



Cultural Differences in the Perception of Robots in Japan and in Europe

ICRA 2005, IEEE International Conference on Robotics and Automation

<http://www.icra2005.org/>

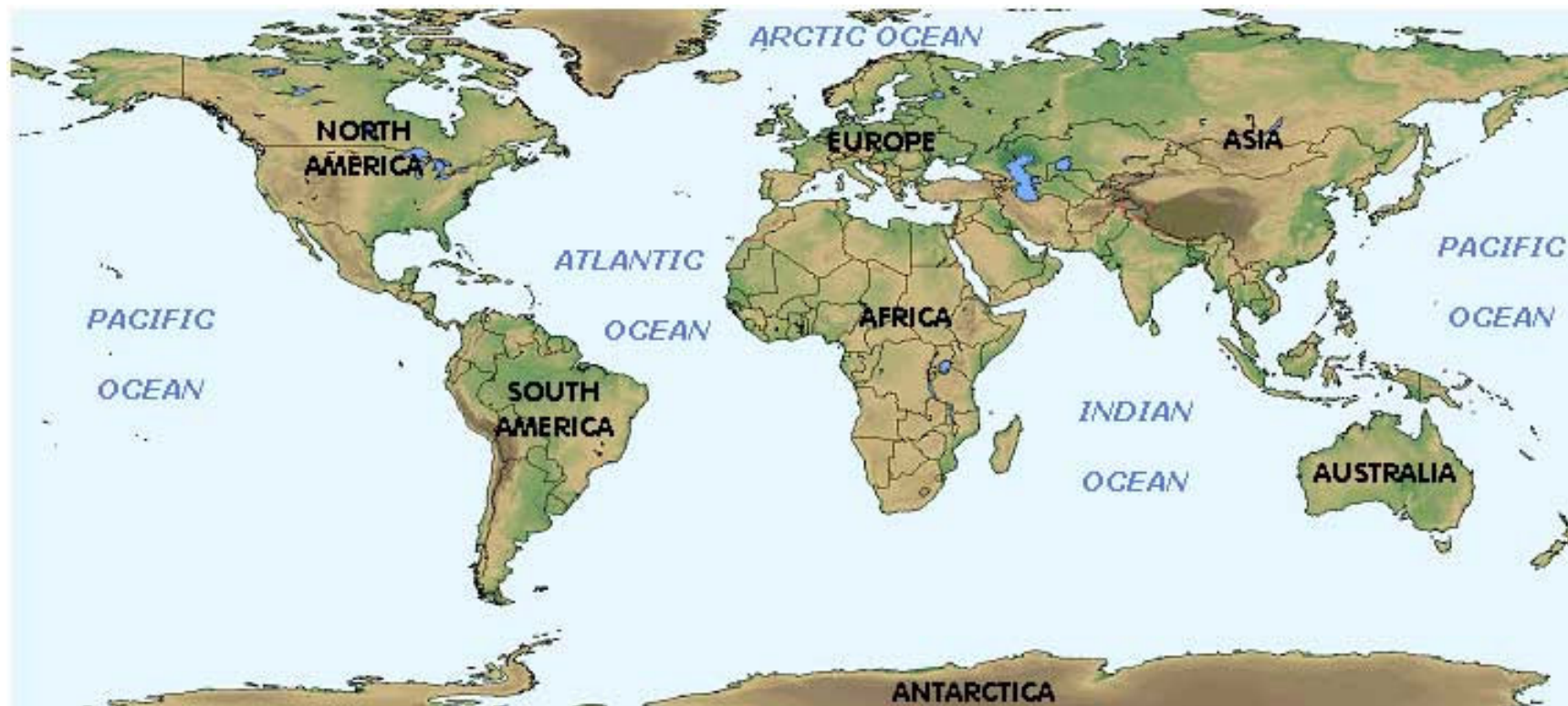
Workshop on Robo-Ethics

Barcelona, April 18th, 2005

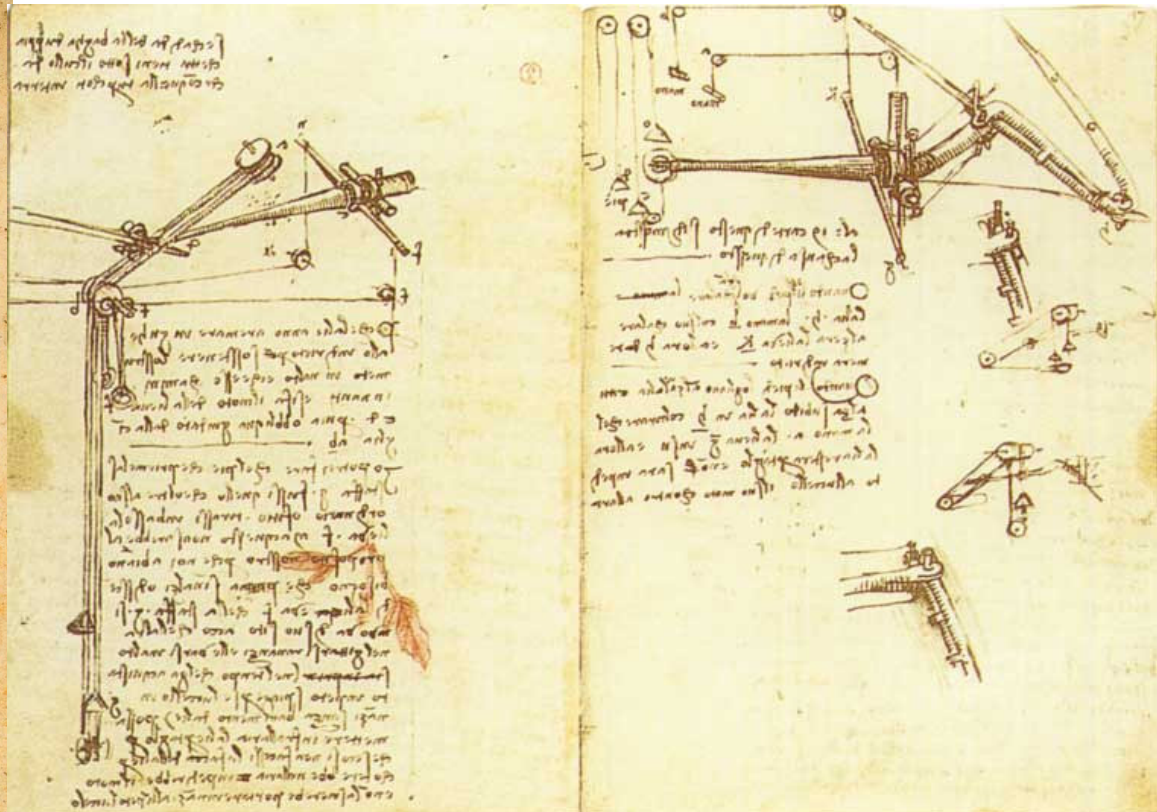
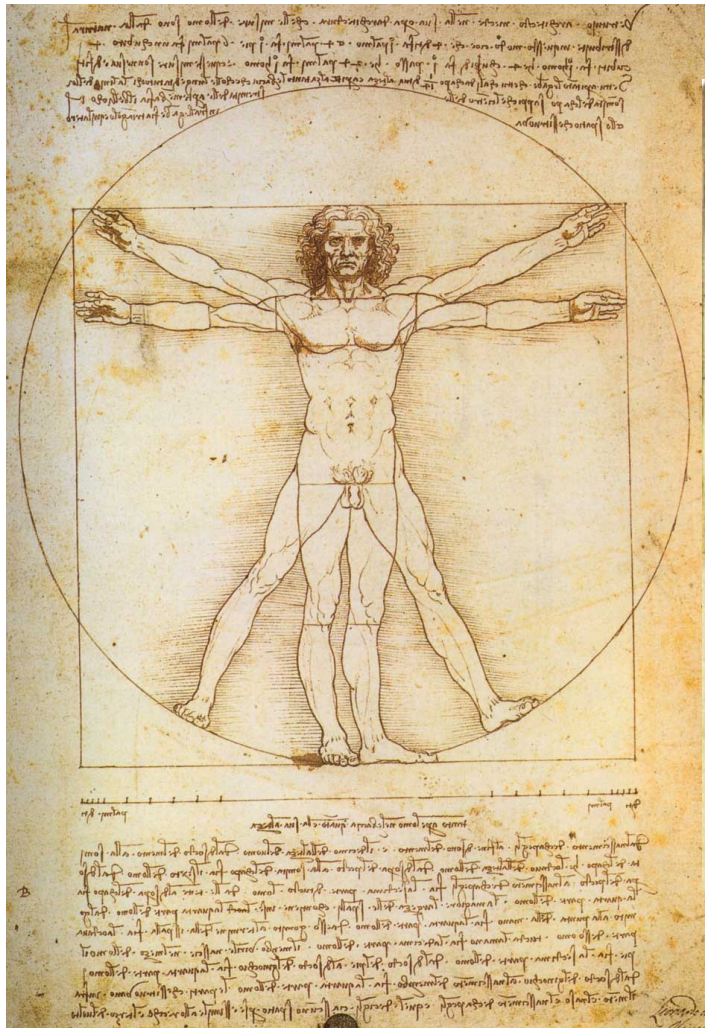
Atsuo Takanishi (高西 淳夫)

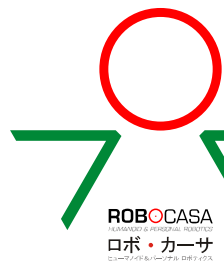
Dept. of Mech. Eng./Humanoid Robotics Institute, Waseda University

Europe and Japan: Far Away Each Other



Leonardo's Distinguished Work in Italy: Engineering Inspired by Nature



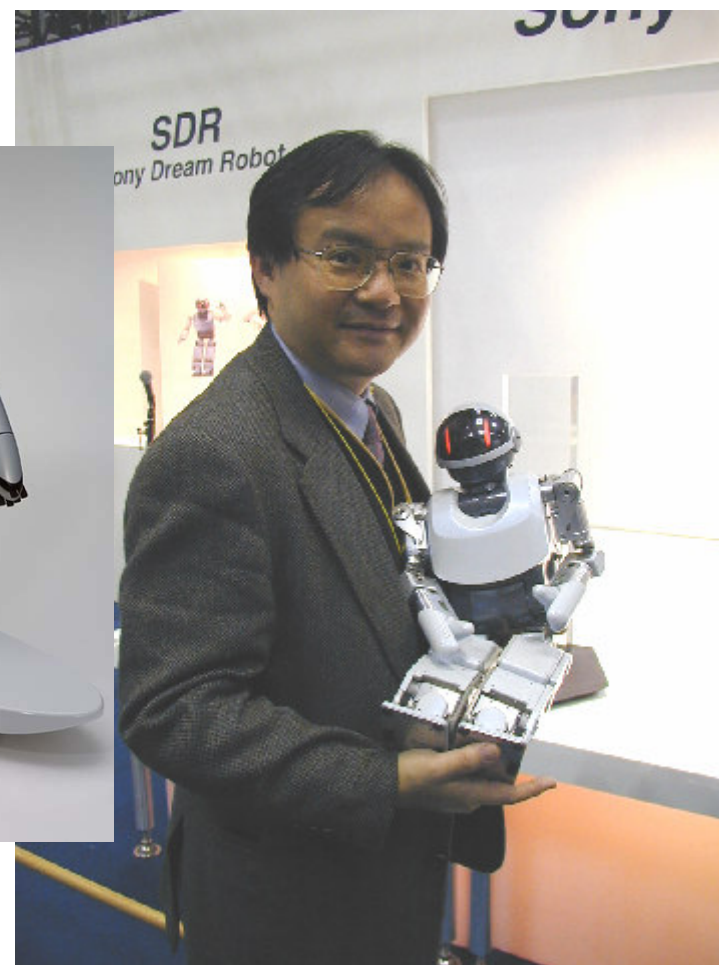
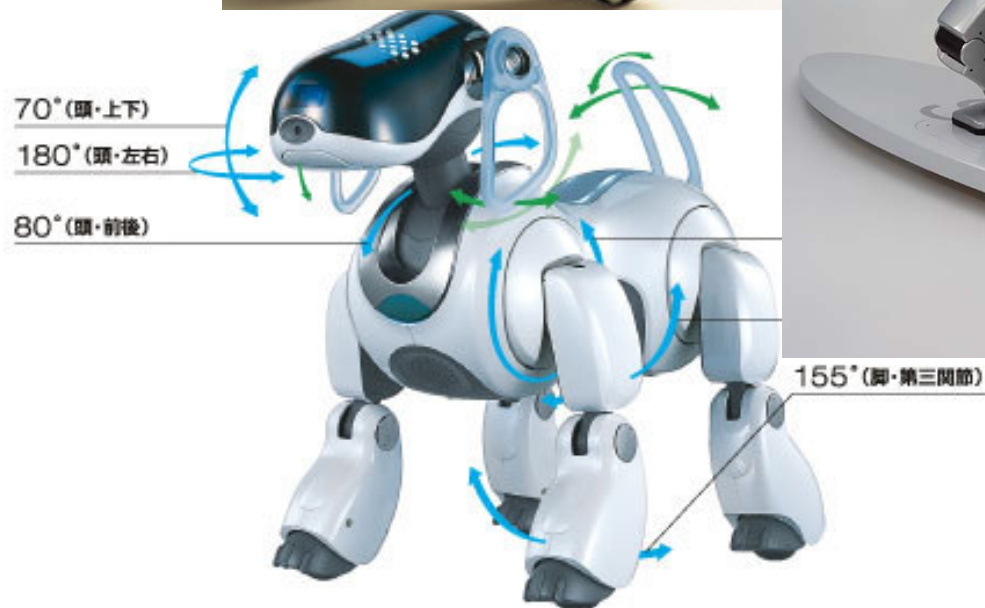


Recent Humanoids and Animaloids for Human Environment in Japan

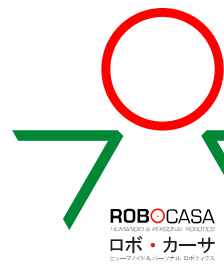


- SONY: AIBO, SDR-3X (3 years of secret collaboration with Takanishi Lab.), SDR-4X, QRIO
- HONDA: P2, P3, ASIMO
- TOYOTA: Partner Robots Performing in Aichi EXPO '05
- MITI: HRP-1, HRP-2
- TMSUK/SANYO: T-4, T-5, Banryu-Series (SANYO)
- Kitano Project(ERATO): PINO, PINO2, Morph, etc.
- NEC: R100, PaPeRo
- Mitsubishi Heavy Industries: Wakamaru
- ATR/MHI: Robovie, Robovie-2, Robovie-3
- HITACHI, Etc.

