<Final Information>

The joint forum of MARS-PTF, RTESS-PTF, (ManTIS-DTF), SDO-DSIG

# Robot Information Forum Kick-Off Meeting in OMG Technical Meeting

**Montreal, Quebec Canada**
**Tuesday, August 24, 2004**

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With the rapid progress in computer and communication technology, the robot systems are fast becoming larger and more complicated. Therefore, there is a real need for the software technologies for efficient developments. Now various software technologies (e.g. layered robot architectures, modular programming techniques, common libraries and so on) are proposed and implemented respectively. Unfortunately, most of these pioneering initiatives are developed independently of the others, driven by specific applications and objectives. In order to settle this state of chaos, this forum would like to contribute to the promotion of standardization in the field of robotics based on the mutual understanding between the relevant parties.

**Schedule :**

09:00-09:15
"Welcome Address"
**Richard Soley**, Chairman & CEO, Object Management Group

09:15-10:15
"Robotics R&D and Business -Present and Future- " (Keynote Speech)
Kazuo Tanie
Principal Reviewer, AIST/Japan
President, IEEE Robotics and Automation Society
About 45 years ago the first commercial industrial robot was supplied to the market. Since then, various robotics R&Ds have been carried out and the remarkable advancement of the robotics technology has been made. Currently, there are about 780,000 industrial robots working in the factory of the world and they are contributing to increasing the productivity in manufacturng industry.
Though the robot has been so far mainly used as a tool for automation in the manufacturing factory, there are several possible applications except the manufacturing automation, like a robot that can do some tasks in the hazerdous environment in lieu of human workers and also a human assistance robot that can be used to support humans in their daily lives. In 21st century, one of the most significant issues to be solved is the one the high elderly dominated society will produce. In the high elderly dominated society, the increase of elderly people population and decrease of labor power enough to keep industrial and social activities high quality will be predicted. In this situation, the robot technology has drawn the people's attention as a candidate of new future businesses.
In this talk, the recent tendency of robotics R&Ds and their applications moving from the manufacturing automation to non manufacturing automation like providing various services to humans in their daily lives and so on will be introduced.
*(Presentation: pdf )*

10:15-10:30
Break (Tea Time)

10:30-11:30
Robot Stories

- "Robot Software & Home Robots"
  **Fumio Ozaki**
  Toshiba Corp.
  I will talk about what is robot software and why you need a middleware for robot. Then I will introduce Open Robot Controller Architecture (ORCA), which is an example implementation of the middleware. Next, I will show Toshiba robot history to make images of robot in you. Home robots are very popular now in Japan, I would like to show some of them and why they are appearing. Finally, I would like to introduce ApriAlpha, the Toshiba home robot.
  *(Presentation: pdf)*
- "Steps toward new robotic systems for lifestyle support"
  **Olivier Lemaire** and **Hitoshi Kitano**
  Matsushita Electoric Works, Ltd.
  While developing a single robot is a difficult and costly task, the result often provides too few added-value to generate interest from potential end-users. The development of a robotic system where several kind of robots collaborate together to provide new functionalities becomes necessary. Hitoshi Kitano and Olivier Lemaire from Matsushita Electric Works, Ltd will share there experience of developing a Lifestyle Support Robotic System and introduce some of the main integration problems they encountered and that a standardized approach could help solving.
  *(Presentation: pdf)*
- "Advanced Robotics Technology
  - introduction of AIST research activities and expectation for standardization"
  **Tetsuo Kotoku**
  AIST, Japan
  Several research activities in AIST will be introduced with video clips.
  In the field of robotics research, every year a lots of new ideas are proposed. However, most of them are tried out by using the unique experimental setups originally developed. It is true that the design of the hardware and software system is important and it affects the

performance of the total system, but it is quite inefficient way to confirm the effect of basic ideas. We would like to discuss the possibility of common robot architecture for the future research platform.
*(Presentation: pdf)*

11:30–13:30
Lunch

13:30–14:30
**Discussion**

- Roadmap
- Future Activity
  *(Presentation: pdf)*

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**Contact:**
Tetsuo KOTOKU (AIST, Japan) E-mail: t.kotoku at aist.go.jp
Makoto MIZUKAWA (Shibaura-IT, Japan)

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# Robotics R&D and Business
# -Present and Future-

**Kazuo Tanie**

**President**
**IEEE Robotics and Automation Society**
**and**
**Principal Reviewer**
**National Institute of**
**Advanced Industrial Science and Technology**

## Contents

# History of Robotics Research and Applications

**Before 1970s**

**Manual Control Robot for Space/Nuclear Plant/Undersea/Rehabilitation**

**Remote Controlled Robot for Hazardous Tasks (Master-Slave Manipulator)**

**Devices of Assisting Handicapped (Powered Prosthesis)**

**1970s**

**Industrial Robot for Manufacturing Factory Automation**

**Automation in Structured Environment**

**(Teaching Playback Industrial Robot)**

**1980s**

**Robots for Non-Manufacturing Applications (Plant Maintenance, etc)**

**Automation in Unstructured Environment**

**（Robot with Intelligence ）**

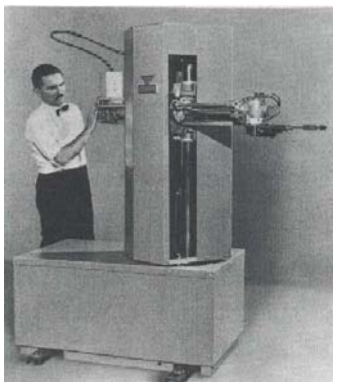
**1990-Present**

**Robots for Non-Manufacturing Applications**

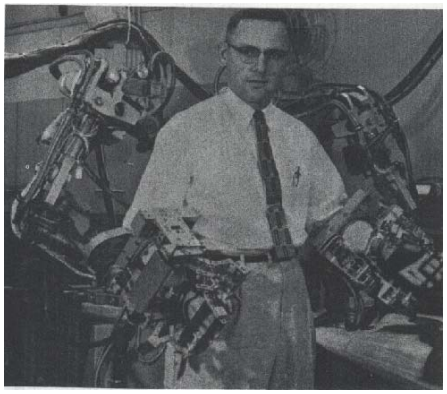
**(Home Robot, Elderly Person Care Robot, Medical Robot, etc.)**

**Human Friendly Robot, Surgery Robot (Humanoid, Micro-Robotics)**

# Robotics in 1960-1970



**Industrial Robot（Versatran）**

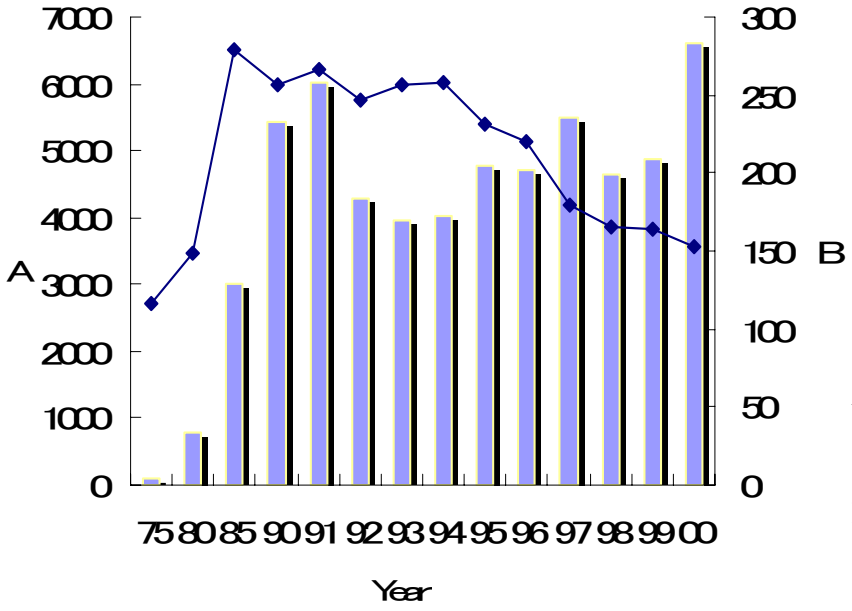


**MS Arm（GE）**

**Hardyman (GE)**

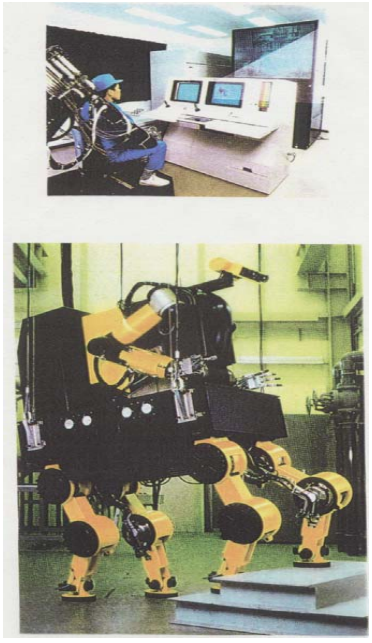
**Myoelectric hand**
**（Waseda Univ.）**

# Industrial Robot Production in Japan

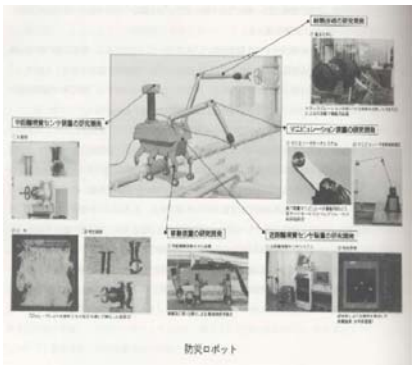



**Number of Industrial Robots used in the world : about 780,000**

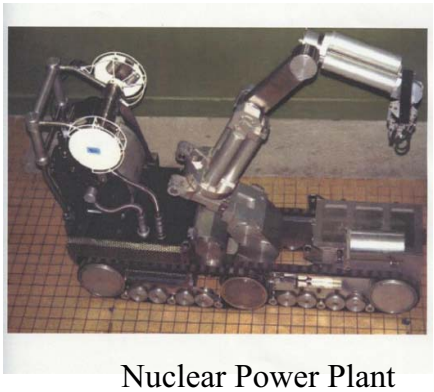
# Maintenance Robot(1980s)



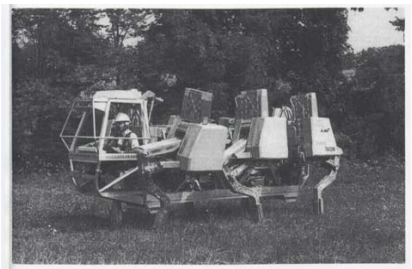
**Nuclear Plant Maintenance Robot (MITI)**
**(1983-1990, Advanced Robotics Project)**



**Fire-fighting Robot (MITI)**
**（1983-1990, Advanced Robotics Project）**



Nuclear Power Plant Maintenance Robot (Cybernetix)



