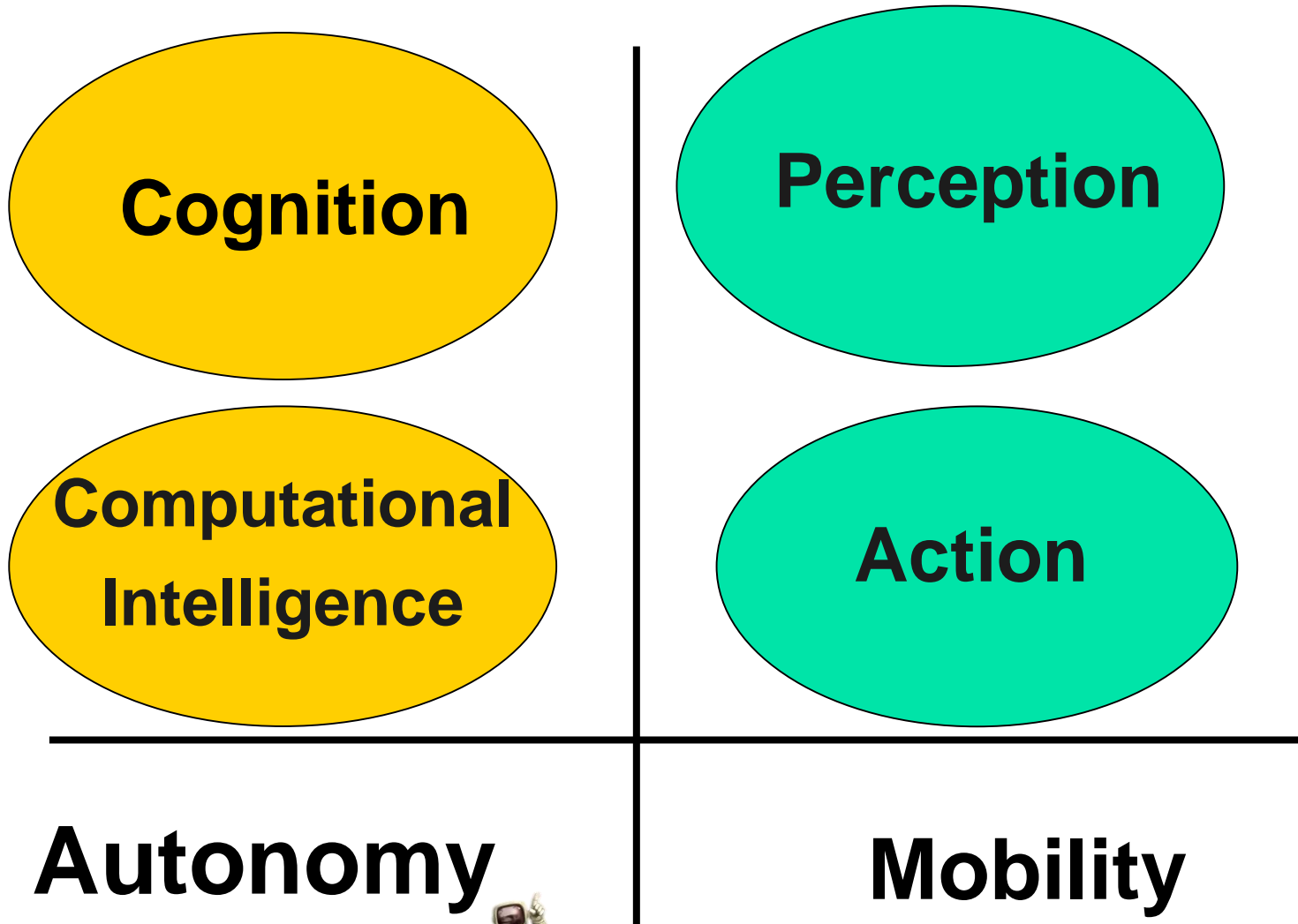
- ***Working in structured environment***
- ***Pre-scheduled motion (simple & repeating)***
- ***Machine-Robot interaction***
- ***Simple technology***



Intelligent Service Robot (21 century)

- ***Working in unstructured environment***
- ***Autonomous motion***
- ***Human-Robot interaction***
- ***Technology convergence***
 - ***RT+BT+NT+etc***