SONY-type Business Model: Entertainment Robotics

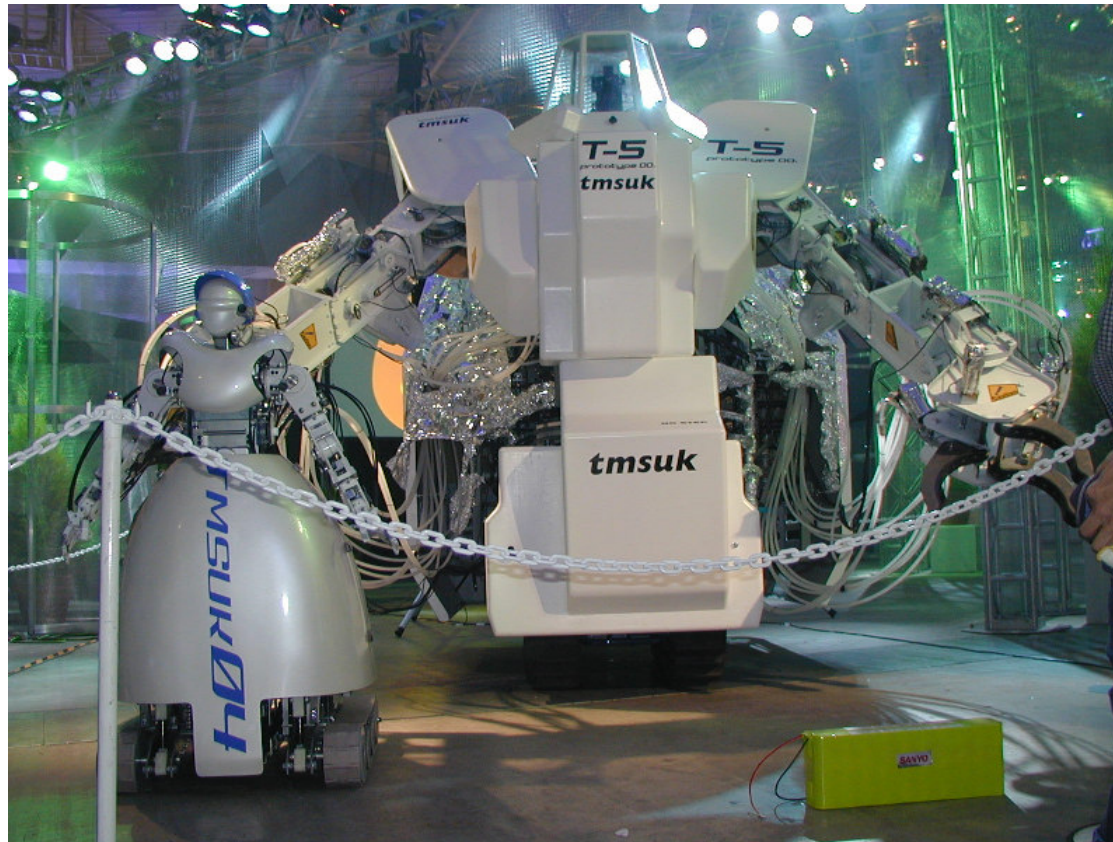


SDR-3X

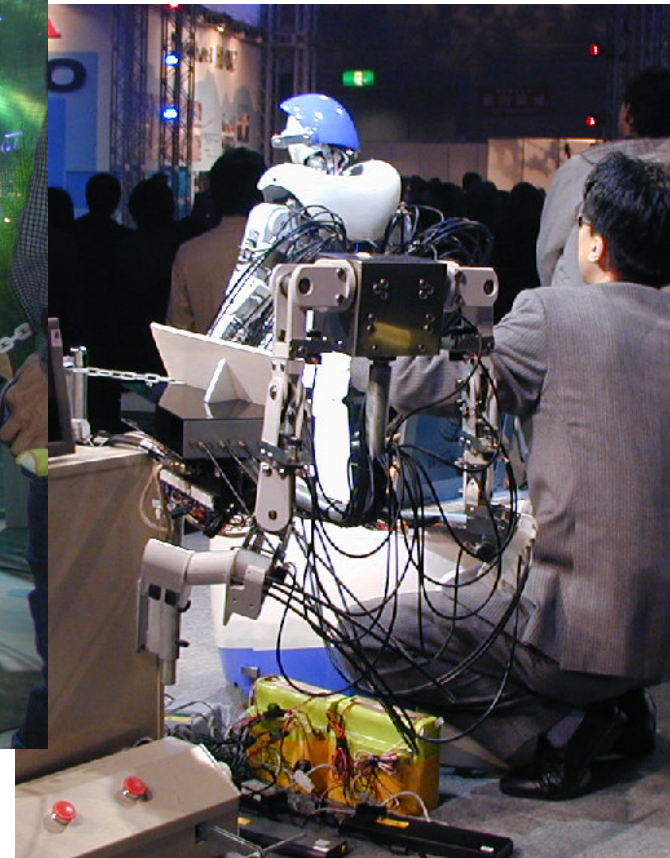


TMSUK-type Business Model: Tele-Operated Humanoid Robotics

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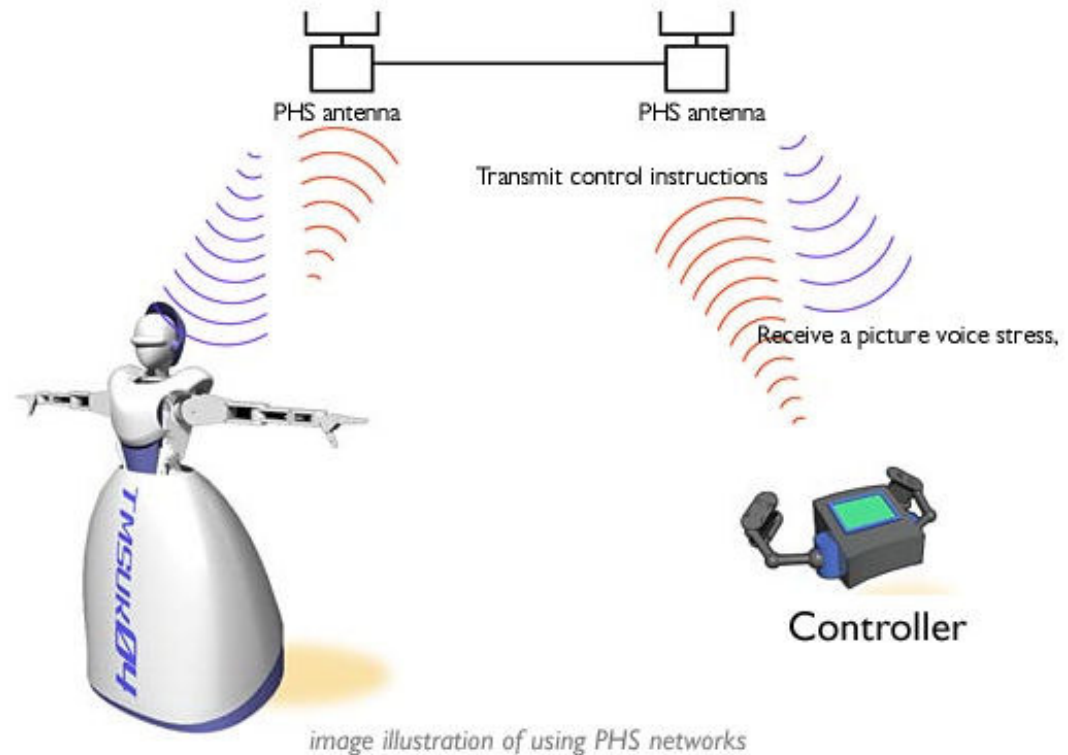
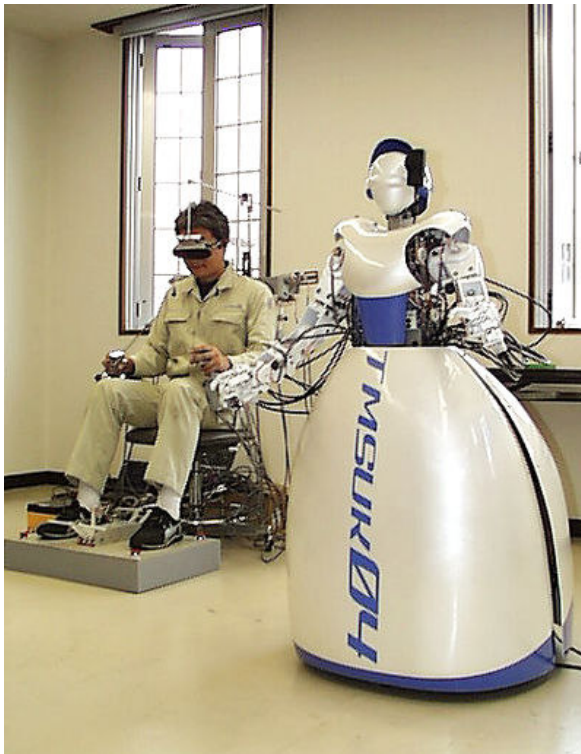


TMSUK-4(Maria)/TMSUK-5

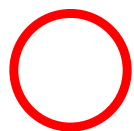


Master Device

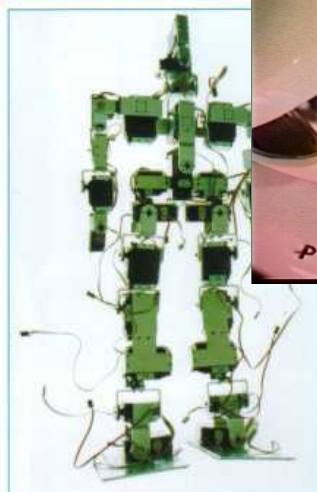
Tele-Operated Humanoid using Mobile Infrastructure/PHS/Cdma2000/FOMA



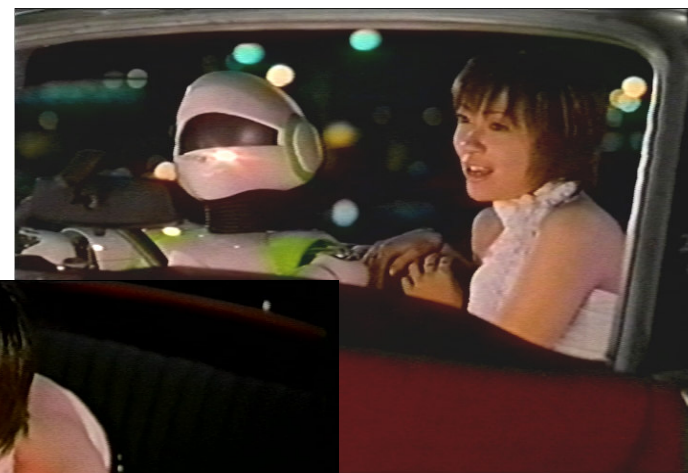
“Premature/Incomplete Autonomy is very dangerous” says Mr. Takamoto (President of TMSUK)



Kitano/ZMP-type Business Model: Design Robotics/Open Platform Robotics

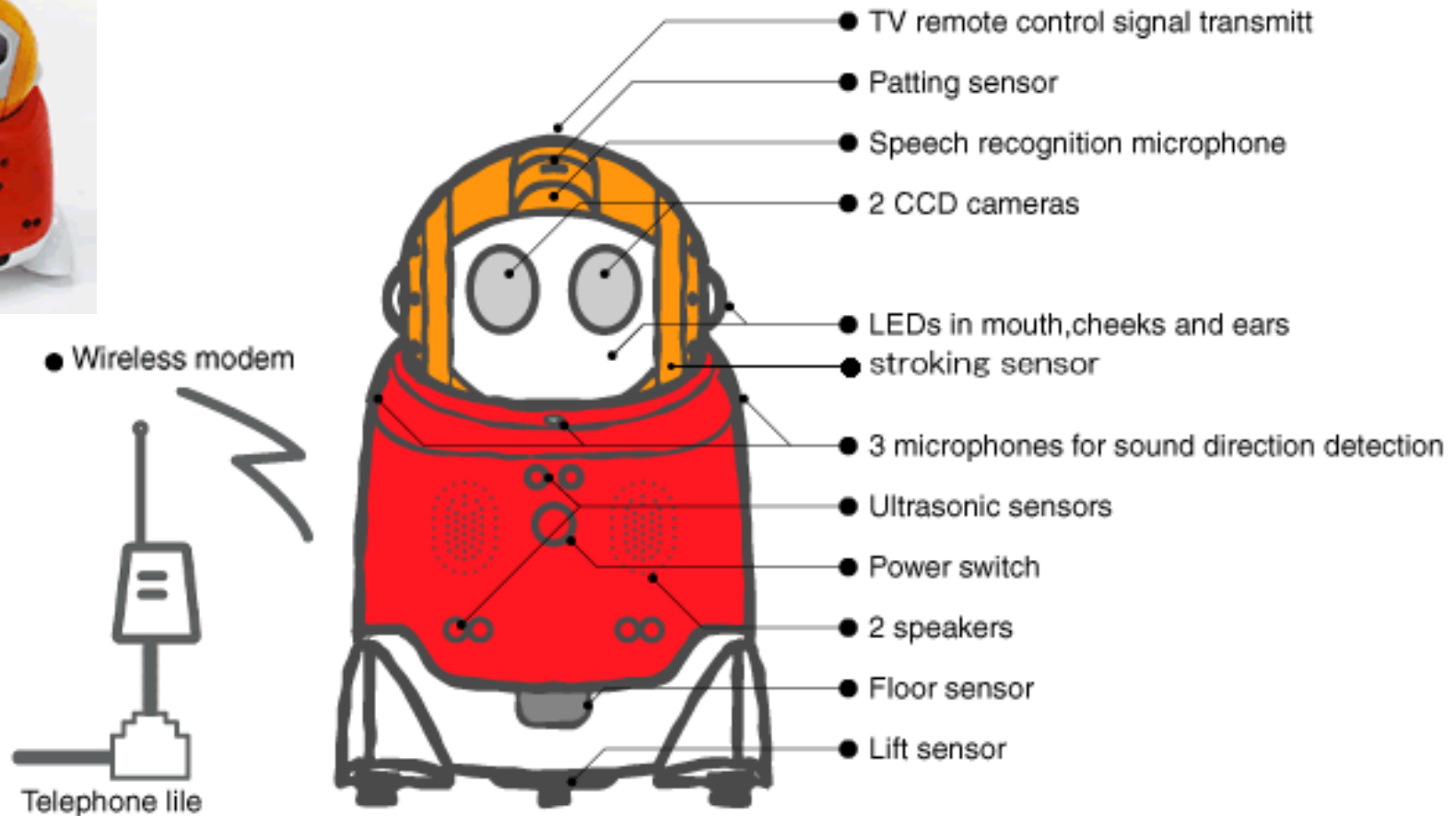


PINOの部品はすべて秋葉原でまかなえるレベルのもの。構造もごくシンプル。モータはすべてラジコン用サーボだ。



PINO & Hikaru UTADA (Toshiba EMI)

NEC-type Business Model: Conversation-Procedure Translation Robotics

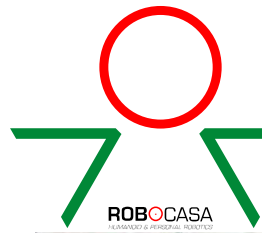


PaPeRo

Historical Backgrounds (Simplified History of Japan)