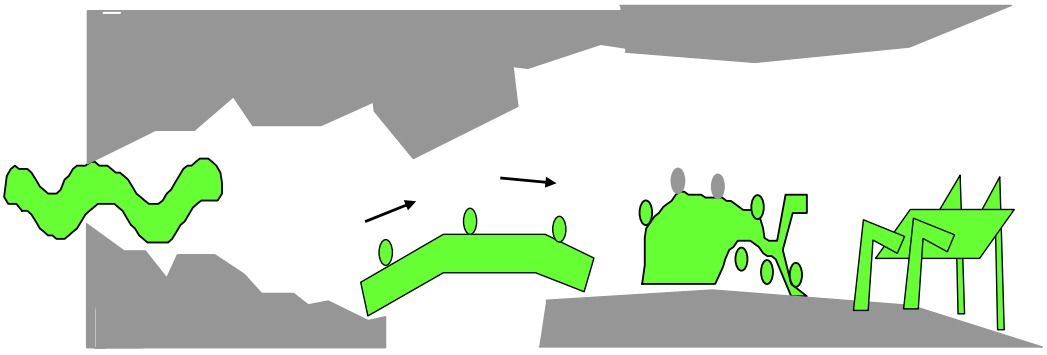
**ODV**
**（OSU）**

## Robots working in dangerous and complex tasks

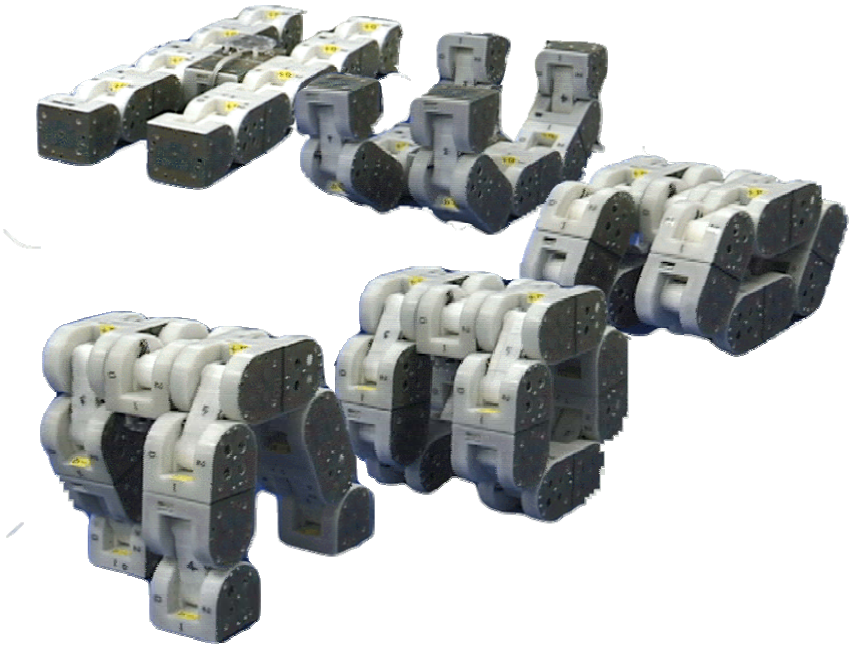
**Power Line Maintenance Robot**
**（Kyushu Power Electric, Yaskawa）**

**Airplane Cleaning Robot**
**（JAL, Kawasaki Heavy Ind. ）**

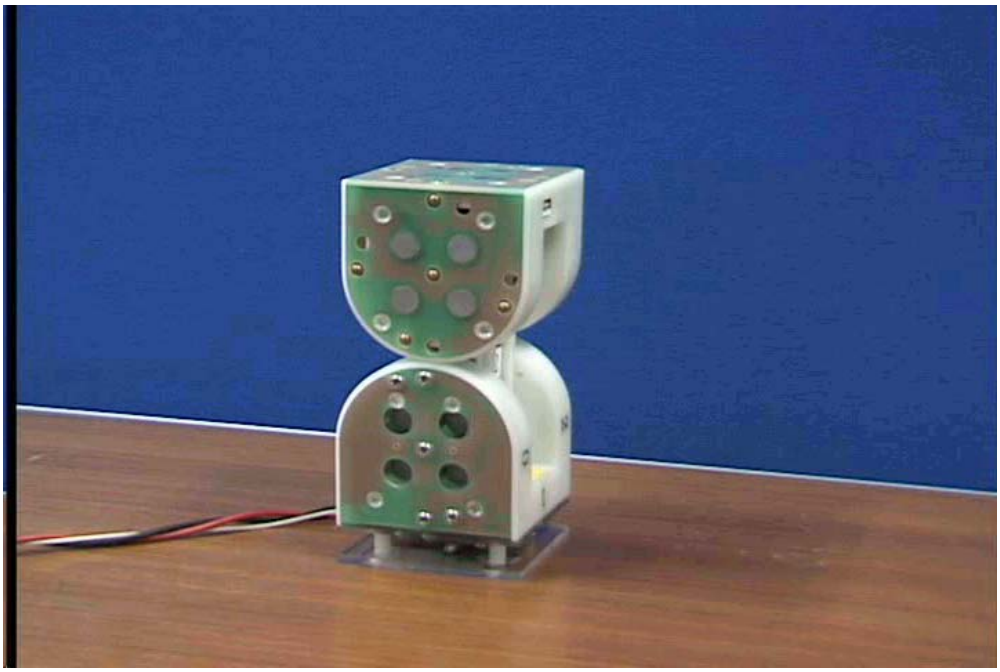
## How to Use Different Shapes to Pass through Narrow Space



**Cellular Robot that can move, changing the shape**



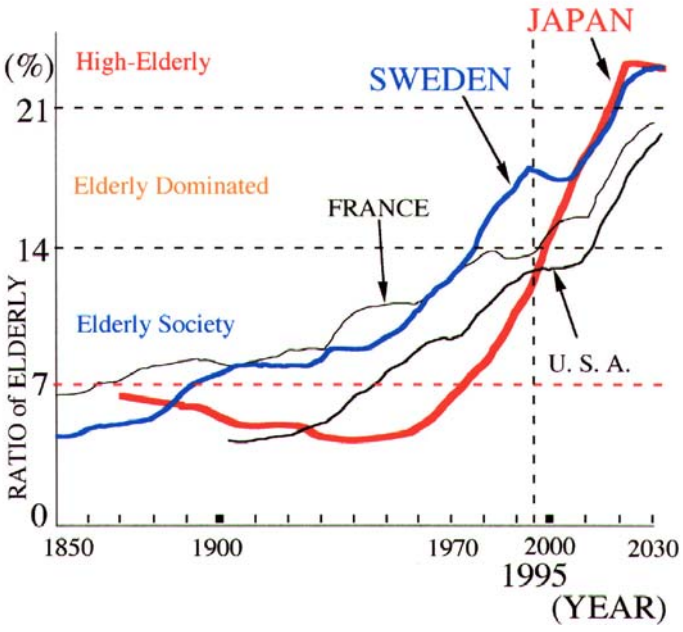
Modular Unit



- Cellular Robotics

9 module system（Crawler→4 legged System）

# Elderly Dominated Society

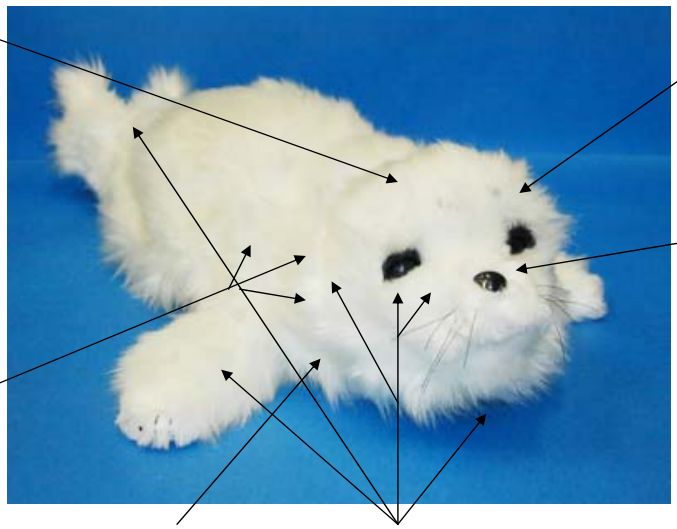



Made by Prof. M. Fujie (Waseda Univ./Hitachi)

Social Needs for robots
that support humans in their daily lives
are increasing!!!

Since about the beginning of 1990s,
Robotics application is moving to
Non industrial application areas!!

# Entertainment Robots



**CPU**
32bit RISC

Weight
2.8 kg

**Touch**
・Tactile Sensor ×10

・Artificial Fur
(Anti-biotic)

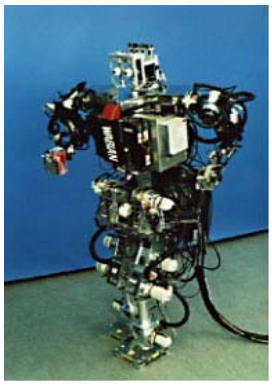
**Audition**
Microphone×2

**Vision**
Light Sensors
×2

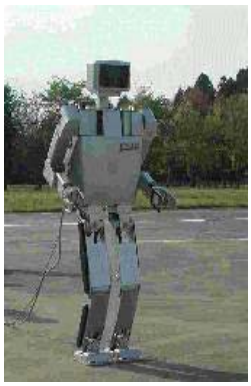
**Posture Sensor**

**Actuator**×8
neck(2), each front fin(1), rear fins(1),
upper & lower eyelid(2), rotation of eyes(1)

# Humanoid



WABIAN
(Waseda Univ.)



**H7**
**(Univ. of Tokyo)**

**HRP-2**
**(AIST/Kawada)**

# Developed Humanoid （HRP-2P）

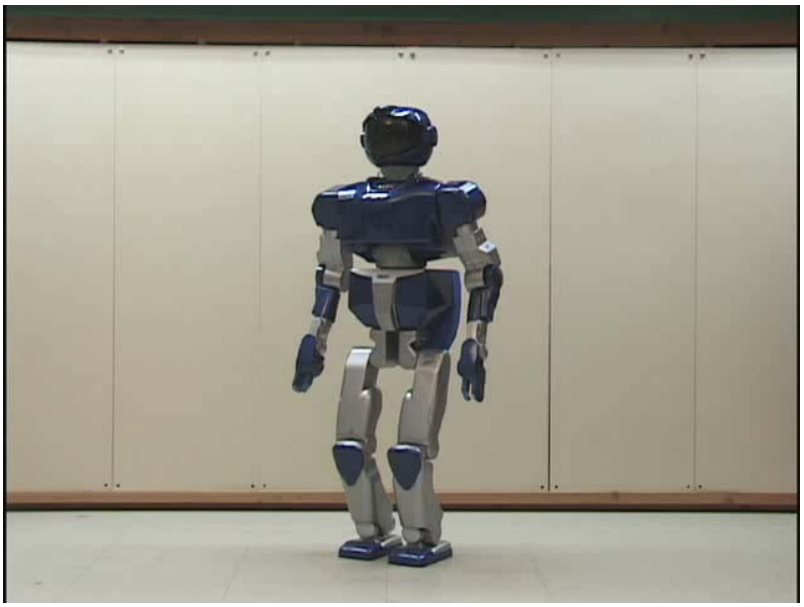
## Specifications

| | | |
|---|---|---|
| Dimensions | Height | 1,540 [mm] |
| | Width | 600 [mm] |
| | Depth | 340 [mm] |
| Weight inc. batteries | | 58 [kg] |
| D.O.F. | | Total 30 D.O.F. |
| | Head | 2 D.O.F. |
| | Arm | 2 Arms × 6 D.O.F. |
| | Hand | 2 Hands × 1 D.O.F. |
| | Waist | 2 D.O.F. |
| | Leg | 2 Legs × 6 D.O.F. |
| Walking Speed | | up to 2.0 [km/h] |

Fundamental Functions

Real-time walking pattern generation
Stable walking (Forward/Back/Turn)
Stable walking on rough surface
Safe fall down and stand up
Whole body motion
Moving function through narrow space
Running
Etc.