Keywords for future technology application

- Networks – wireless (Ubiquitous)
- Intelligence – autonomous
- Mobility – physical contact



**Robot & Related
Technology**

- Human friendly
- Coexisting



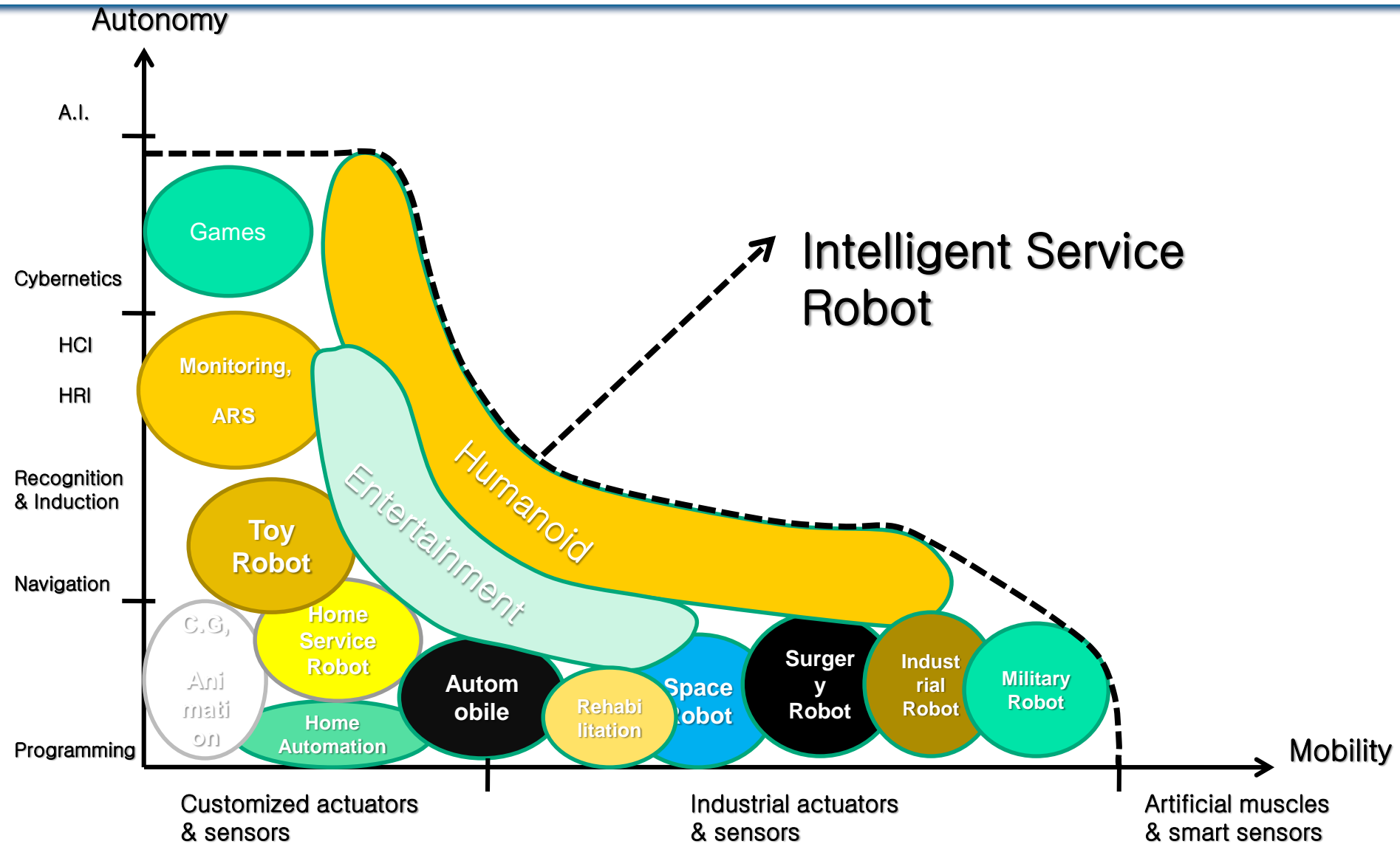
Dilemmas

■ ***Autonomy***

■ ***Mobility***



Autonomy & Mobility



END