One Continu- ous Dynasty by One Imperial Family .	BC 660 - Shomu	Jyomon & Yayoi Era	
	AD -1095	Nobles Era	Kyoto/Nara
	1095 -1600	Samurai Era	Portugal
	1600 -1867	Edo Era	Cultural Explosion (Japan's Renaissance) Karakuri/ Sushi/ Manga/ Ukiyo-e/ Kabuki/ Haiku/ Bonsai/ Tea Cer./ Hanami/ Kendo/ Judo/ Karate
	1867 -1989	Meiji Era	J. vs China/Russia Wars
		Taisho Era	WW1
		Showa Era	WW2 / Manga & TV Anime Industrial Robots
	1989 -	Heisei Era	Social Robots





Origin of Manga in the 12th C



(Chyo-Jyu-Giga 12C to 13C)

Manga & Ukiyo-e in Edo Era

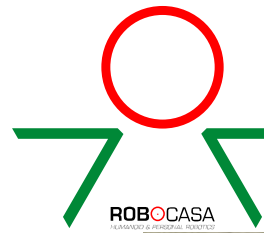


Manga & Ukiyo-e in Edo Era



Manga & Ukiyo-e in Edo Era





Manga & Ukiyo-e in Edo Ira

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ROBOCASA
HUMANOID & PERSONAL ROBOTICS
ロボ・カーサ
ヒューマノイド&パーソナル ロボティクス



ROBOCASA
HUMANOID & PERSONAL ROBOTICS
ロボ・カーサ
ヒューマノイド&パーソナル ロボティクス



Manga & Ukiyo-e in Edo Era



Manga & Ukiyo-e in Edo Era



Karakuri Puppets in the 18th Century (Automatic Types)



Sanbansou Doll

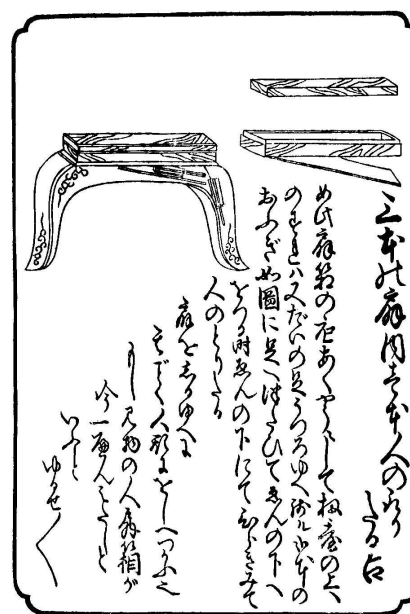


Tea Serving Doll

Karakuri Puppets in the 18th Century (Tele-Operated Types)

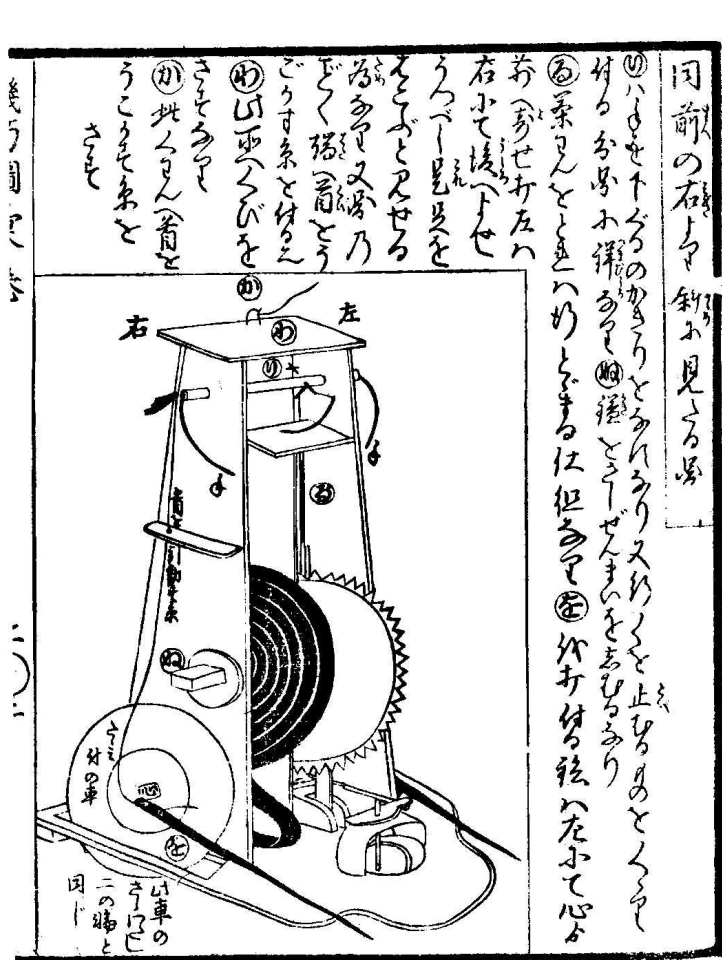




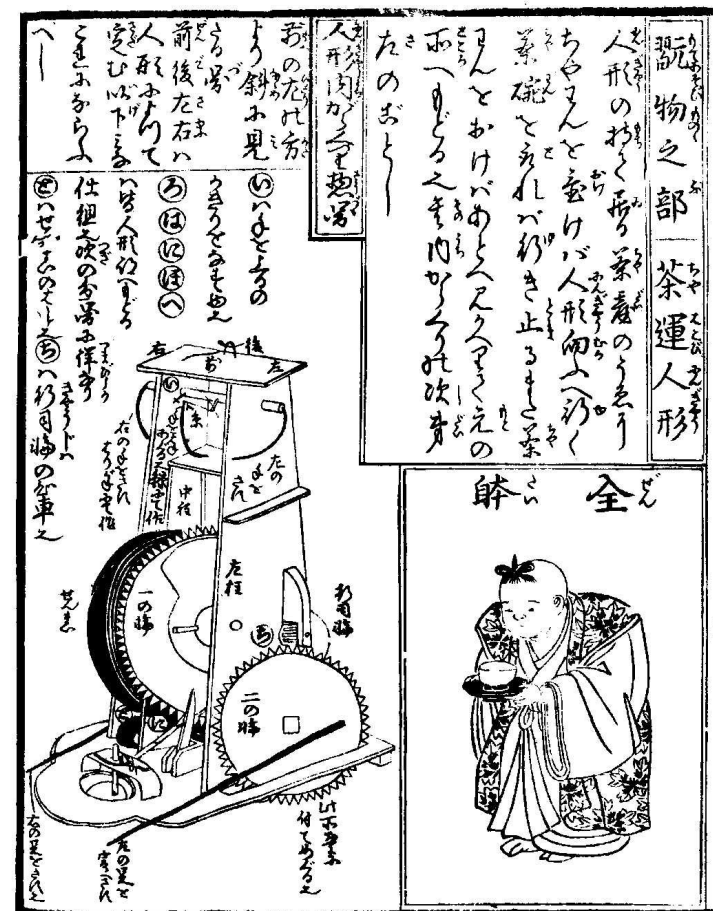


磯訓蒙鑑草:多賀谷環中仙 (1730年)

Japan's Karakuri Books



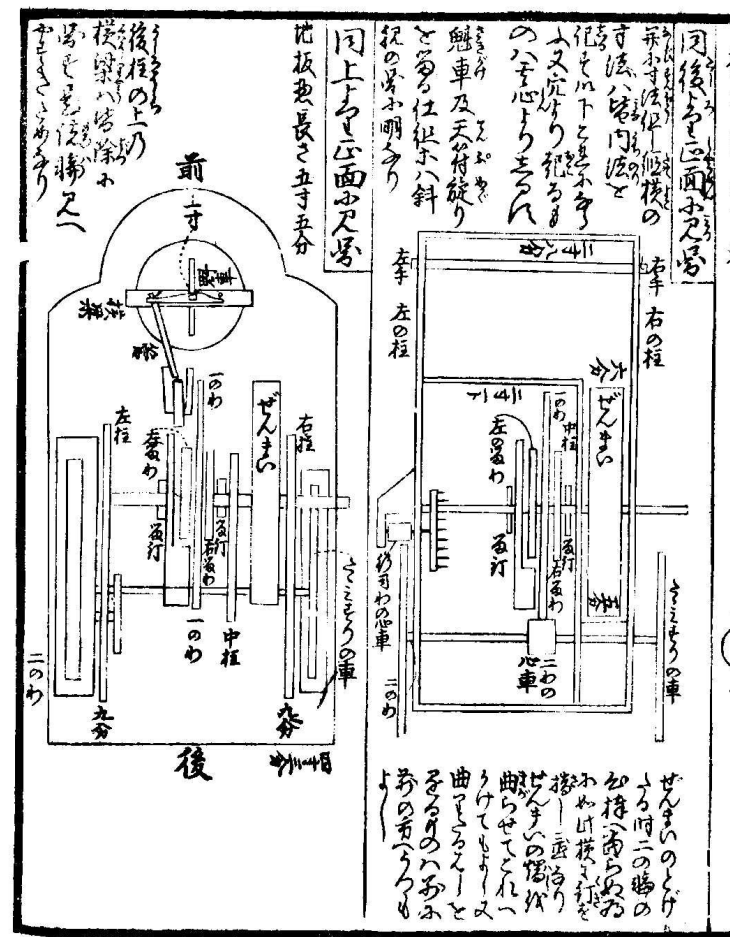
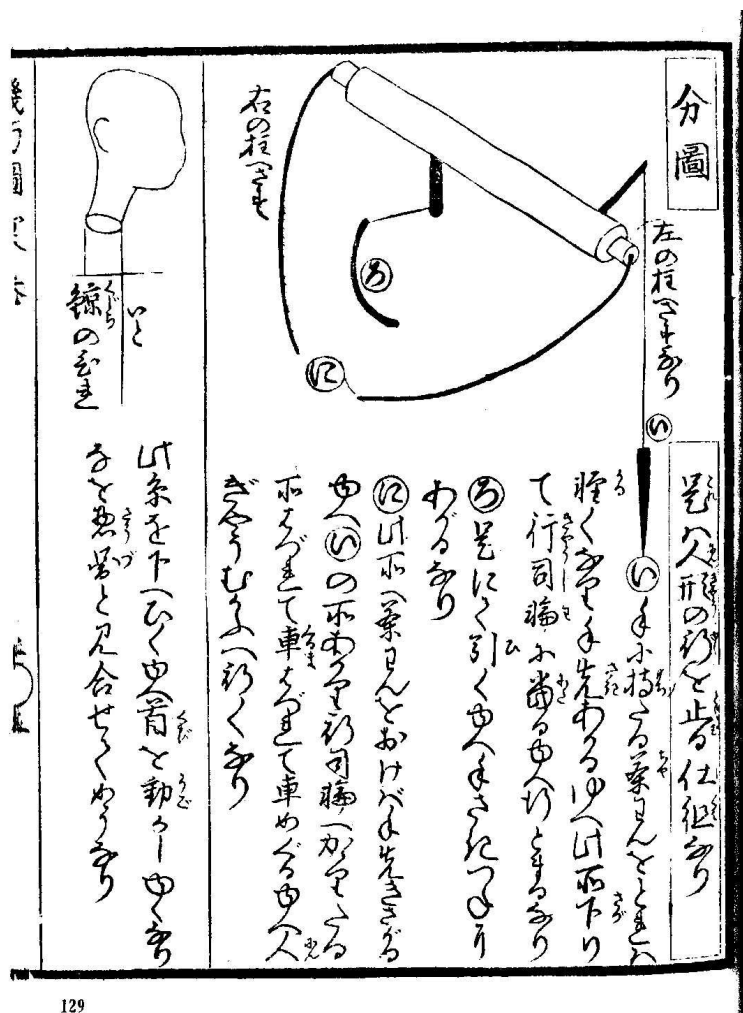
127



126

機巧図彙:細川半蔵(1796年)

Japan's Karakuri Books



機巧図彙:細川半蔵(1796年)

Robot Manga & TV Animations in Japan in the `50s and `60s

■ Tetsuwan Atom / Astro Boy

- Autonomous Humanoid
- Emotion
- Human Size
- In the 21st Century

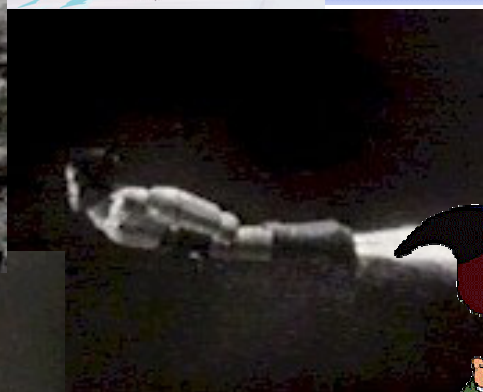


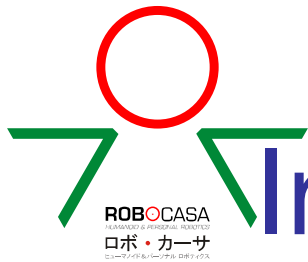
■ Tetsujin 28 / Iron Man the 28th

- Tele-Controlled Humanoid
- No Emotion
- Giant Size
- In the `50s to `60s



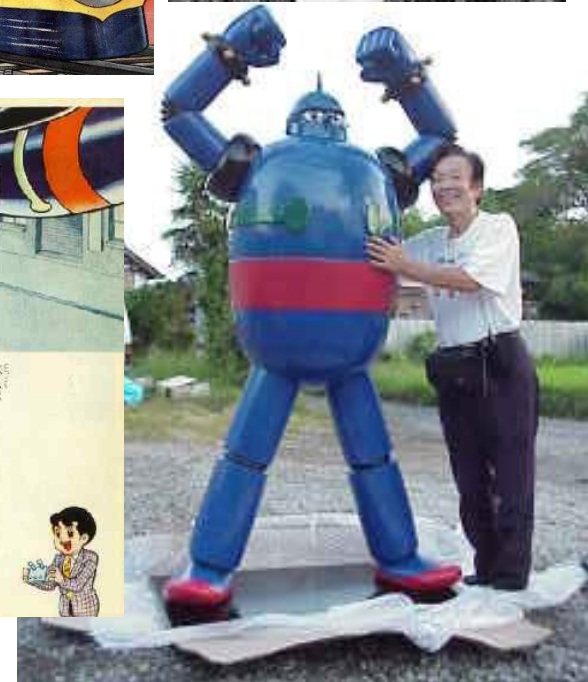
Astro Boy (1951/2~)