# HRP-2P (2002)



# Humanoid Platform HRP-2


## Safe Fall Over and Stand-up







# Humanoid Platform HRP-2P


# Future Robot Market

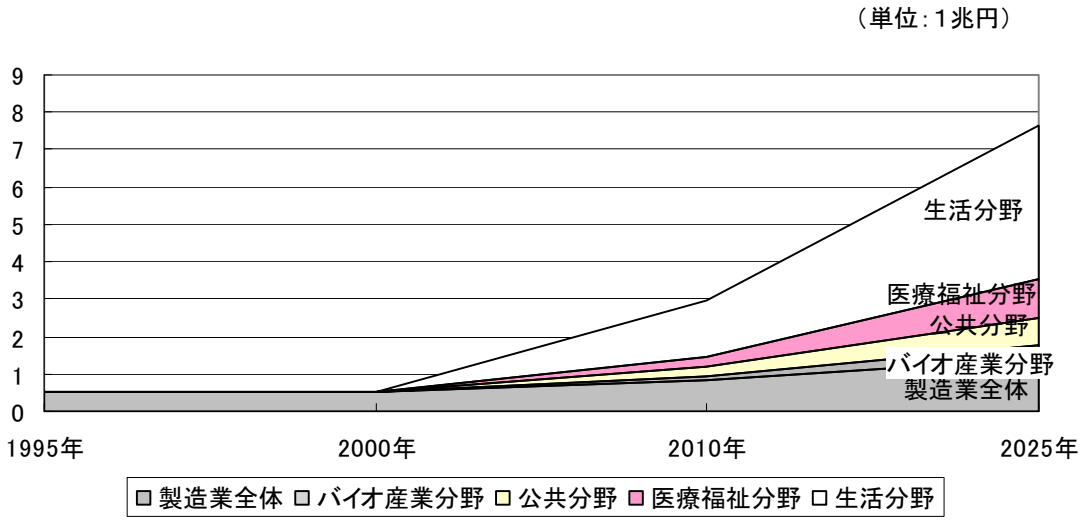



図　次世代ロボットの市場規模（予測）

## Possible future big market products in robotics

1. **Robotized home electronic products**
   **(Ex.: Vacuum cleaner robot…)**

2. **Entertainment robot**
   **（AIBO、PARO……）**

3. **Surgery robot**

4. **Robot for manufacturing automation in new future industry, like bio-industry…**

5. **Humanoid**

Toshiba/Electrolax

## What is the current situation in robotic business?

**There are not so many big market robotic products**

**except industrial robots,**

**though We have “Technologies” and “Possible Markets”.**

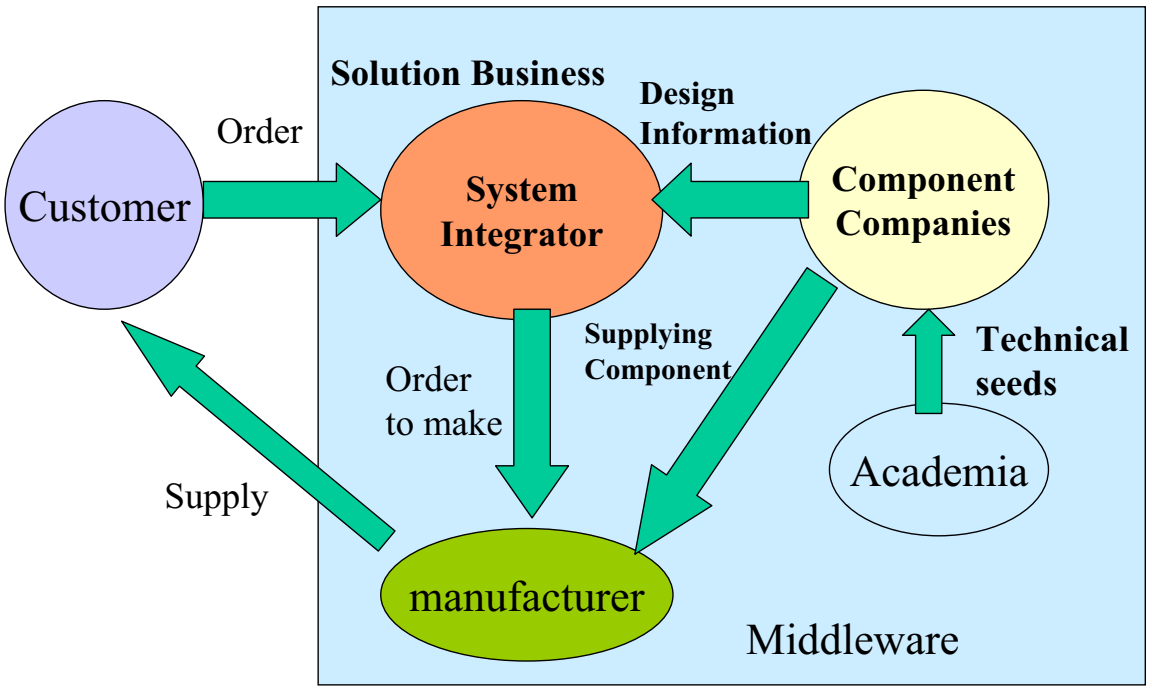
**How to create new robot product concepts???**

# Two Types of Robotics Business

1. Ready-made (big market) Robotic Products
Industrial Robot, AIBO, Robot Cleaner(?) ……
(Possible future products: entertainment robot, surgery robot, humanoid….)

2. Custom-Made Robotic Products
Power line repairing robot, Pipe line inspection underwater robot, Airplane body cleaning robot , …….
(Possible future products: Intelligent room, Elderly care robot….)

# Expected Future Robotic Industry Business Model



# Important Issues

**Preparing for Technological Infrastructure for the System Integration Industry**

**Robotic components with open architecture controller should be supplied to the market.**

**Middle-ware, a kind of software which standardizes robotic component connection should be considered.**

**A specially designed processor for open controller of robotic system should be developed.**

# Summary

1. **Robotics needs new products concept to contribute to industry.**

2. **There are two types of robotics business, ready-made robotics and custom-made robotics.**

3. **With the market possibility in mind, the technology should be prepared and also R & D should be organized.**

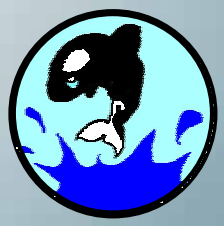
Thank you

TOSHIBA

# Robot Software & Home Robots

Ozaki, Fumio Toshiba Corporation

Robot Software
ORCA
Toshiba Robots History
Home Robots in Japan
ApriAlpha





## Robot Software

- What is Robot Software?

  Integration of Many Kinds of Software

  Mechanical Control

  Voice Processing, Image Processing

  Artificial Intelligence, Application

- Why RT Middleware is needed?