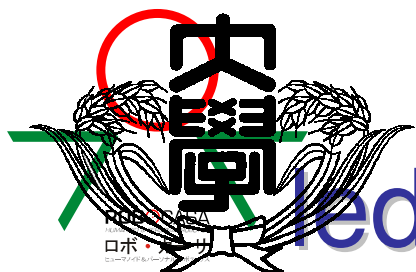




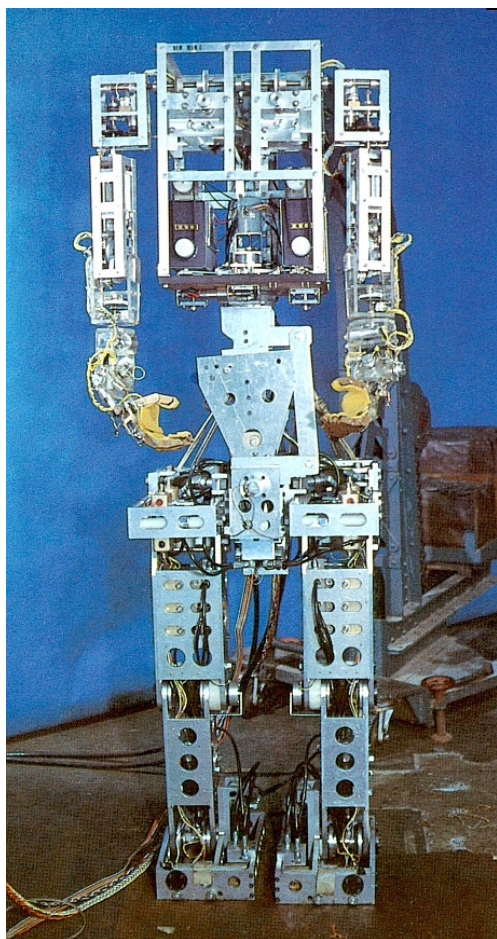
ROBOCASA
ロボ・カーサ

Iron Man the 28th (1956~)





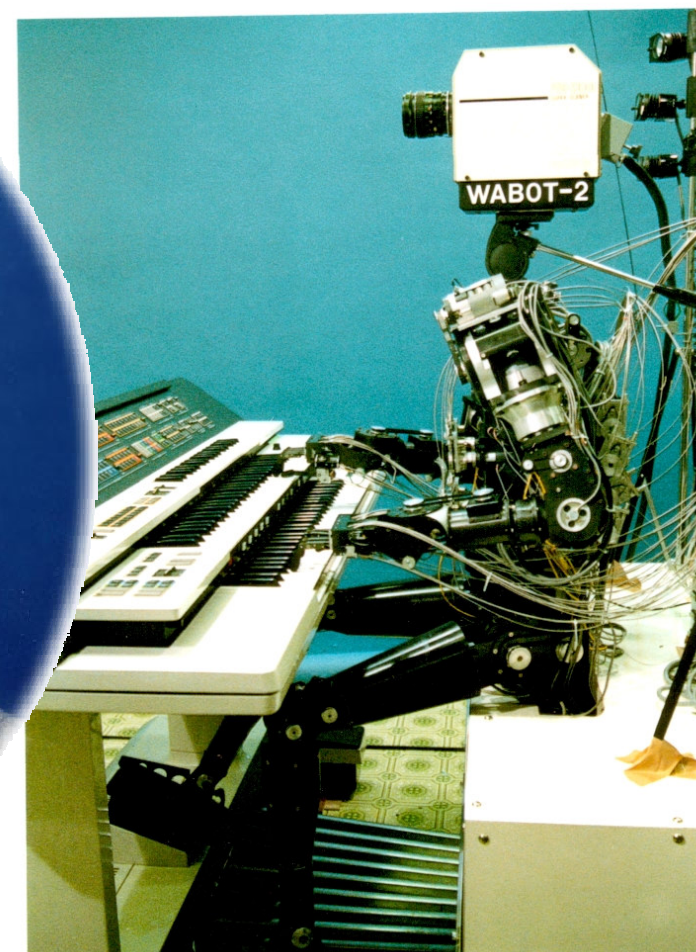
Waseda's Achievements led by the late Prof. Ichiro Kato



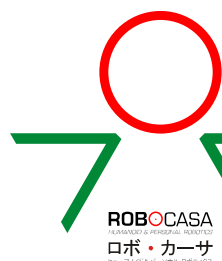
WABOT-1 (1973)



Prof. Ichiro Kato
(1926-1994)



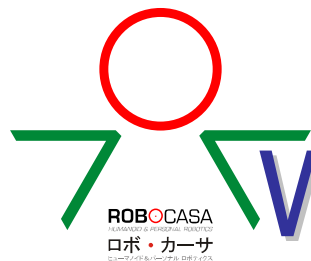
WABOT-2 (1984)



About Humanoid Robotics Institute, Waseda Univ.



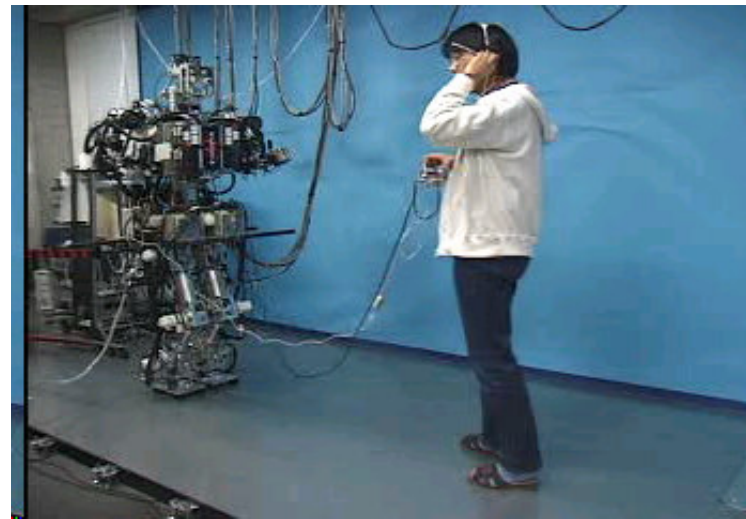
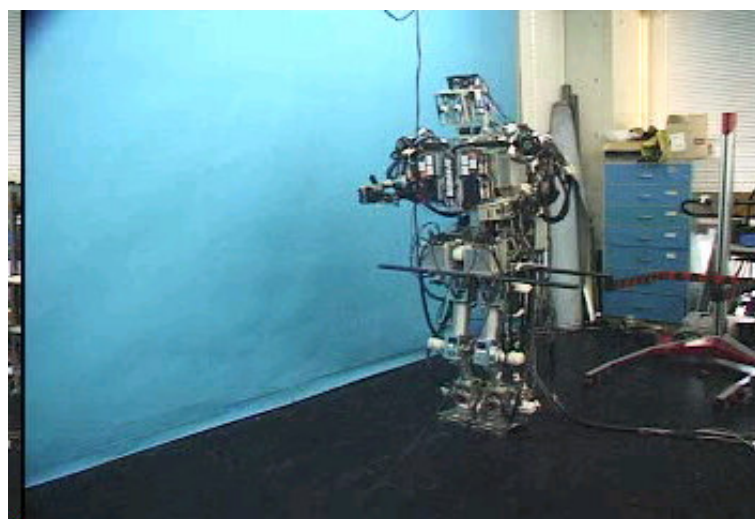
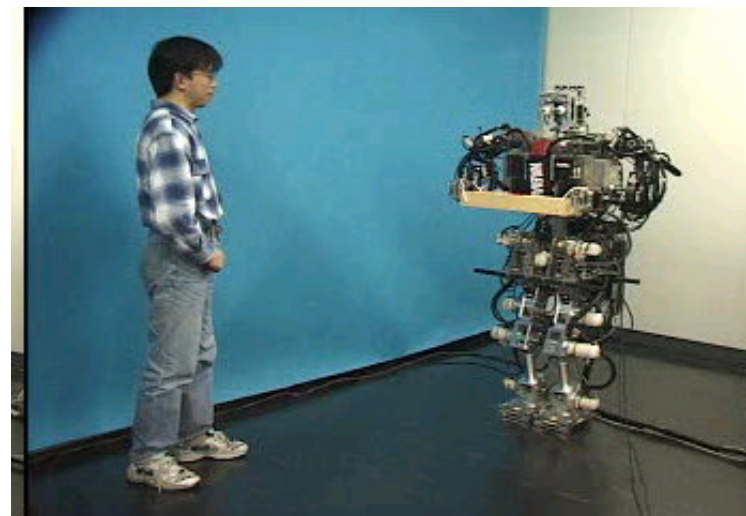
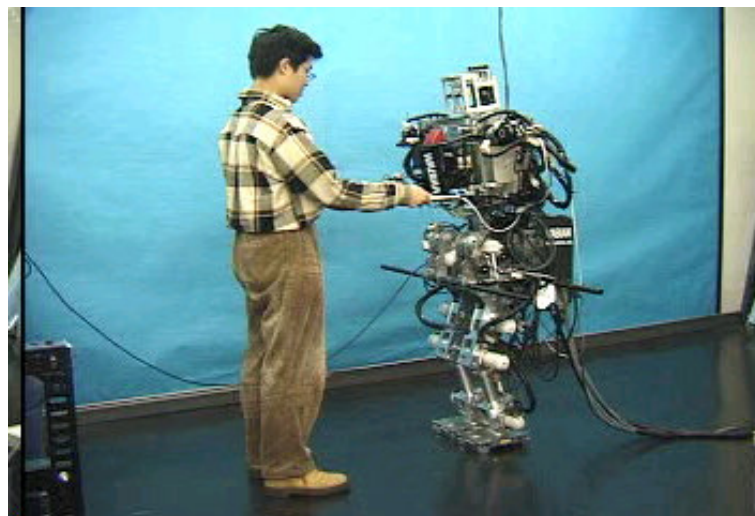
- Established in April, 2000
- 9 Fulltime Professors and 10 Visiting Professors/Researchers including from Overseas
- More than 60 graduate students and post-doc researchers (More than 100 including undergraduates)
- More than 30 ongoing projects
- Organizing Humanoid Consortium
- Supported by: METI, NEDO, MEST, Gifu Pref., TMSUK, SANYO, SONY, HITACHI, NTT, NTT DoCoMo, OKINO, OSADA, ZMP, Fukuoka Pref., Fukuoka City, Niigata Pref.
- **RoboCasa**: SSSA-Waseda Joint Laboratory (2003/4/1)
- **Center of Excellence in the 21st Century in Robotics** **Show!** (2003/7)
- **Super COE on Advanced Science and Medical Care** (2004/7)



Why Humanoid Robots?

- To Build Human Model to Understand Human from Robotics View Point: *“Robotic Human Science”*
- To Make Robotics as One of the Social Technologies based on the Human Model to Support Elderly Dominated Society and to Support Education, Etc.
- Grand Challenge for Roboticists: A human is considered to be an excellent robot both in motional functionality and in intelligential functionality.

WABIAN's Demos: Interactions with Human





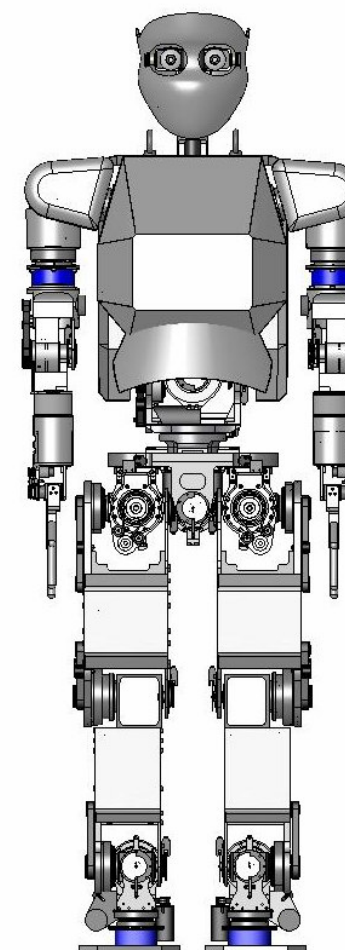
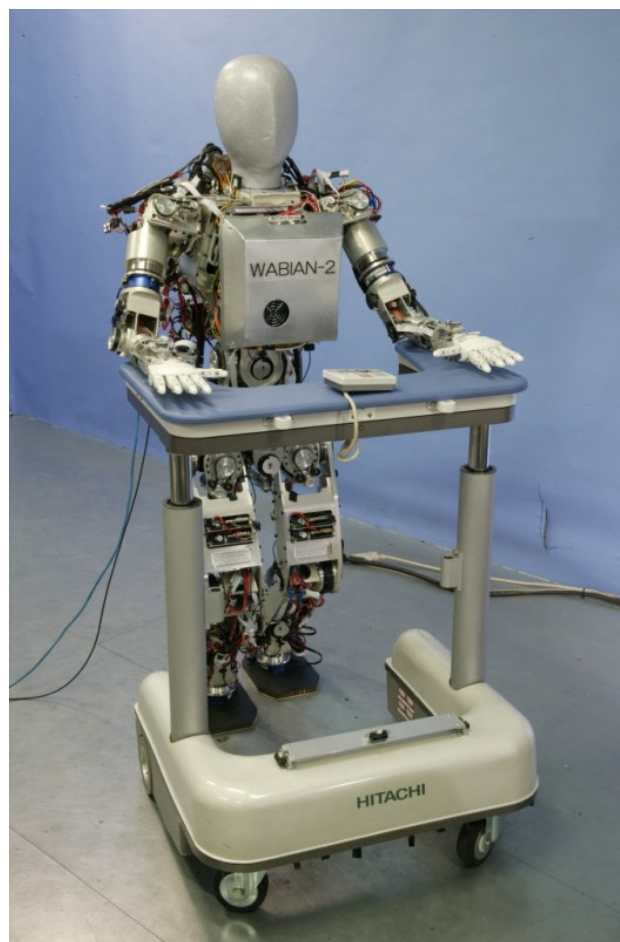
ROBOCASA
ロボ・カサ
ロボット・介護
ロボット・介護
ロボット・介護

WABIAN-2 as a Robotic Human Simulator and a Measuring Device for Quantitative Evaluation of Handicapped/Elderly Supporting Machines/Robots



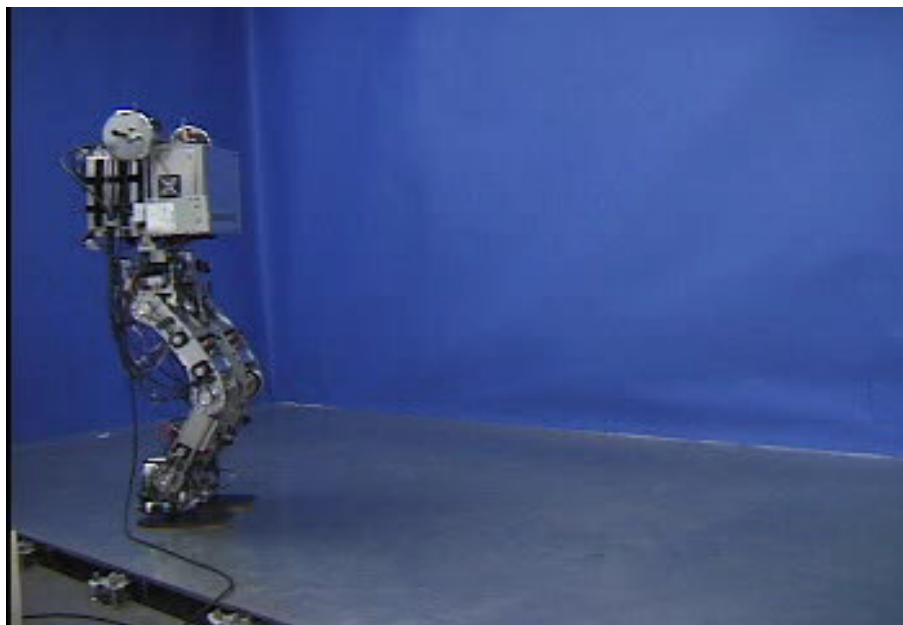
height : 1.5 [m]
weight : 55 [kg]

Total
DOF : 41
leg : 7×2
waist : 2
trunk : 2
arm : 7×2
neck : 3

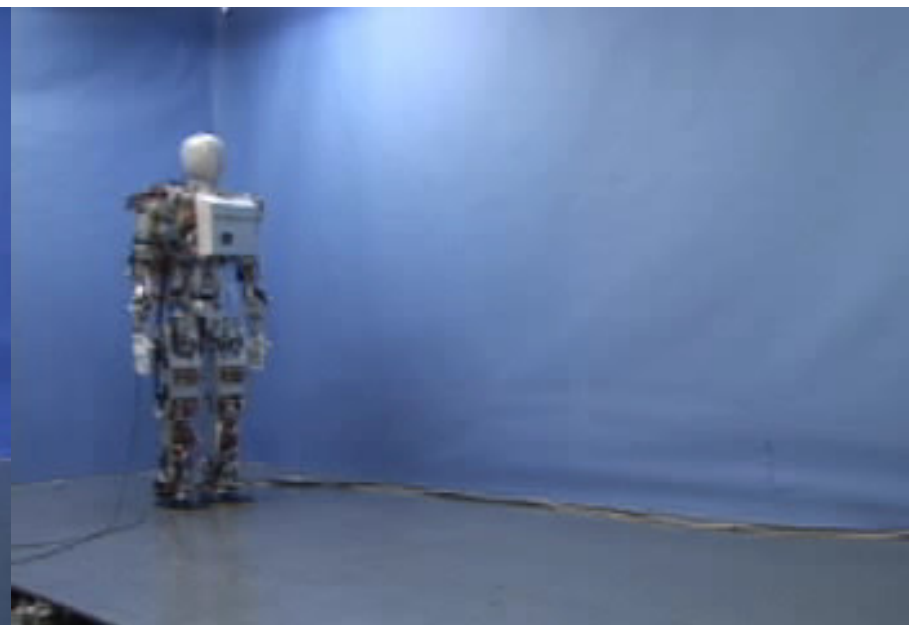


WABIAN-2 Measuring Effects of the Robotic Walking Aid collaborating with Fujie Lab.
(HRI Fukuoka Branch in The Specialized Economical Zone for Robot Development)

WABIAN-2's Human-like Walking

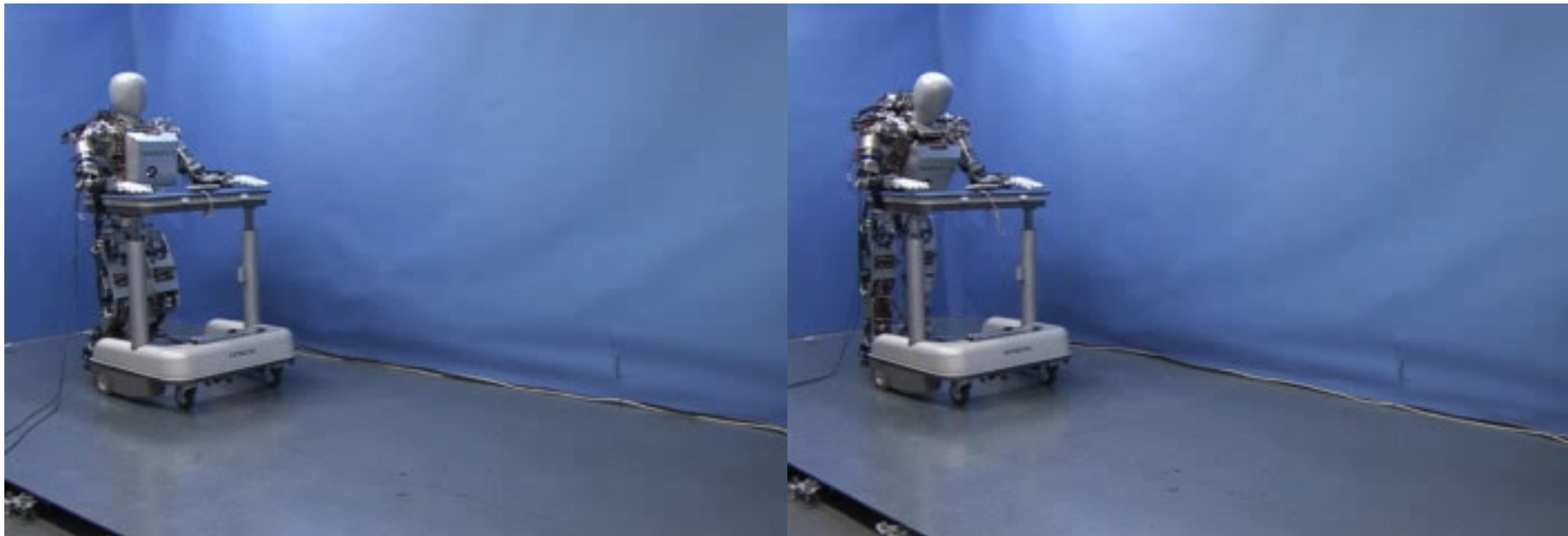


Conventional Bent Knee Walking
without Pelvis Mechanism



WABIAN2's Extended Knee Walking
with Human-like Pelvis Motion

WABIAN-2's Assisted Walking



Bending 0.2[m]

Knee stretched 0.2[m]

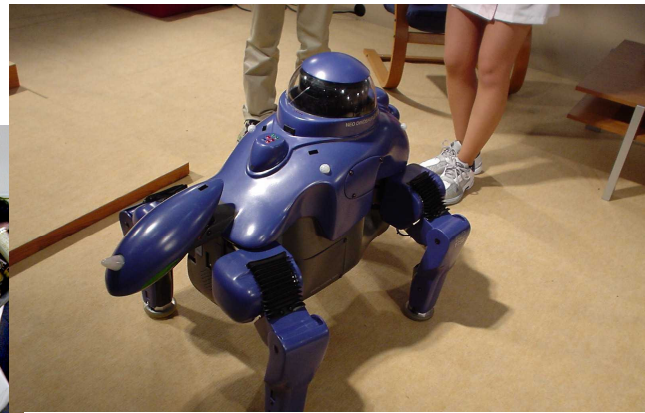
Real World Simulations of a human assisted by the Walker



Applications of Waseda's Bipedal Walking Robot Technology



METI HRP-1



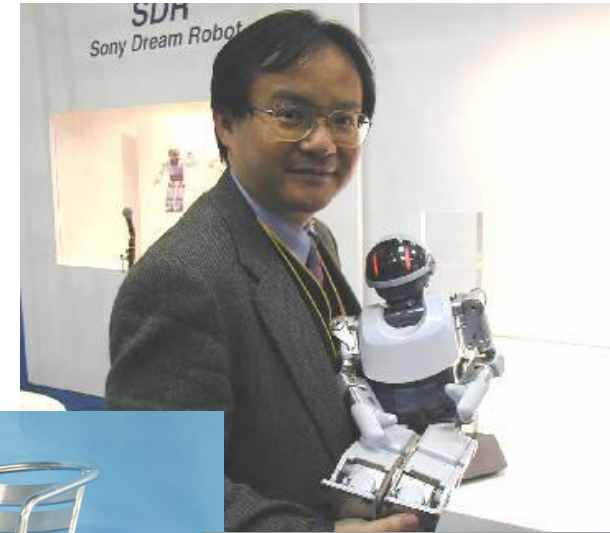
TMSUK / SANYO Banryu



ZMP PINO2



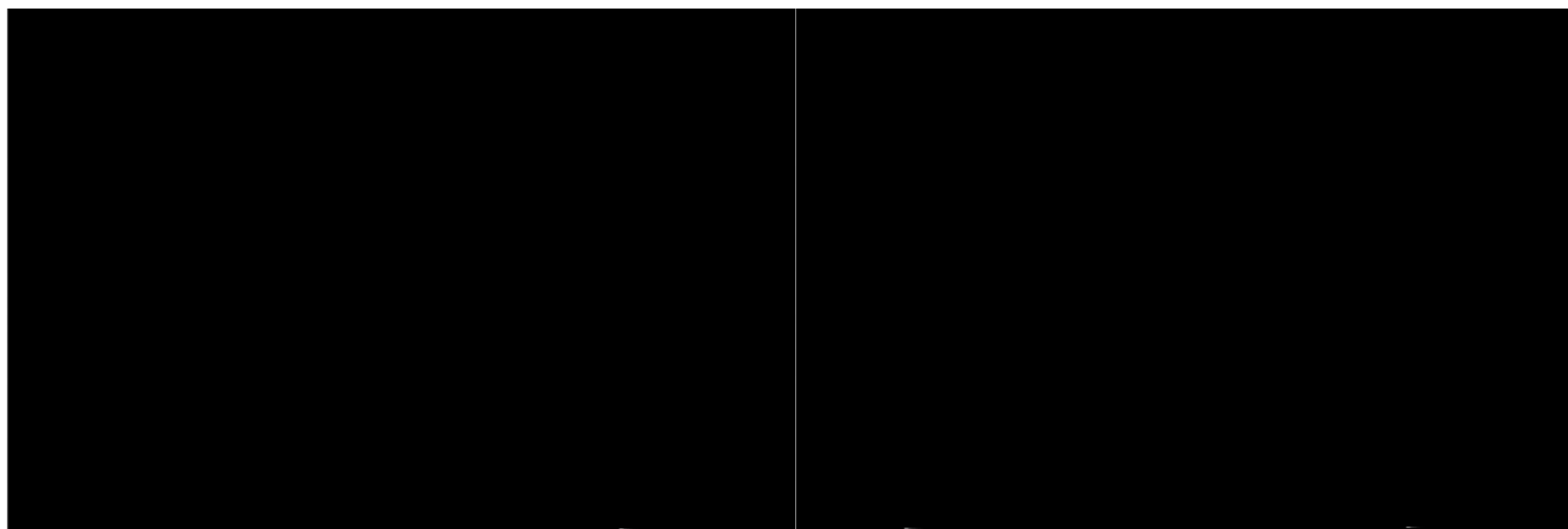
TMSUK / Waseda WL-16



SONY QRIO



SDR-4X's Demo



Biped Robot That Can Carry a Human: WL-16



2003.10.08

WL-16 Walking Experiment

Carrying Human

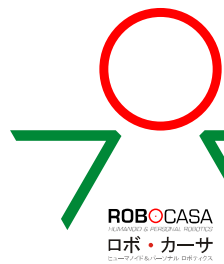
Virtual Compliance Control : Enabled
Step Length : 100 mm / step
Walking Cycle : 0.96 s / step
Rider's Body Weight : ? kg

2003.11.20

WL-16 Walking Experiment

Carrying Human

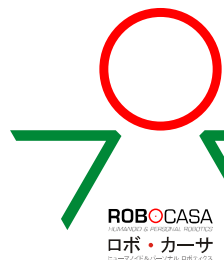
Virtual Compliance Control : Enabled
Step Length : 100 mm / step
Walking Cycle : 0.96 s / step
Rider's Body Weight : 60 kg