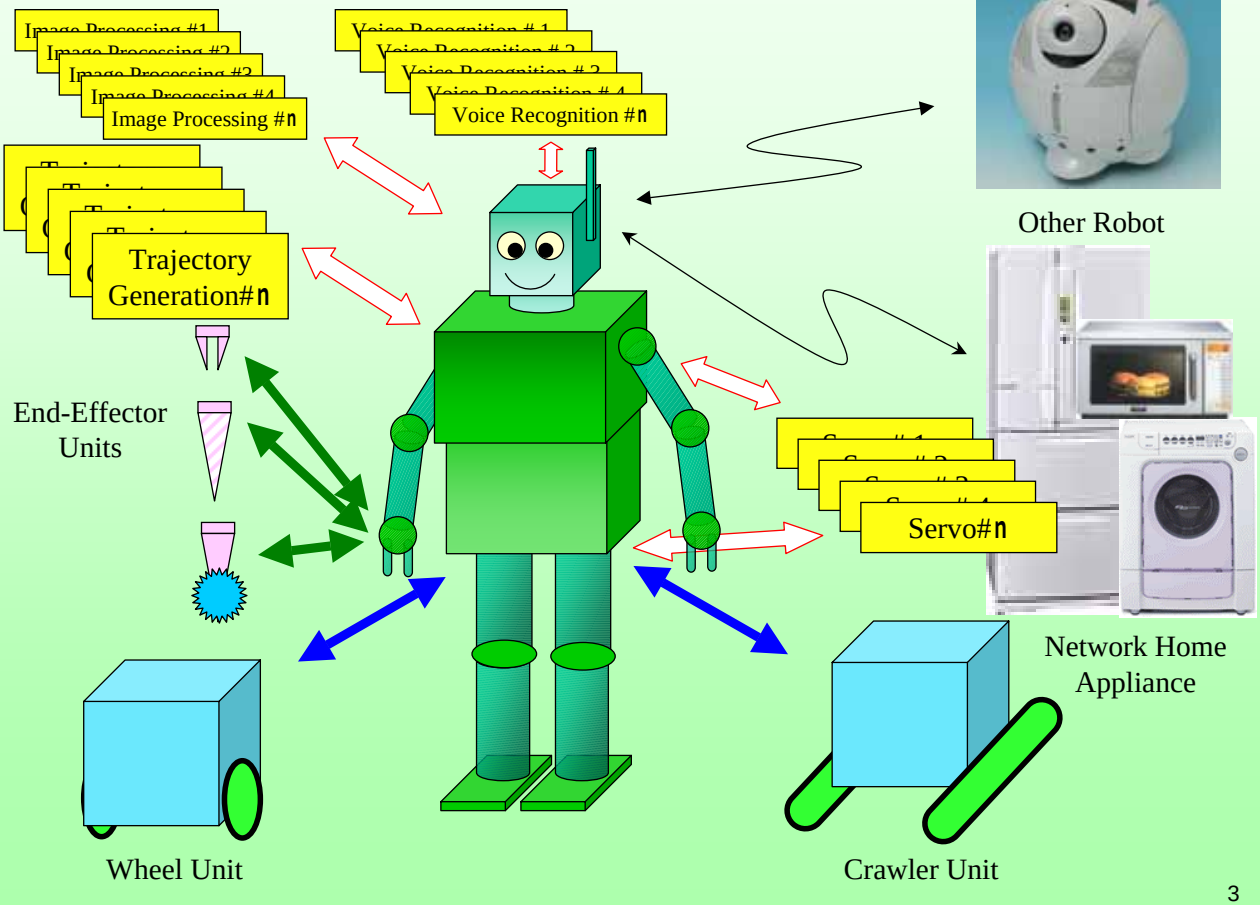
  Separately Developed Software

  Framework to Integrate Above Technologies as Components

  -> RT Middleware

# Component Based Development

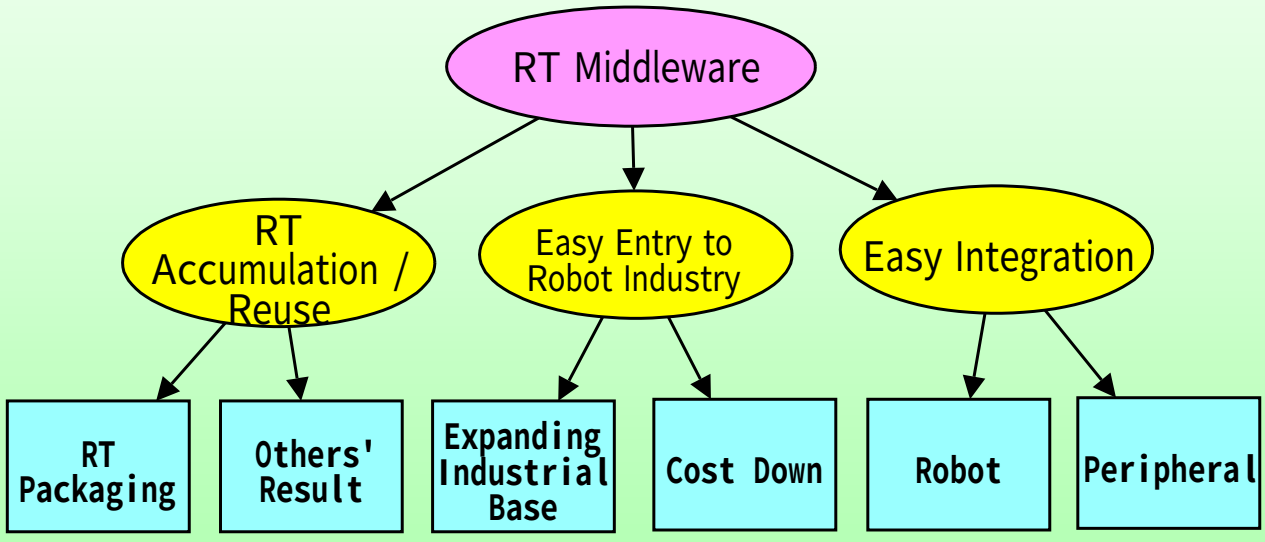






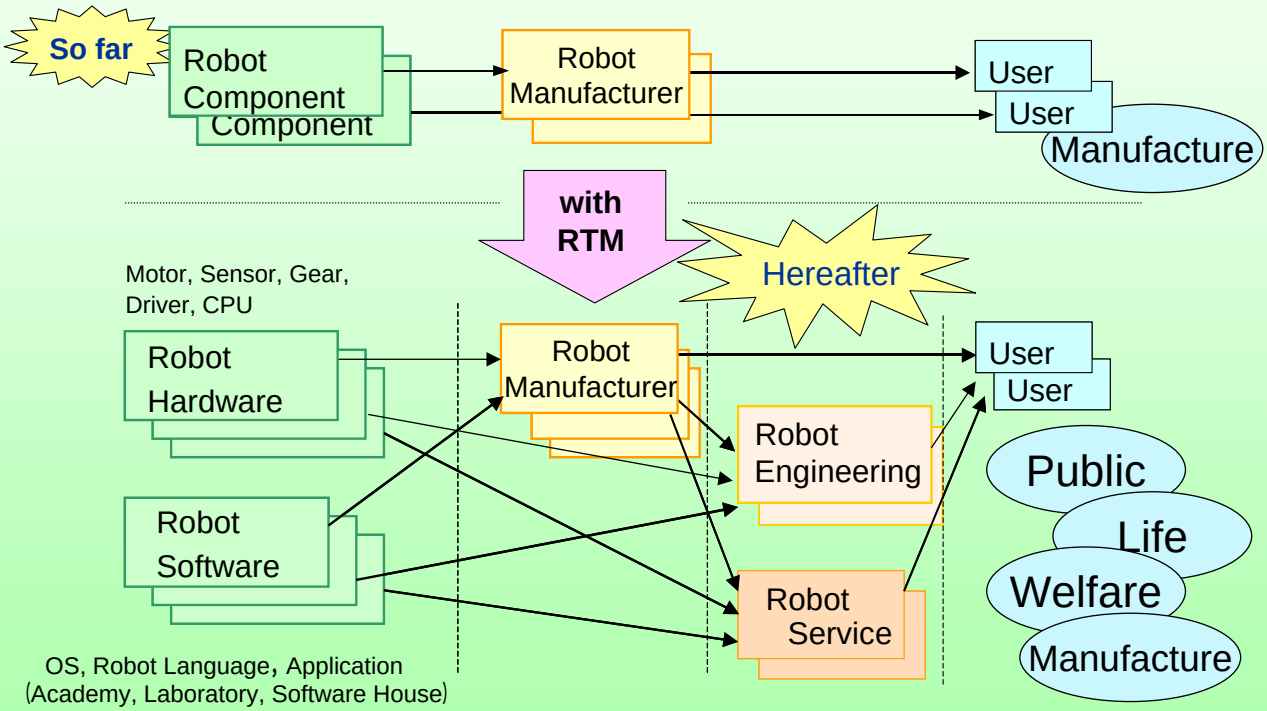



# Why RT Middleware?




→ **From IT to RT**

# Structural Change of Robot Industry with RT Middleware



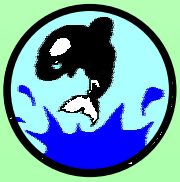

- Increasing Application Fields
- Increasing Entries of Various Makers / Manufacturers





# Open Robot Controller Architecture (ORCA)

- Fast Development of Robot Controllers
- Easy Connection with Other Robot Controllers / Peripheral Equipment
- Easy Algorithm Change
- Rapid Introduction of New Technologies
- Robot Technology Accumulation / Reuse
- New Market Creation



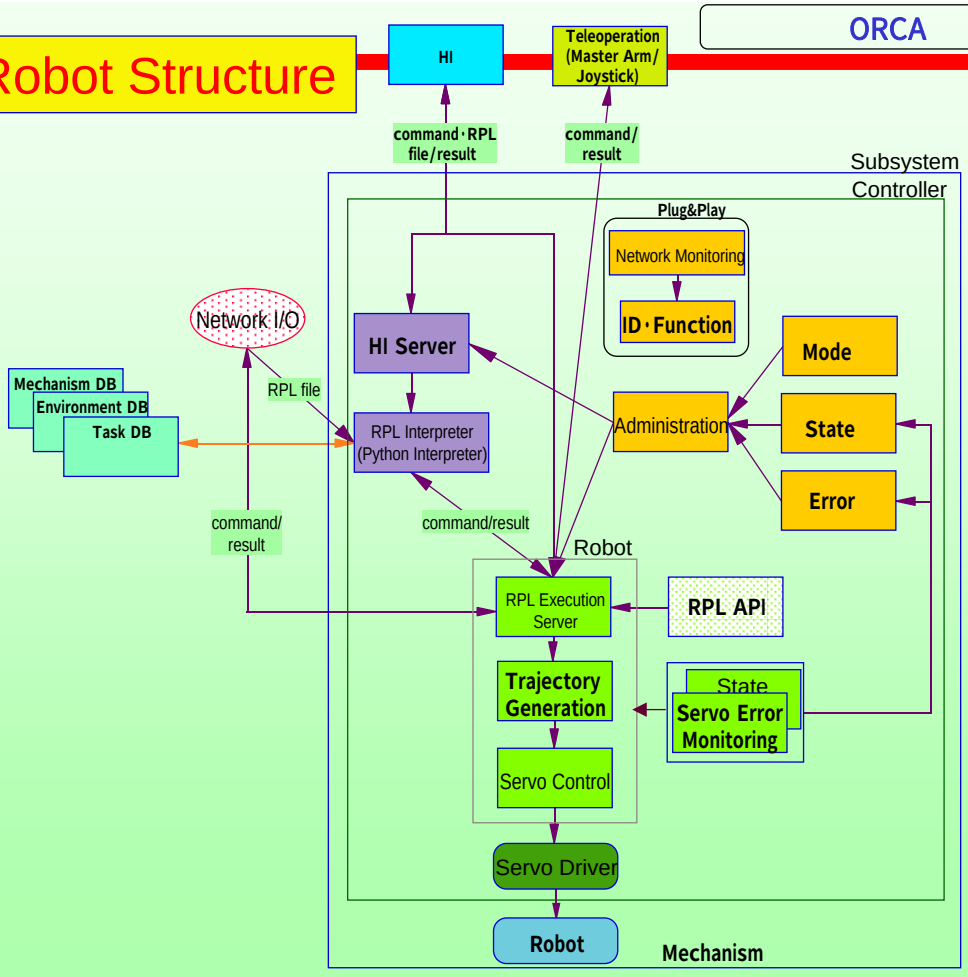
# Features of ORCA

- Extensibility / Reusability using OO Technology
- Portability using Java
- Network Transparency using HORB
- Extensible Robot Language using Python
- Unified Software Interface





# ORCA Robot Structure



# Developing History of Robot Software in Toshiba

1980 - Developing System from Scratch
- VME Bus System, Multi Bus System
- Assembler, C

1990 - Introducing General Purpose Real Time OS (VxWorks)
- VME Bus System
- C/C++

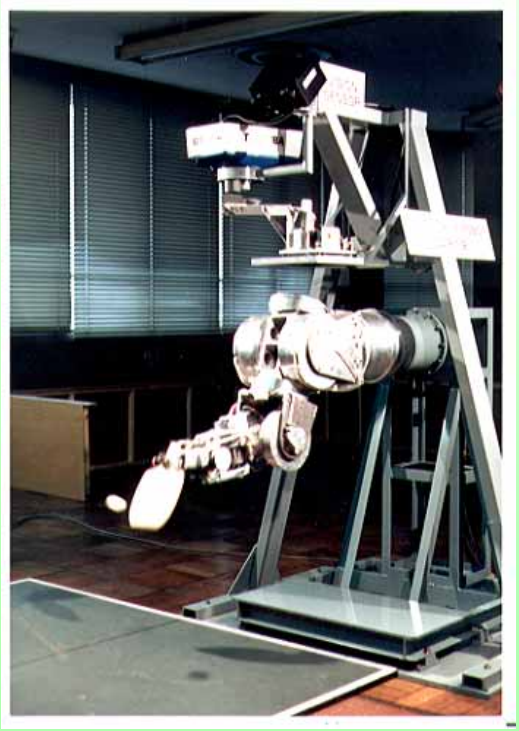
1998 - Making Software System Reusable
- Object Oriented Technology
- Using IBM-PC Compatibles
- Network
- Distributed Object Technology Using HORB