Designing Mechanisms for Robots in Movie CASSHERN

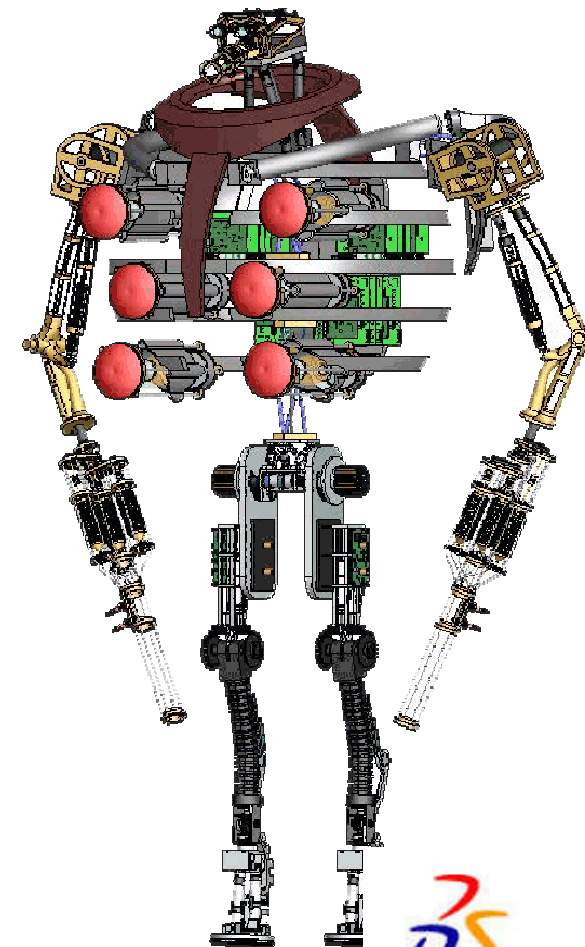
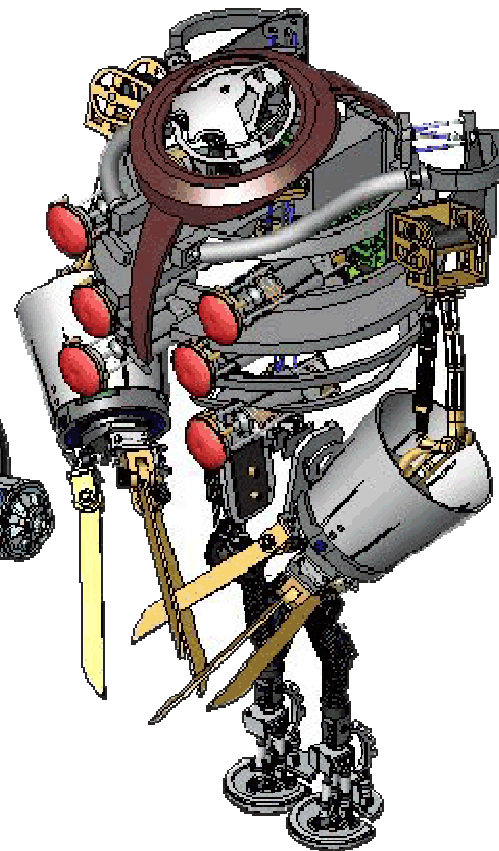
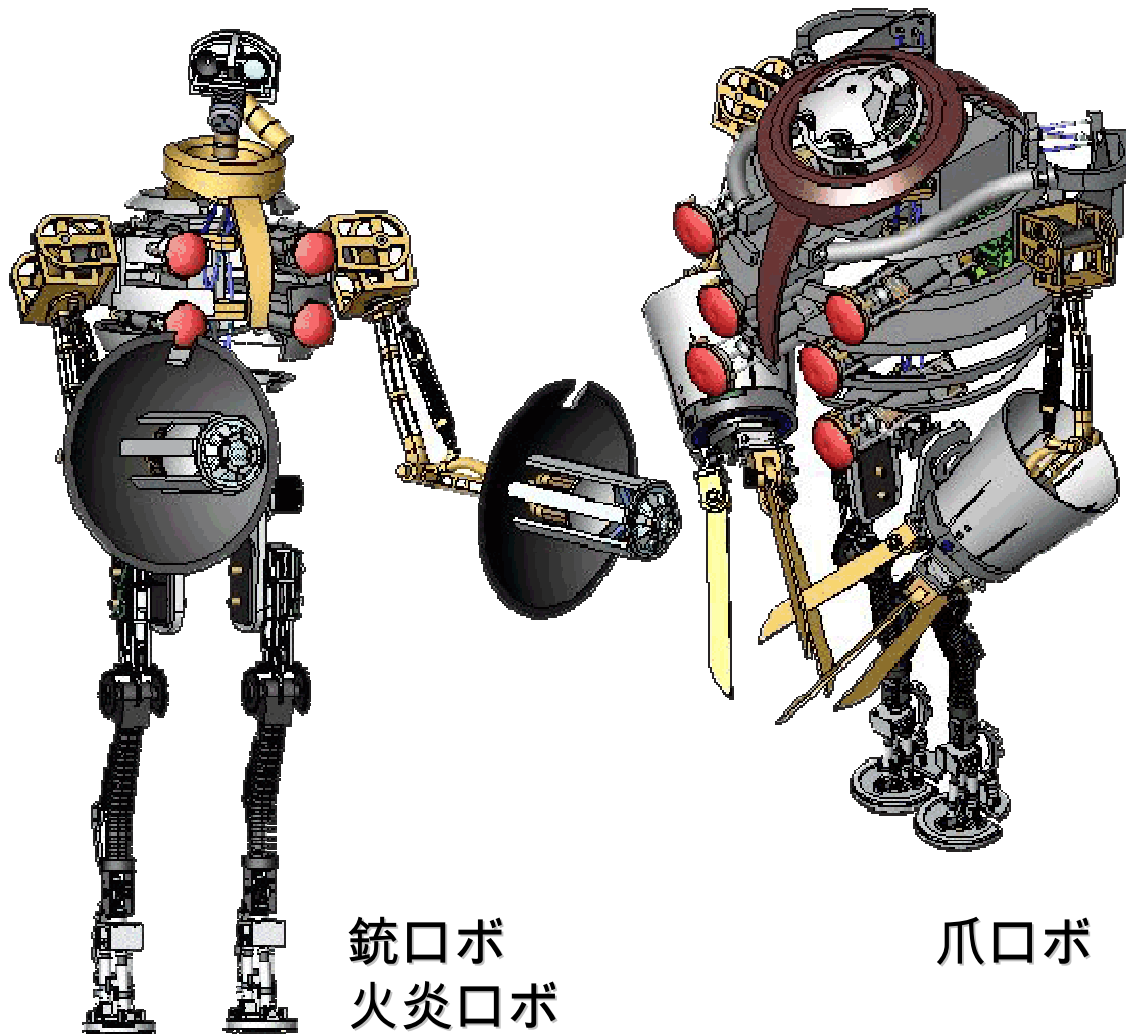
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Designing Mechanisms for Robots in Movie CASSHERN

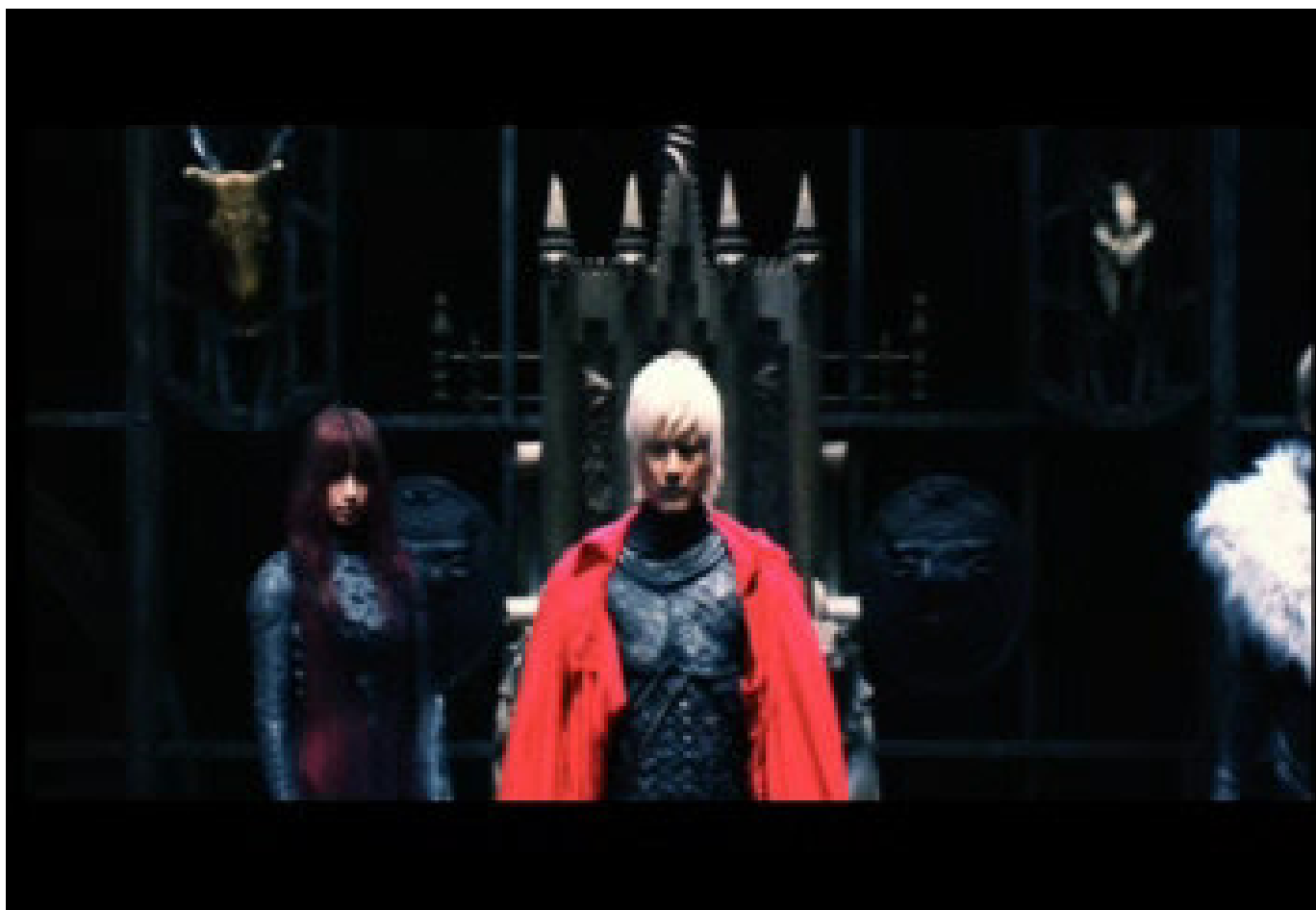
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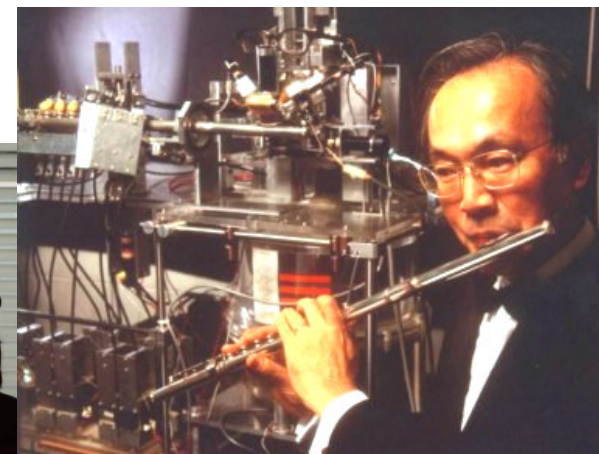
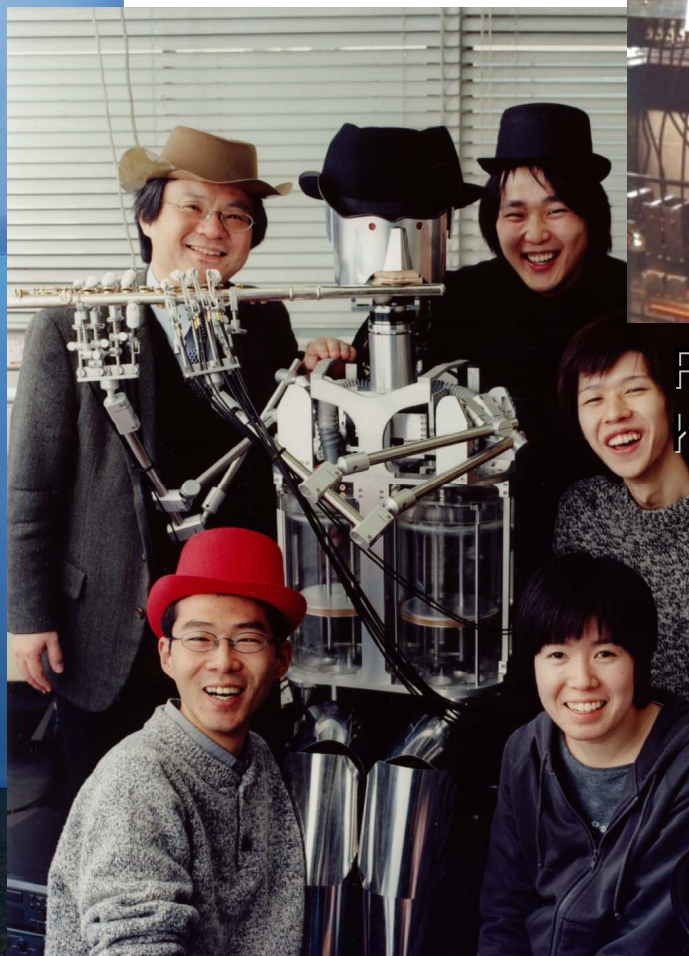
7 ROBOTS in CASSHERN

ROBOCASA
ロボ・カーサ
ROBOTIC CASSHERN

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Flutist Robot for Simulating Human



Professional Flutist: Mr. Kunimitsu Wakamatsu

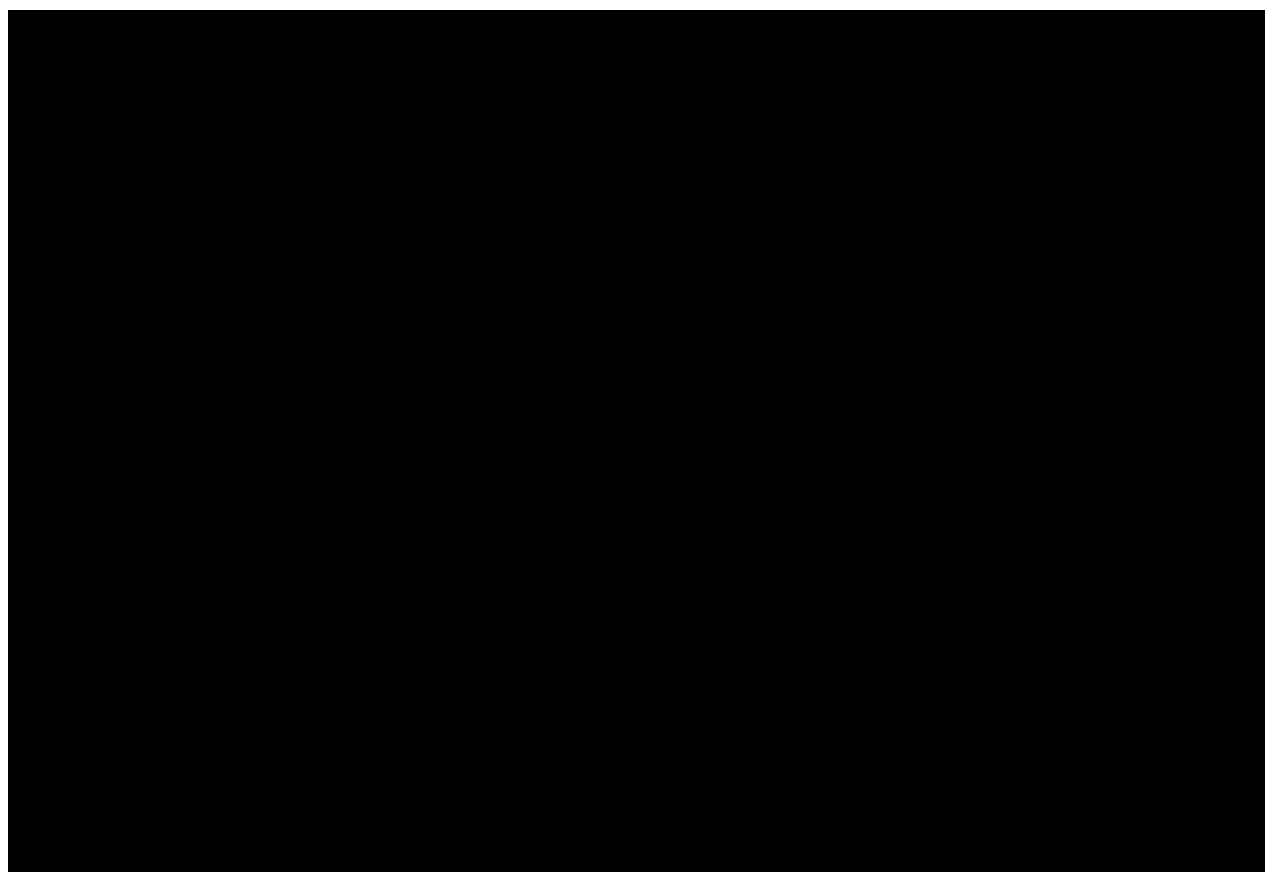
Play!