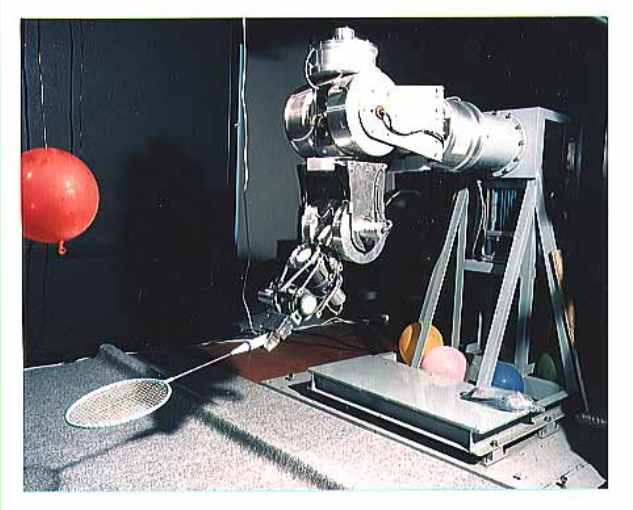




## Maintenance Robot for Nuclear Facilities

# Juggling Robots

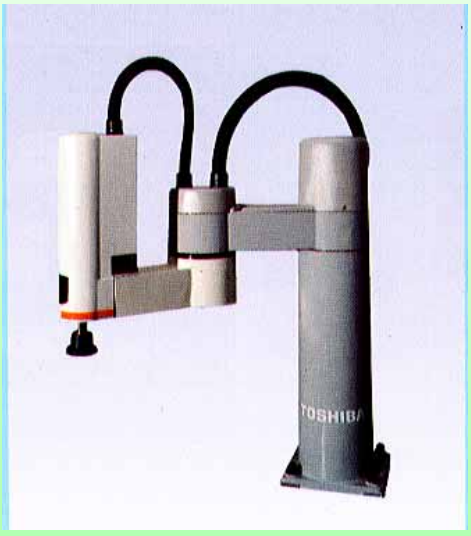


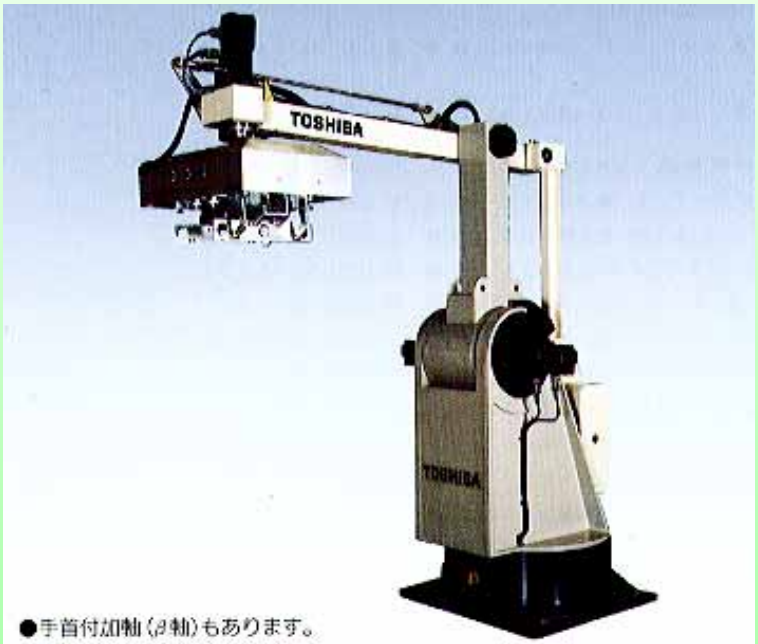






# Industrial Robots



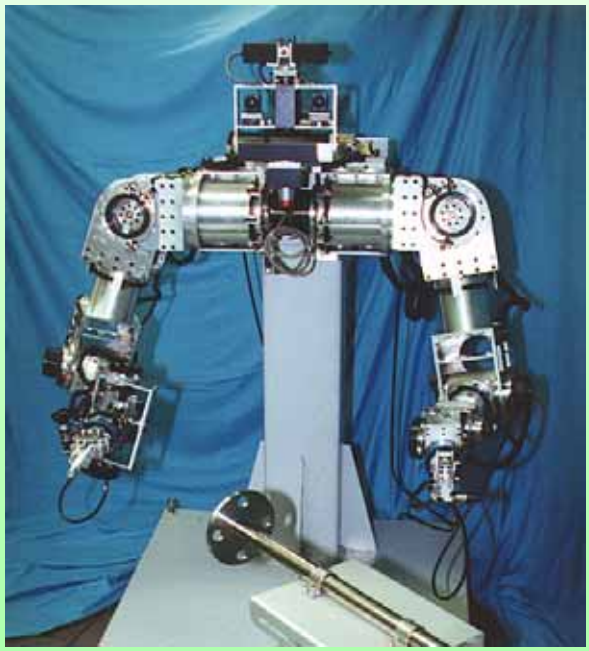
# Grinding Robots



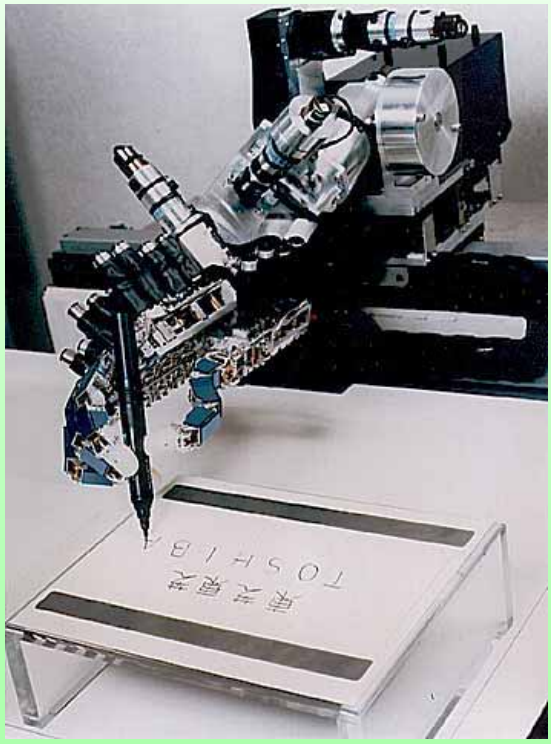




# Remote Maintenance Robot for Overhead Power Distribution Lines



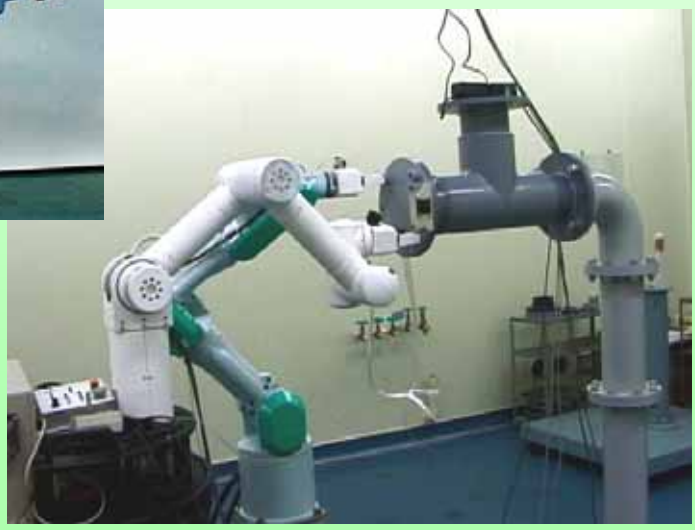
# Multi-Fingered Hand





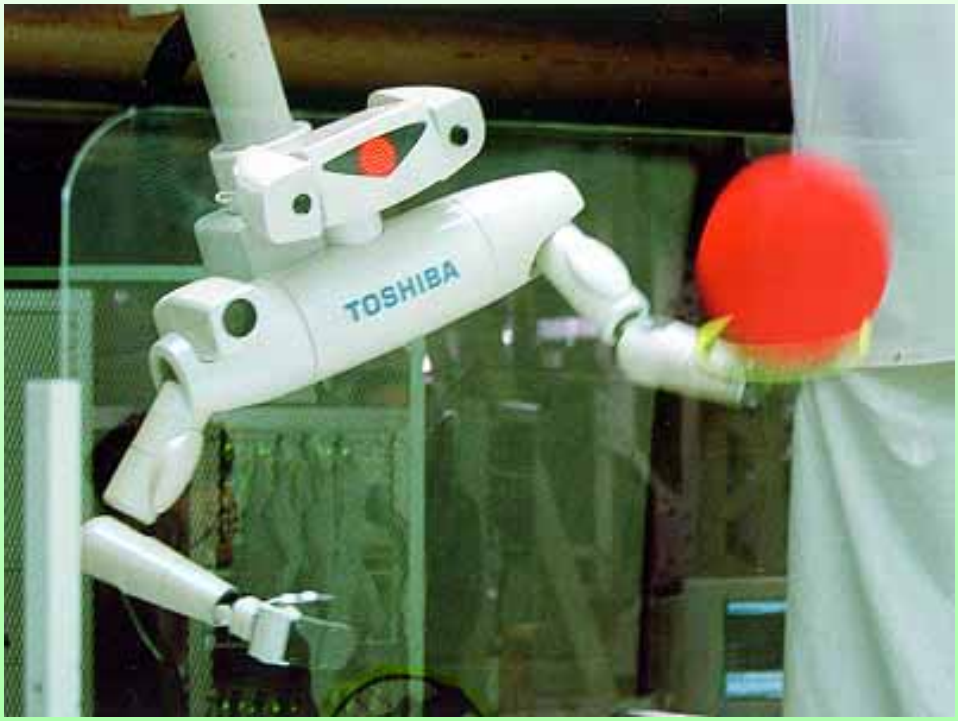


# Remote Operation Robots



Courtesy of AIST

# Human Friendly Robot








# Home Robot

# Why Home Robots?

- Industrial Robot Market in Car Industries
  - Occupied by a Few Robot Companies
  - Saturated Market
- Japanese Robots Favorites
  - Astro-Boy, Gigantor, Gundam, etc.
- Many Robots Researchers including Students
  - Electronics Companies
  - Universities

New Market
↓
Home Robot





# Home Robot ApriAlpha

# Working with Home Appliances

IT Airconditioner

Bluetooth

What's inside the Fridge ? Tell me a menu using eggs ?