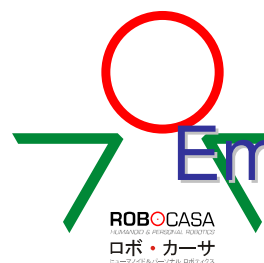
GIFU-WASEDA WABOT-HOUSE Project



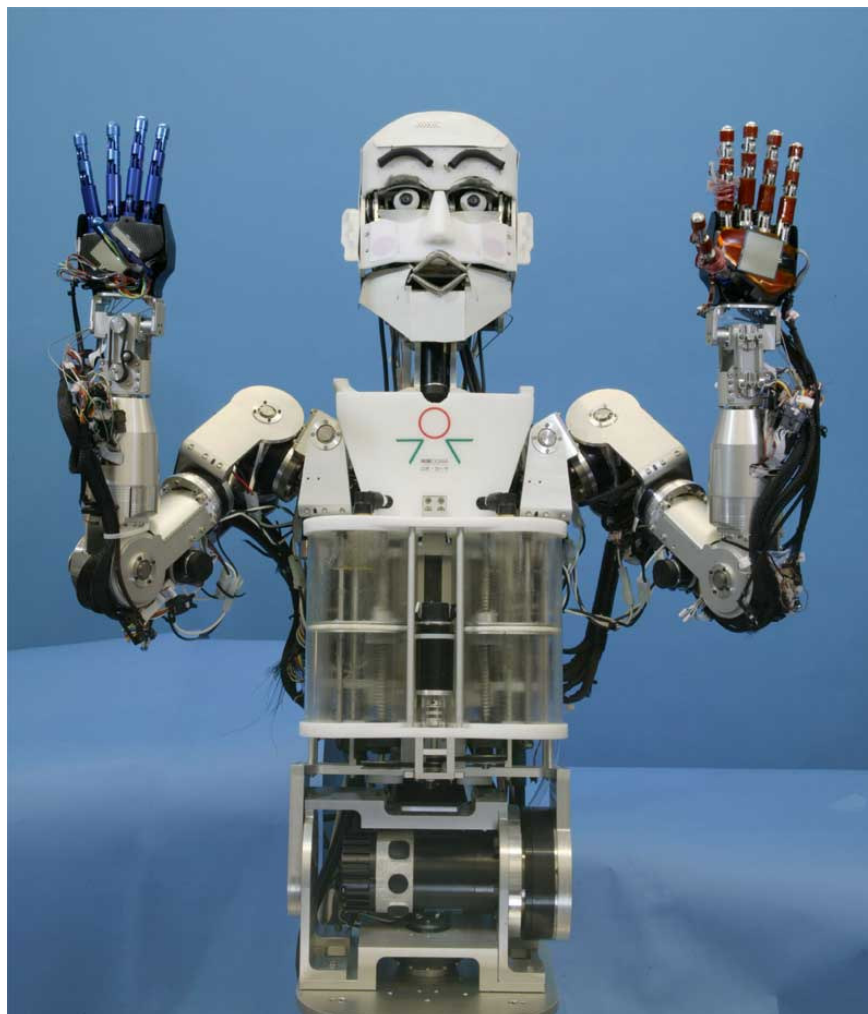
WF-4's Flute Play:

The Flight of the Bumble-Bee (Rimsky-Korsakov)



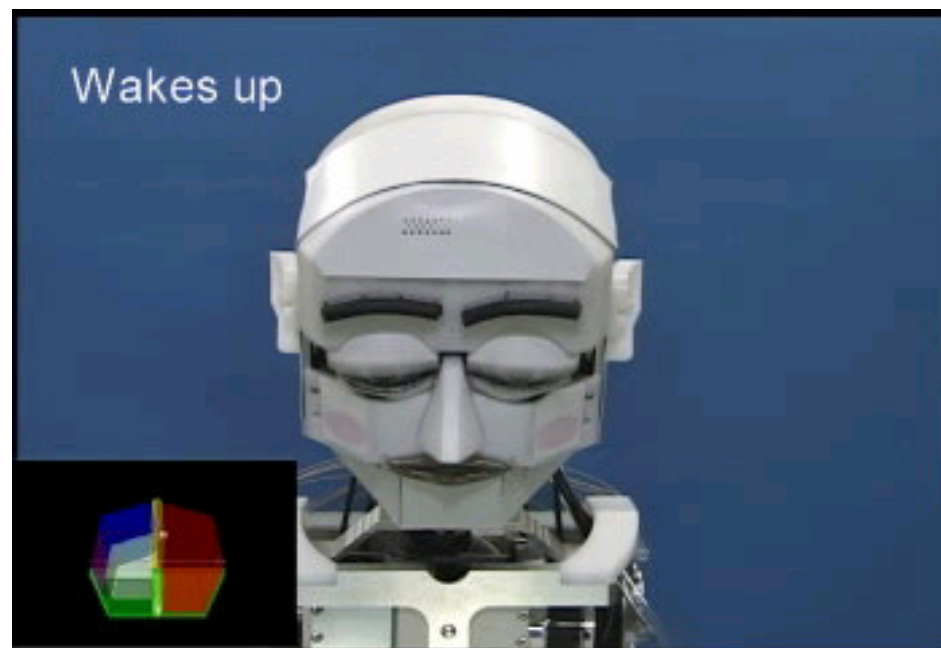


Emotion Expression Humanoid **EYE-Chan**: WE-4RII for Modeling Human Mind

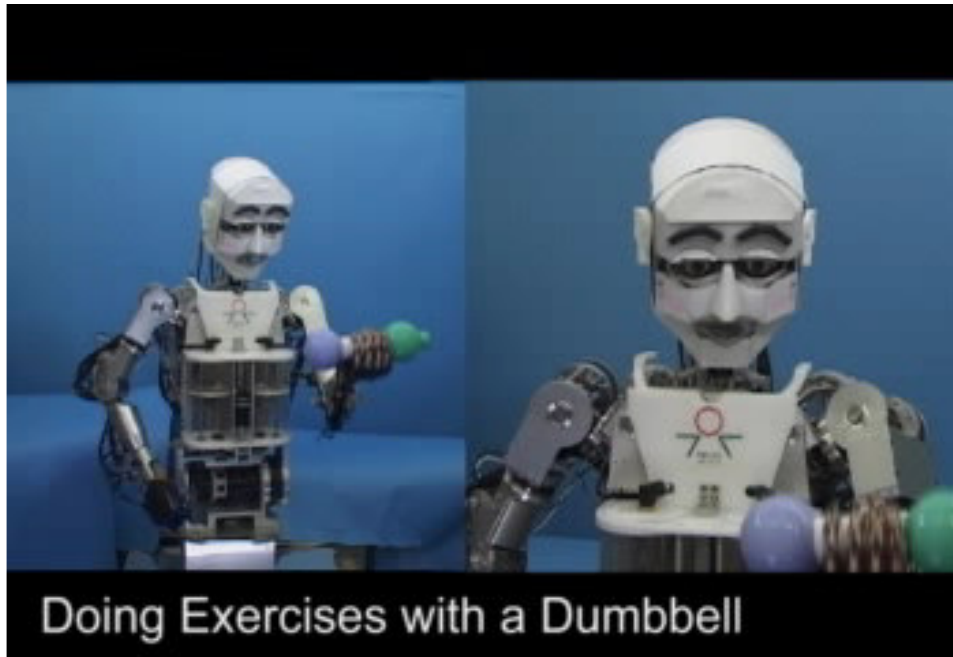


Part	DOF
Neck	4
Eyes	3
Eyelids	6
Eyebrows	8
Lips	4
Jaw	1
Lung	1
Waist	2
Arms	18
Hand	12
Total	59

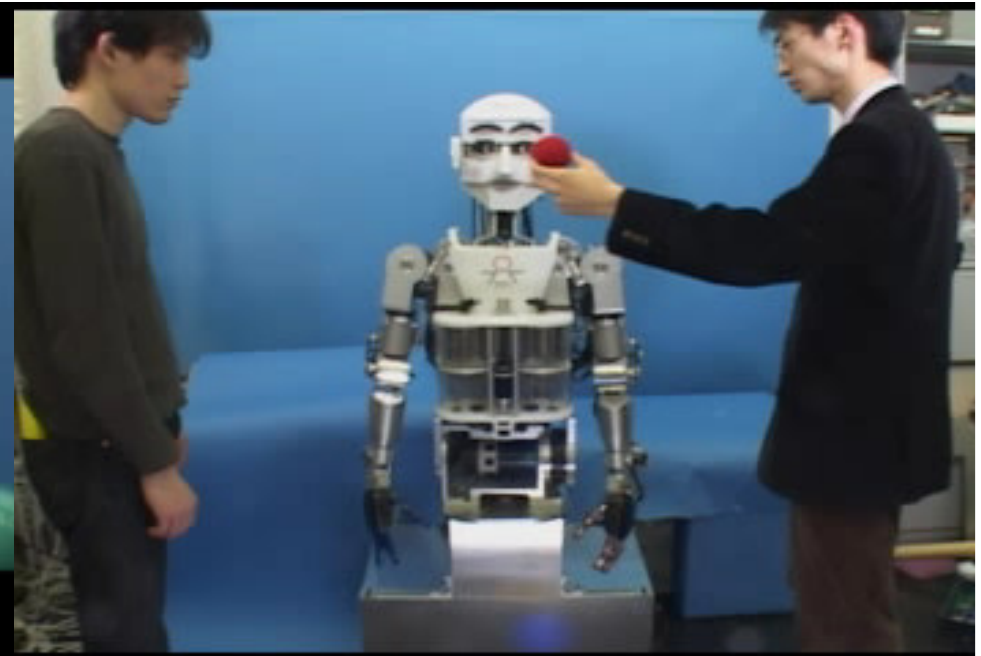
Demos of EYE-Chan



Additional Demos



More Behaviors

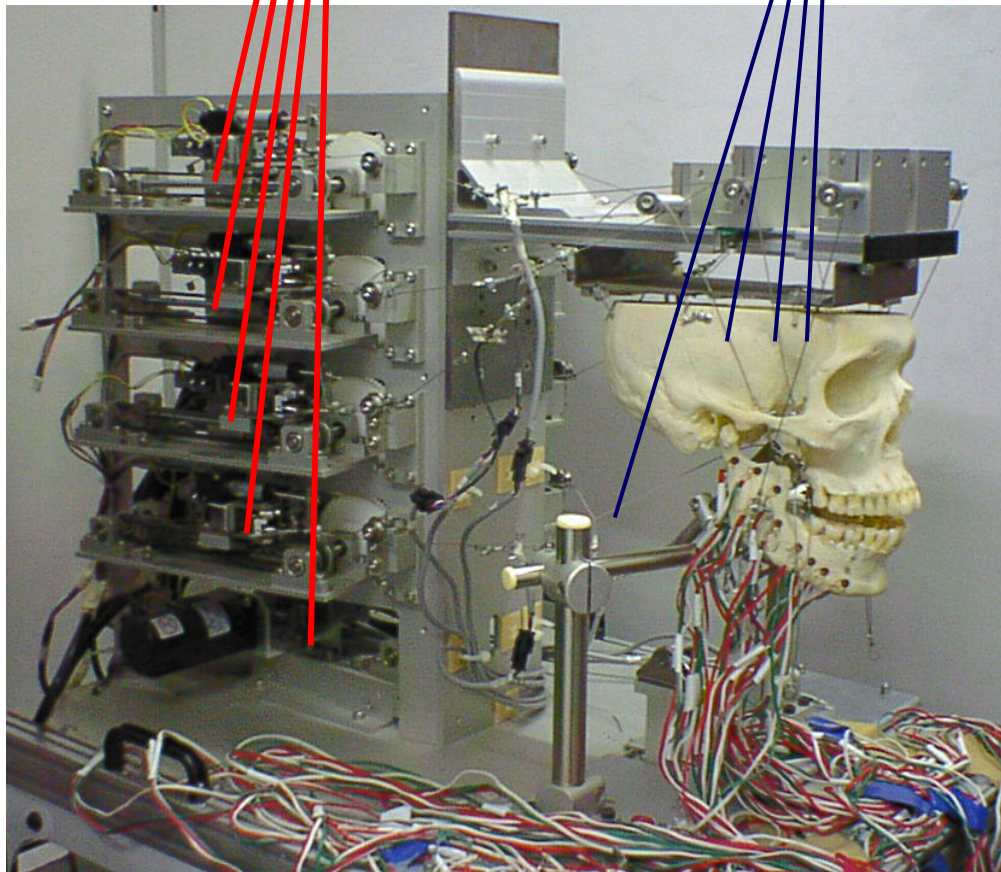


Addition of
Consciousness

Dental Robotics: Clarify Human Mastication with Mastication Scientists

9 Linear Actuators

Driving Wires



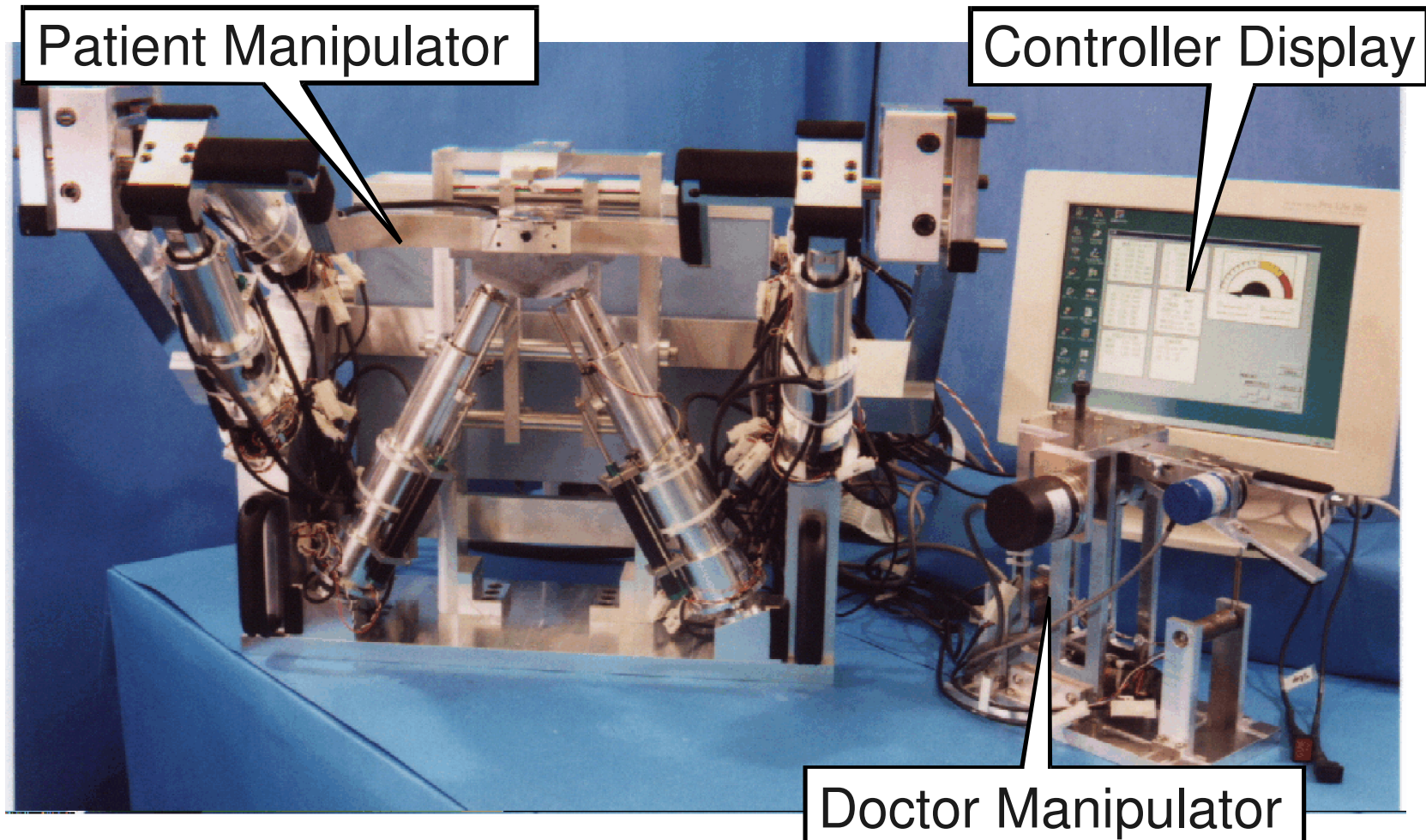
Height : 510 [mm]
Width : 450 [mm]
Depth : 600 [mm]