What's the latest news ?

It's hot.

IT Fridge

LAN

Bluetooth

IT Electric Oven

QA System

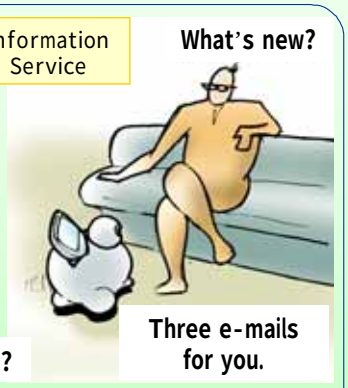


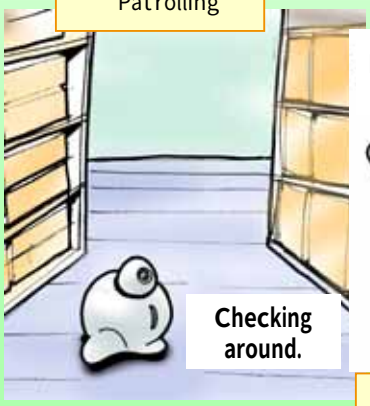


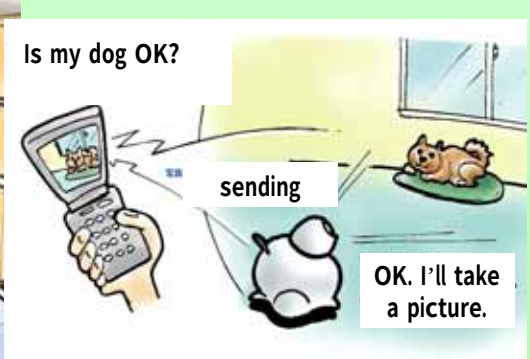
# Other Services


Patrolling


Information Service




Remote Control


Cecking a Sick

TOSHIBA

# Conclusion

Robot Software
ORCA
Toshiba Robots History
Home Robots in Japan
ApriAlpha

**Market Growth with RT Middleware**

TOSHIBA

## Related Information on the Web

■ApriAlpha Press Release

http://www.toshiba.co.jp/about/press/2003_03/pr2001.htm

■ApriAlpha and ORCA in an article

http://www.onrobo.com/enews/0205/toshiba.html

■ORCA in Toshiba Review (Japanese)

http://www.toshiba.co.jp/tech/review/2001/09/56_09pdf/a04.pdf

# Steps toward new Robotic Systems for Lifestyle Support

OMG Robotics Focus Day
Montreal - August 24th,2004

*Hitoshi Kitano - Olivier Lemaire*
*Matsushita Electric Works, Ltd (Japan)*
*- Production Engineering Research Laboratory -*
*- Human Robot Development Group -*

Matsushita Electric Works, Ltd

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- ***A brief introduction to Matsushita Electric Works***
- ***Robotics at Matsushita Electric Works***
- ***From Robots to Robotic Systems***
- ***Challenges of Robotic Systems***

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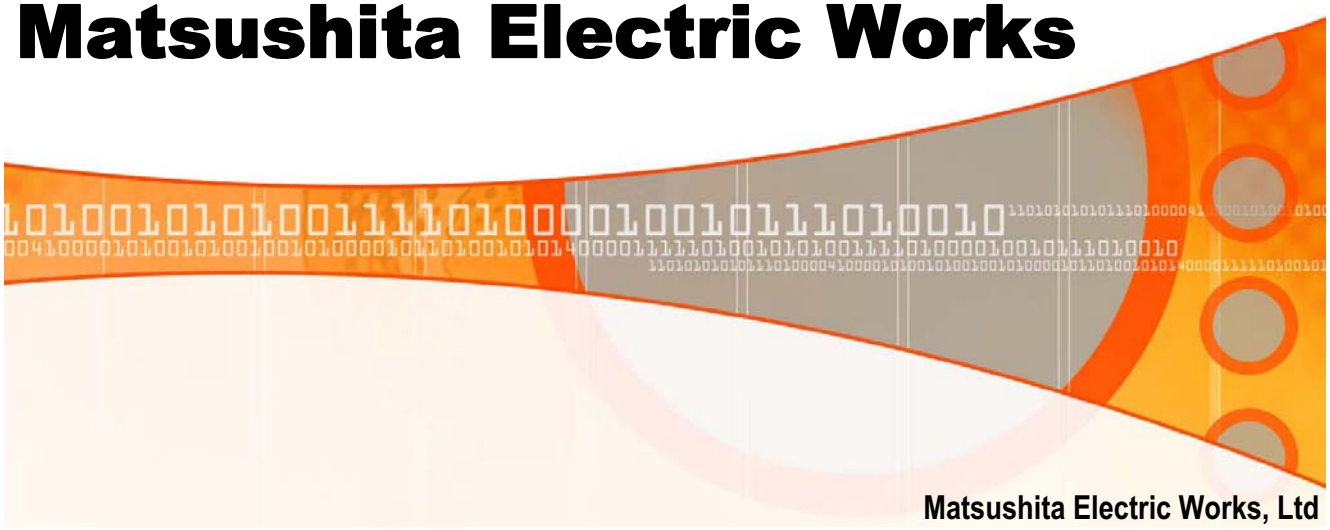
# A brief introduction to Matsushita Electric Works





# A Brief Introduction

## Matsushita Electric Works, Ltd (MEW)

**Date founded**
March 7, 1918

**Date of incorporation**
December 15, 1935

**Capital**
¥138.3 billion ($1,257 million)

**Employees**
15,302

**Head office**
1048 Kadoma, Osaka 571-8686, Japan

**Tokyo head office**
5-1, Higashi-Shinbashi 1-chome, Minato-ku,
Tokyo 105-8301, Japan

# MEW - Key Businesses & New Businesses

**6 Core Businesses**
MEW core competencies


Lighting Products


Information Equipment & Wiring Products


Home Appliances

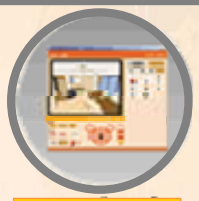

Building Products


Electronic & Plastic Materials


Automation Controls

**New Businesses**
MEW challenges


Green & Clean


IT-related Businesses


Robotic Solutions


Elderly Support & Care


Stock Renovation Solutions

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# Robotics @ MEW

*HOSPI : an Hospital Delivery Robot*

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# A Hospital Robot Solution

**HOSPI** is MEW's autonomous hospital delivery robot for

- X-ray films
- Medical Documents
- Samples
- Medicines ...

Featuring :

- Intelligent navigation without pathway guide
- Fully Autonomous
- Elevator boarding function (for the first time in the world)
- Enhanced safety and reliability
- Give-way function
- PHS and LAN-based remote operation & monitoring system
- Security function

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# From Robots to Robotic Systems

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# Image of the Robotic Space

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# A Robotic System that supports your Lifestyle

## Our Robotic Space


**The Robotic Space presently comprises :**

- Mobile Robot
- Lights (3)
- Electric Sliding Door
- Interphone
- Television
- Electric Fridge Door
- Electric Entrance Lock
- Camera (2)
- PDA

- Much more to come…

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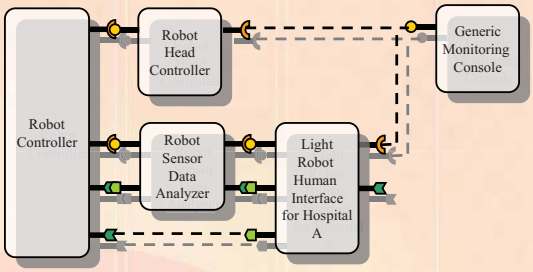
# Challenges of the Robotic Systems



# We all need a Model

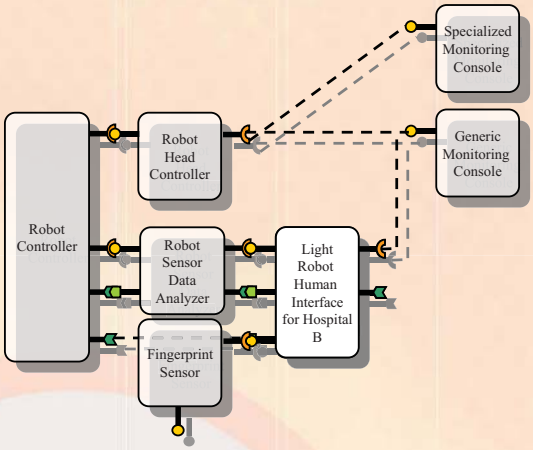
- *A Robotic System is, by essence :*
  - *Modular*
  - *Open*
  - *Distributed*
- *We need the **definition of a framework** to :*
  - *Let all Robotic Entities share semantics and behaviors*
  - *Define ways Robotic Entities work together*
  - *Facilitate the integration and management of the Robotic System*
- *A Robotic System will be **multi-vendor** :*
  - *Multi-Platform*
  - *Multi-Language*
  - *… and Multi-Technologies*
- ***The framework must not be technology driven but model driven***



# Everything but Static

**(Dynamic Configuration)**

- *We cannot shutdown a Robotic System every time an entity is added or removed*
- *System configuration needs to adapt to hardware mobility in a real-time manner*
- ***We need a way to handle dynamic connection between components as well as their modeling***
- ***We need a way to manage dynamic properties of components***






# Question of Point of View

**(Inheritance, Composition and Granularity of Components)**

- *The robot can be considered as a whole or as the sum of its components... Or anything else*
- ***We need a way to let the same entity provide different views***
- *Light with a dimmer is still just a light*
- ***We need a way to define and advertise complex services without breaking the semantic of the underlying basic services***
- *A camera on a mobile robot becomes a mobile camera*
- ***We need a way to compose, at integration time, functionalities defined at design time***

+

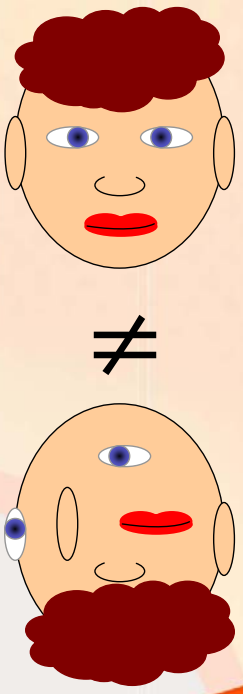
=

A **mobile Robot**
Or
A **Camera**
Or
A **Mobile Camera**
Or
A **Robot with Camera**

# Relationships are important

***(Spatial and Temporal Integrity)***

- *Software distributed entities are location independent, but the pieces of hardware they control are not*
- ***We need a shared representation of the Robotic World and a way to clearly define robotic entities physical relationship***
- *Data generated from Robotic Entities may go through several other entities before reaching their destination*
  - *Delay may be induced*
  - *Information concerning the origin of the data might be lost*
- ***We need a way to ensure spatial and temporal integrity of the data***





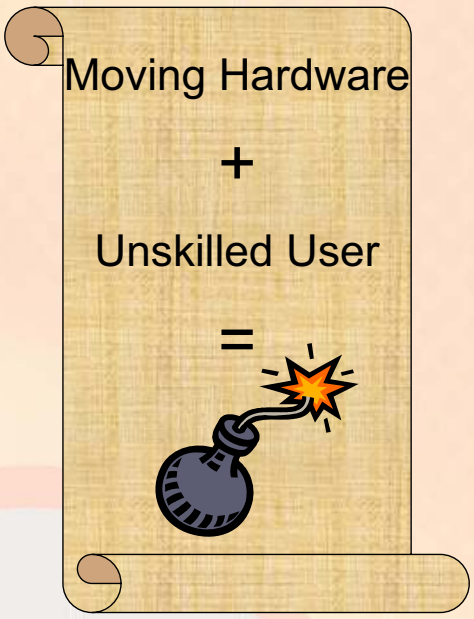
# To go or not to go ?

***(Conflict Management)***

- *In a distributed Robotic System, we cannot assume anything about the synchronization of task*
- *Conflicting requests to (especially hardware) entities may lead to incoherent behavior of the system*
- *Some request may be more important than others (especially safety related ones)*
- ***We need a way to manage conflicting requests to robotic entities and to prioritize them in an homogenous way***

# Safety First !

- *Even if a Robotic System cannot be 100% reliable,* ***it has to be 100% safe !***
- *A robotic entity well design and implemented can take all necessary safety actions for itself when a problem occurs but…*
- ***What about other entities relying on or cooperating with this faulty entity ???***
- *We need a way to propagate errors in the entire system in a way that all entities can understand so as to take the necessary actions.*
- *Provide a standard way to (and somehow enforce) developers and integrators to include safety procedures into their design and implementation*






# Tools for the people !

- *Robotic Systems will be more often used by people with minimal technical skills*
- ***Robotic Systems must become easier to program and to manage***
- *Many tools are necessary to manage the different aspects of the construction of a Robotic System*
  - *Functionality design*
  - *Application design*
  - *Application configuration*
  - *Simulation*
  - *Monitoring*
- ***We need a way to let all these tools homogenously and interchangeably work together***

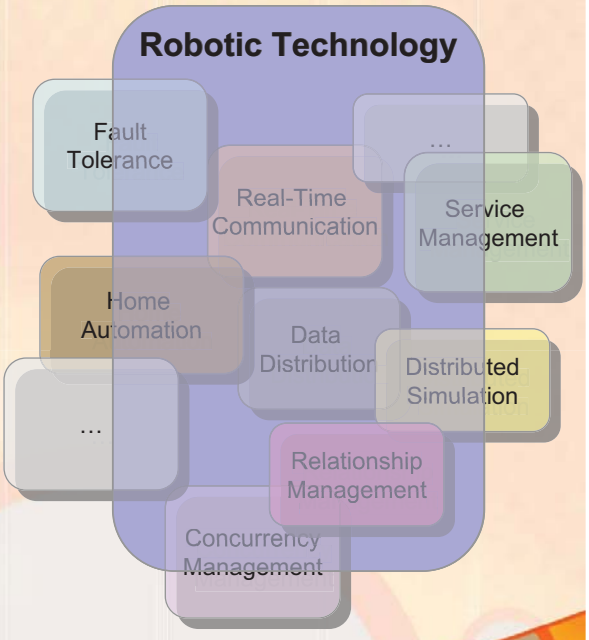
# Is someone trying to address these challenges ?

*Of Course ! … But…*



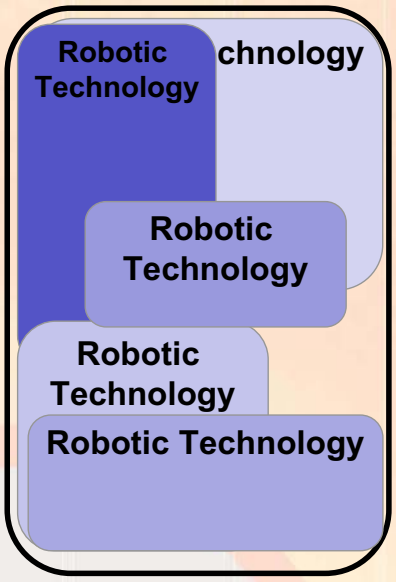
# We need a Framework,… not a Patchwork !

- *There are standard frameworks addressing problems related to distributed objects*
- *Most of them are either too general*
  - *Hard to understand and support*
- *… or too limited*
  - *Some specific aspects of the robotic technology are not covered*
- *They can't always integrate well*
  - *Based on different technologies*
  - *Overlapping and conflicting*
- ***We need a framework that would homogeneously address the problematic of robotic system***



# Some frameworks do exist ...

- *Many research groups around the world have been and are still trying to address*
- *Most of them take a similar approach which indicates that **a consensus could be reached**, but...*
- *Most of them are research oriented*
  - *Technically correct, unusable as is*
  - *None of them as yet been backed up by the industry*
- *Some companies are trying to develop their own solution which usually*
  - *Cover only their needs*
  - *Is proprietary*
- *None of these solutions is even close to reach the volume to make it a de-facto standard*






# Conclusion

- *To work efficiently in a **multi-vendor** environment, a Robotic System must be supported by a **common model***
- *Robotic System Technology has **particularities** that are **not yet covered** by any recognized standard*
- ***No de-facto standard** seems to be emerging, the establishment of a de-jure standard will be necessary*

# Advance Robotics Research

## — introduction of AIST research activities and expectation for standardization

Tetsuo KOTOKU
Intelligent Systems Research Institute
AIST, Japan

# Outline

- Brief introduction of AIST
- Research Activities
  (with video clips)
- Personal Comments
  (from the view of research)

# Introduction (AIST)

## The National Research Institute

an Independent Administrative Institution (IAI) under the Ministry of Economy, Trade and Industry (METI)

**Researchers: ~2,400**
**- Tenured: ~2,000**
**- Fixed-term: ~400**
**Administrative Staff: ~700**


http://www.aist.go.jp/index_en.html



# Introduction (ISRI)

## Intelligent Systems Research Institute

The objective of the Intelligent Systems Institute is to conduct researches on fundamental and component technologies, system integration technologies for the computer-oriented intelligent systems, and also physical systems which support human activities in the real world.

**Researchers ~60**

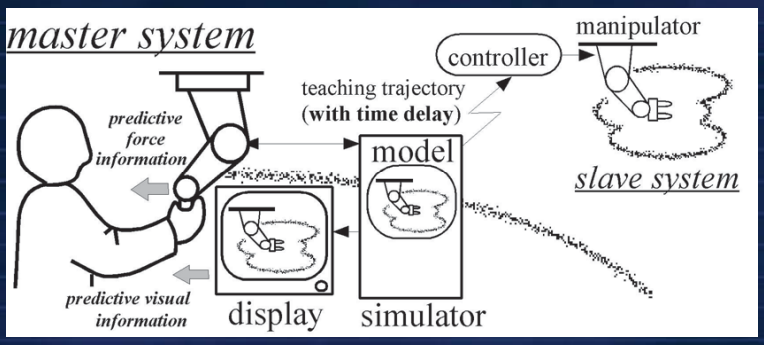
**Information Science, Robotics, Mechatronics**

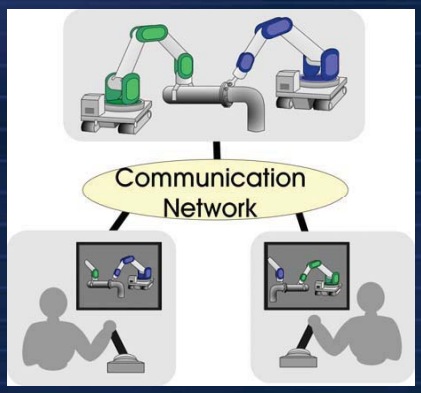
http://unit.aist.go.jp/is/index_e.html

AIST

# Introduction (myself)

## Tele-operation and Virtual Reality




**Model-based bilateral teleoperation**

**Networkbased Collaborative tele-operation**

**DOS(i386) -> Transputer(T800)
-> VxWorks(PowerPC) -> Linux (P3,P4)**

**http://staff.aist.go.jp/t.kotoku/**



AIST

# Research Activities

## Humanoid Robot Project (HRP) (1998-2002)

**HRP-1**

**Remote Operation**

**Robot Assistant**

**HRP-2**

**Contact : Humanoid Research Group**
**http://www.is.aist.go.jp/humanoid/index.html**

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# Research Activities

## Humanoid

crawl on one's hands and knees

Push heavy object (25.9kg)

[Harada et al. 2004]

**Contact** : **Humanoid Research Group**
**http://www.is.aist.go.jp/humanoid/index.html**



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# Research Activities

## Humanoid

get object on the table

[Harada et al. 2004]

walk up stairs holding on to the railing

[Harada et al. 2004]

**Contact** : **Humanoid Research Group**
**http://www.is.aist.go.jp/humanoid/index.html**

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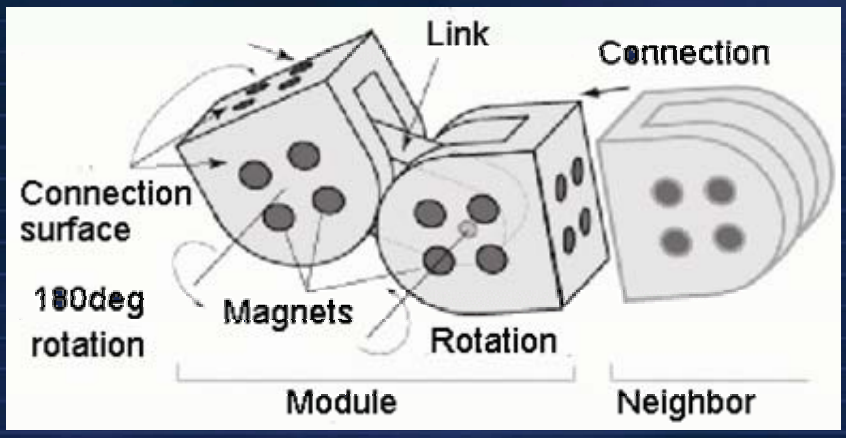
# Research Activities

## Distributed Modular Robot




**A module with two degrees of rotational freedom**

***Self-Organizing System***

**Contact** : **Distributed System Design Group**
**http://unit.aist.go.jp/is/dsysd/index.html**



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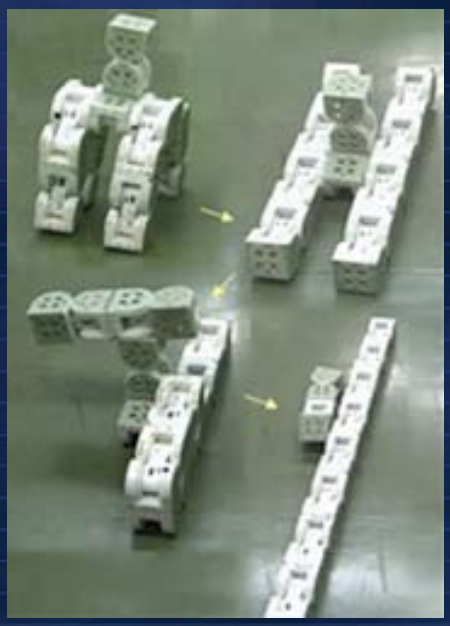
# Research Activities

Modular robot (M-TRAN) travels by transforming itself between an quadruped walker, H-shape, and a caterpillar.