9 DOF

- 9 AC Servo Motors
- Wire Drive
- Nonlinear Viscoelasticity

With OKINO Industries

Jaw Training Robot for TMD Patients Designed using Human Mastication Model





New Clinical Application of WY-5: Intermaxillary Traction Treatment

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Un-physiological Movement

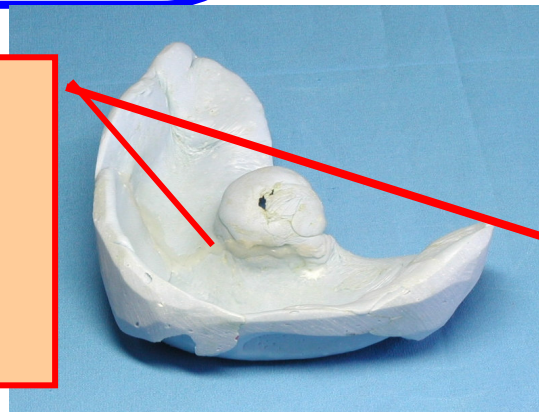
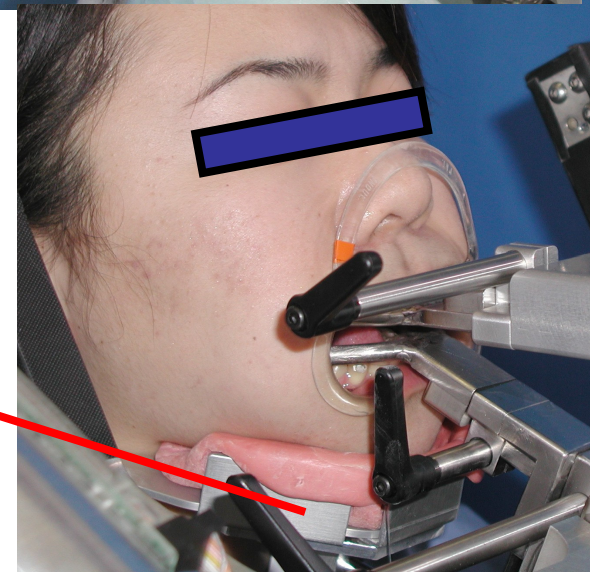
Upper
Mouthpiece

Patient

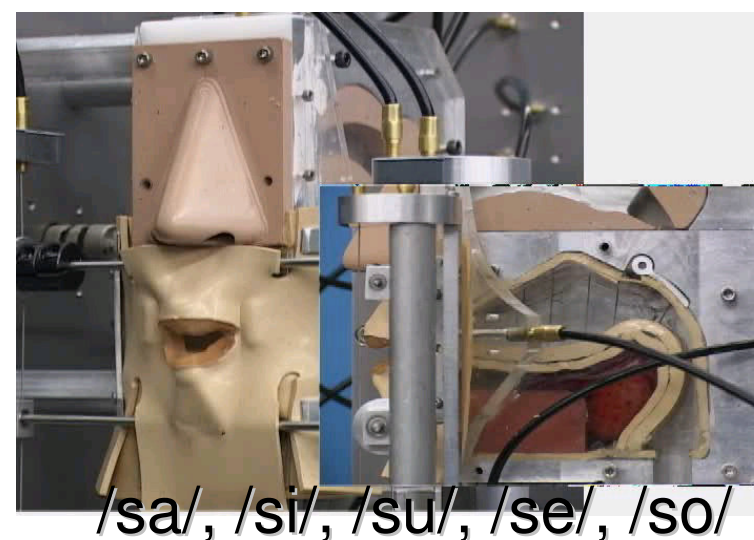
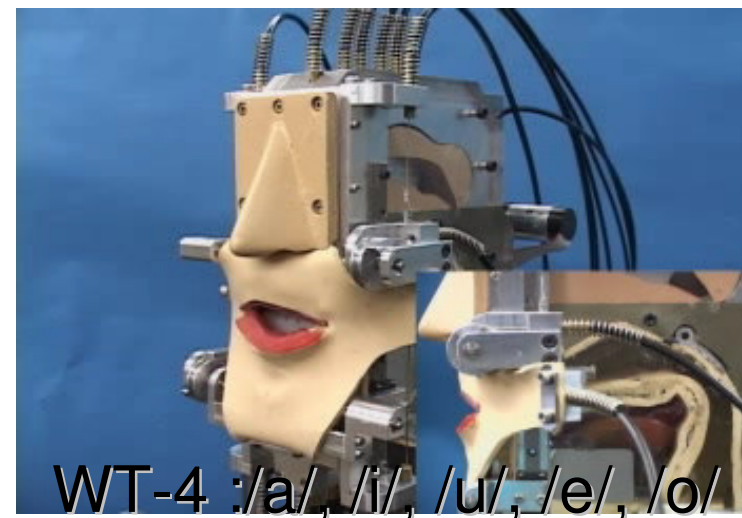
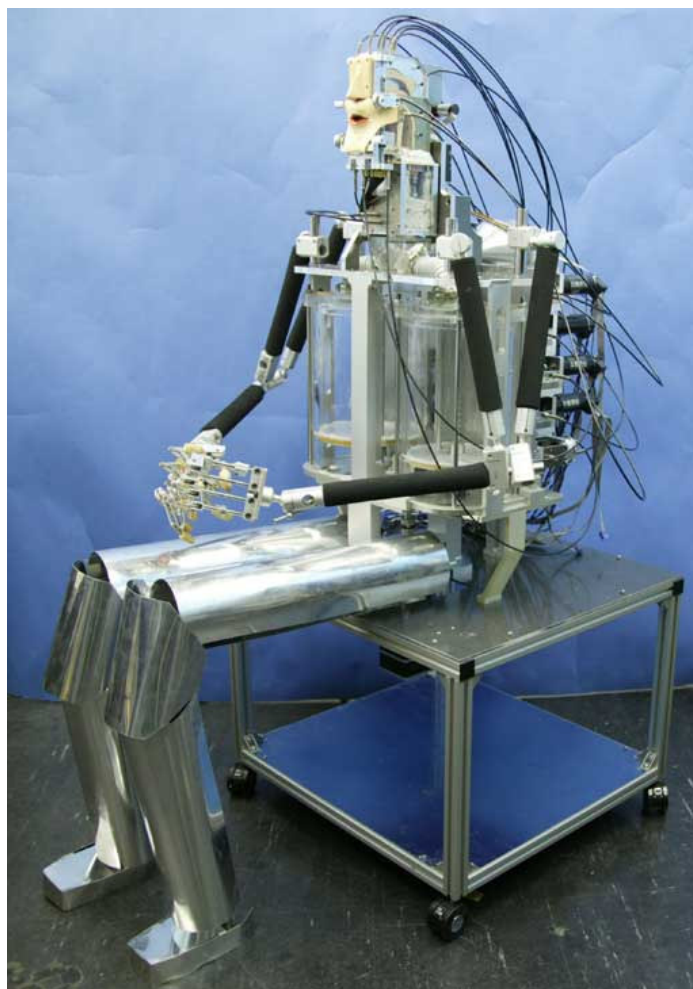
Lower
Mouthpiece

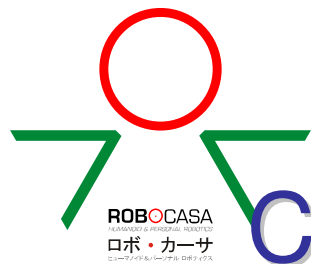
Patient Lower Jaw
Model by Resin
(Quick-drying
Acrylics)

Dental
Headrest



Towards Vocal Humanoid Robot: WT-4





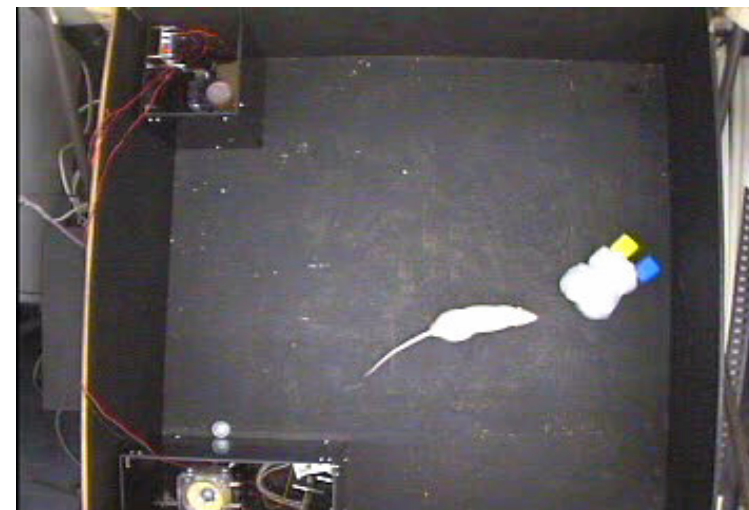
Robotic Animal Psychology Collaborating with Psychologists

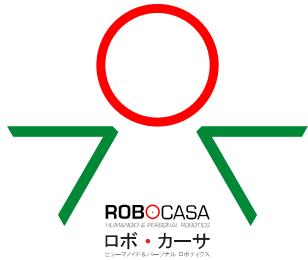
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ロボ・動物実験Ⅱ

ロボ・動物実験Ⅱ

ロボ・動物実験Ⅱ





High Social Acceptability of Robots in Japan



- Acceptability of Humanoids/Animaloids
 - Feel/Accept Life-likeness through the Robots which Mimics Humans and Animals
- Social Acceptability depends on Religious and Cultural Backgrounds
 - Western Countries (Monotheism) and Japan/Asian Countries (Animism / Polytheism)
 - Organ Transplantations VS Artificial Organs
- Need of Social Systemic Preparation for Robot Acceptable Society
 - Change of Laws/Regulations to Accept Robots (*Special Zone for Robot Experiments in Fukuoka*)
 - Licensing/Insurance System
 - Black Chip (Black Box) for Better Life with Robots

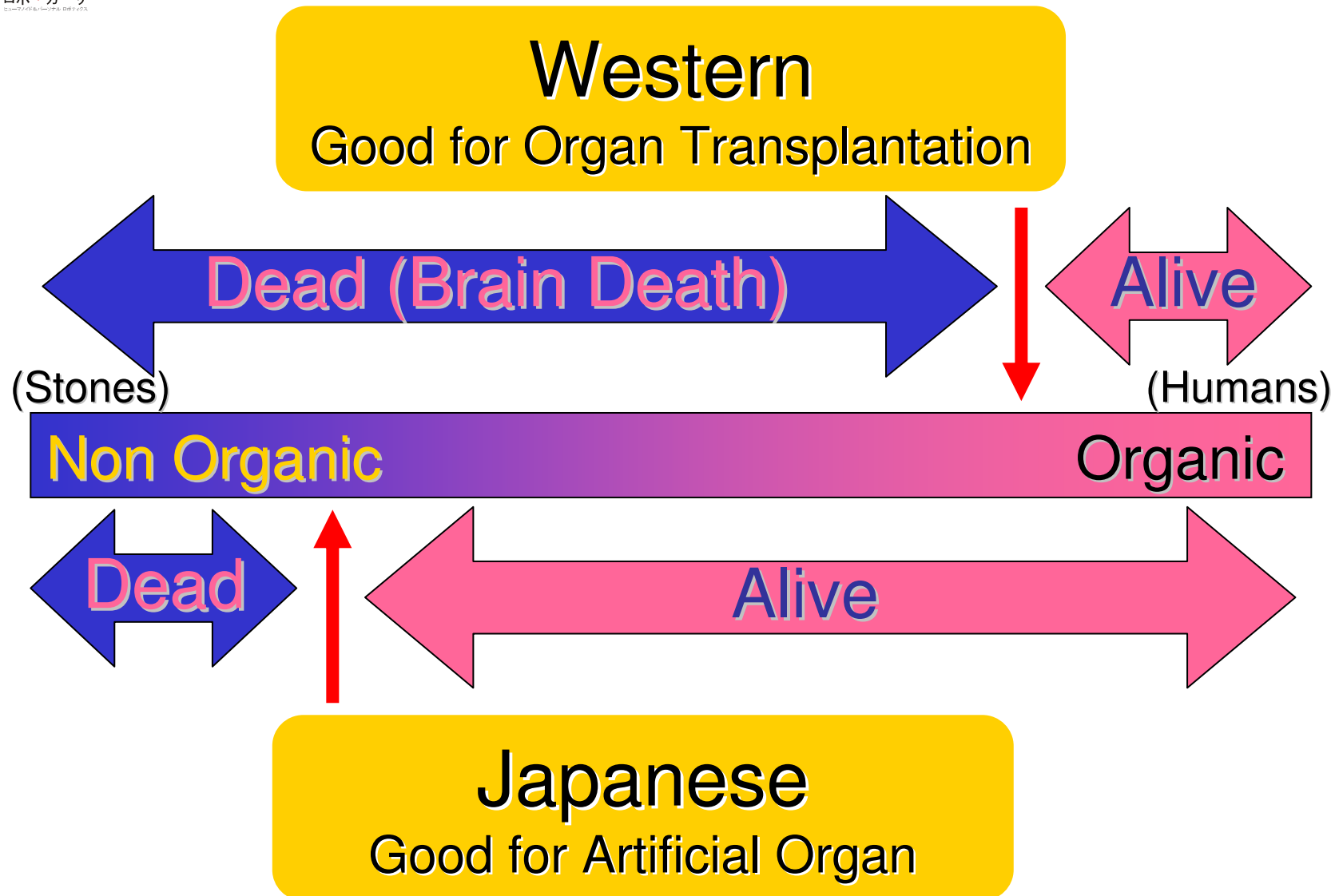
Requiem Service for Broken Needles in Japan



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ロボットと暮らしの共生



Dead or Alive?





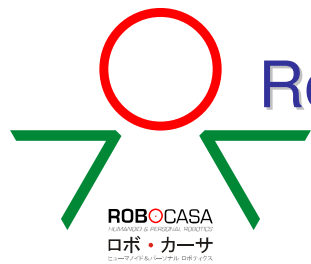
Special Zone for Robotic Experiment in Fukuoka: Change of Traffic Law Enabling Robots to Move on Public Roads



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- • • next are for Easy Usage of Radio Waves for Robots
and for Robotic Medicine, etc.



Robot Experiments in the Special Economical Zone for Robots in Fukuoka