**Contact** : **Distributed System Design Group**
**http://unit.aist.go.jp/is/dsysd/index.html**

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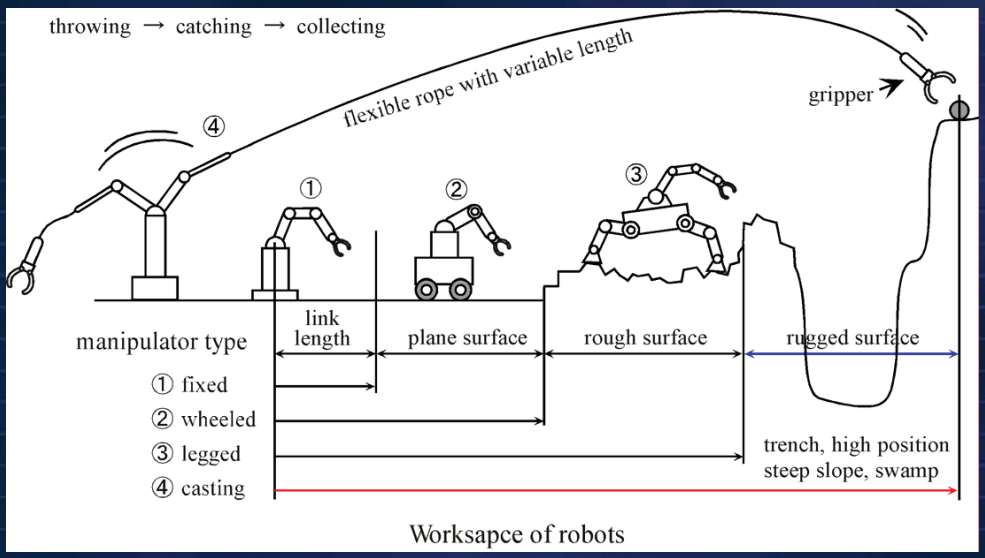
# Research Activities

## Casting Manipulation





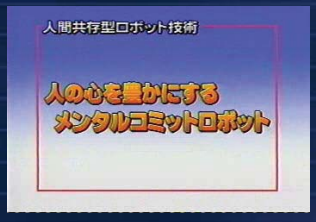
**Contact : Dr. Hitoshi ARISUMI**
**http://staff.aist.go.jp/h-arisumi/english.index.html.htm**



# Research Activities

## Human Interactive Robot

### for Psychological Enrichment and Robot Therapy




**Contact : Dr. Takanori SHIBATA**
**http://staff.aist.go.jp/h-arisumi/english.index.html.htm**

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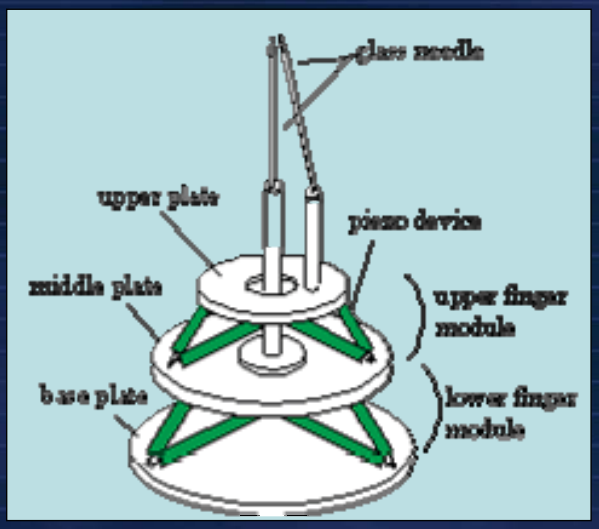
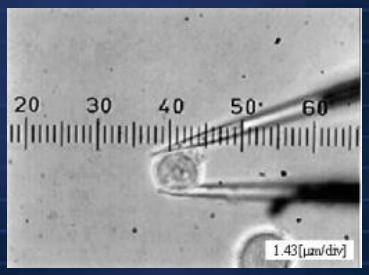
# Research Activities

## Micro Manipulation




two fingered micro-hand




white blood cell manipulation

**Contact : Dr. Tamio TANIKAWA**
**http://staff.aist.go.jp/tamio.tanikawa/**



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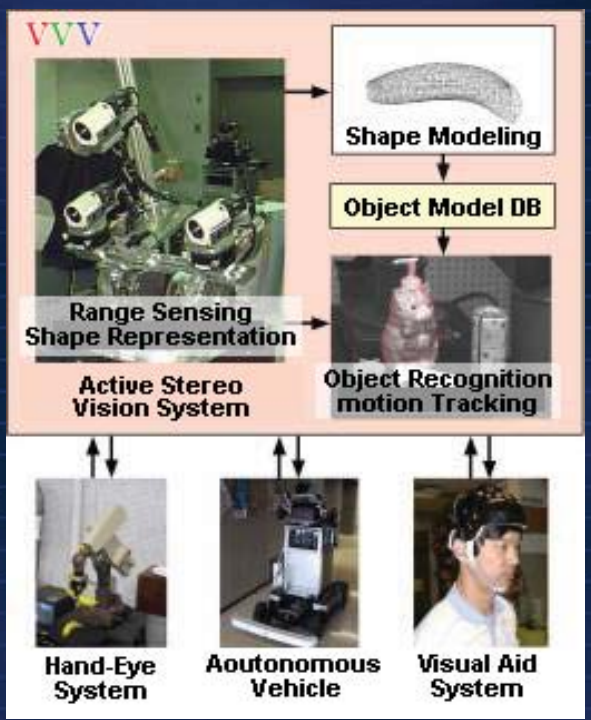
# Research Activities

## 3D Vision System

**V**ersatile **V**olumetric **V**ision (VVV)
- Range sensing
- Shape modeling
- Object Model DB
- Object Recognition
- Motion Tracking

**Real-time 3D Vision System**


**Contact : 3D Vision Systems Research Group**
**http://unit.aist.go.jp/is/vvv/index.html**

# Personal Comments

*In the field of Research:*

**Originality**

**Uniqueness** of the experimental setups

-Hardware Design
- Algorithm
-Software Design

} ***Total System Performance***

***Not all but …***

**Case study tendency**



# Personal Comments

**Uniqueness**

Pros:

Good performance from total optimization
Good for education

Cons:

Take times to develop the system
Difficult to compare the results of different system
Difficult to transfer its technology

***Total design is important, but …***

**Inefficient research activities**

AIST

# Personal Comments

*For the efficient research activities in Robotics*

- Rapid prototyping for experiments
- Easy to transfer the technology developed
- Easy to modify the system for comparison

***Needs for sharing results and increasing specialization***

**interoperability**

**Expectation for standardization**

**Common research platform**



AIST

# Call for participation

## IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2004)

September 28 - October 2, 2004
Sendai International Center, Sendai, Japan

Sendai is located 350 kilometers north of Tokyo on the pacific coast of Japan with its excellenct accessiblity. From Tokyo, it takes only 100 minutes by Shinkansen SuperExpress (bullet train). Domestic flights to Sendai from Osaka(Itami Airport), Nagoya and other major domestic airports are available.

**659** papers' presentation
(1,192 were submitted)

**http://www.irs.mech.tohoku.ac.jp/iros2004/**

# Robotics Information Forum Kick-Off Meeting

Montreal, Quebec Canada
Tuesday, August 24, 2004



## background

- With the rapid progress in computer and communication technology, the robot systems are fast becoming larger and more complicated. Therefore, there is a real need for the software technologies for efficient developments. Now various software technologies are proposed and implemented respectively.
- Unfortunately, most of these pioneering initiatives are developed independently of the others, driven by specific applications and objectives. In order to settle this state of chaos, this forum would like to contribute to the promotion of standardization in the field of robotics based on the mutual understanding between the relevant parties.

**Interoperability**

# Purpose of this forum

- Communication between robot community and OMG community
- Identification of the participants for future collaboration
- Kick-Off of the robotics related activities



# Mission Statement

The **Robot** is a Special Group within the Super Distributed Object (SDO) DSIG and Domain Technical Committee of the Object Management Group (OMG)

Coordinated with the related OMG Task Forces
(e.g. MARS-PTF, RTESS-PTF, ManTIS-DTF, etc…)

**Robot Domain specific SDO**

# Mission

- Promote mutual understanding between robot community and OMG community
- Identify and propose new OMG specifications for the robot community
- Contribute to the portability, reusability, scalability and interoperability of robot-related platforms and applications
- Deploy these technologies to market



# Roadmap

To make standards from fundamental model and functions

- Basic model in the field of robots
- Architecture and functions

CORBA and SDO is too general to make interoperable robot systems. We need some guidance how to implement robot application program

# Roadmap

SDO in the field of Robots

- Basic Command Interface
  (on, off, reset, …)
- Component Interface
  (InPort, OutPort)
- Configuration Profile
  (essential items)
- Error handling
- Logging
- …



# Free discussion

- Roadmap
- Future activities
- Any Suggestion

# Call for papers and participation

**IEEE Workshop on Advanced Robotics and its Social Impacts** (ARSO2005)

**June 12-15, 2005**

**Nagoya, Japan**

**Planning OMG related Special Session**

**http://www.mein.nagoya-u.ac.jp/ARSO2005/**

**ROBOT WEEKS, Expo'05 Aichi**

**June 9-19, 2005**

**Nagoya, Japan**

**63 Robots Exhibition at the world**

**http://www-0.expo2005.or.jp/en/index.html**



# Related Schedule

- Sep. 2004 IROS 2004 in Sendai, Japan
- Nov. 2004 OMG TM in Washington
- Jan. 2005 OMG TM in Burlingame
- Apr. 2005 OMG TM in Europe
- Apr. 2005 ICRA2005 in Barcelona, Spain
- Jun. 2005 Robot Week, Expo'05 Aichi
- Jun. 2005 ARSO 2004 in Nagoya
- Jun. 2005 OMG TM in Boston

# Conclusion

We would like to kick-off the robot-related activities.

Please keep in touch with us by e-mail and continue the discussion by next OMG TM in Washington, D.C.

**We appreciate your kind cooperation**