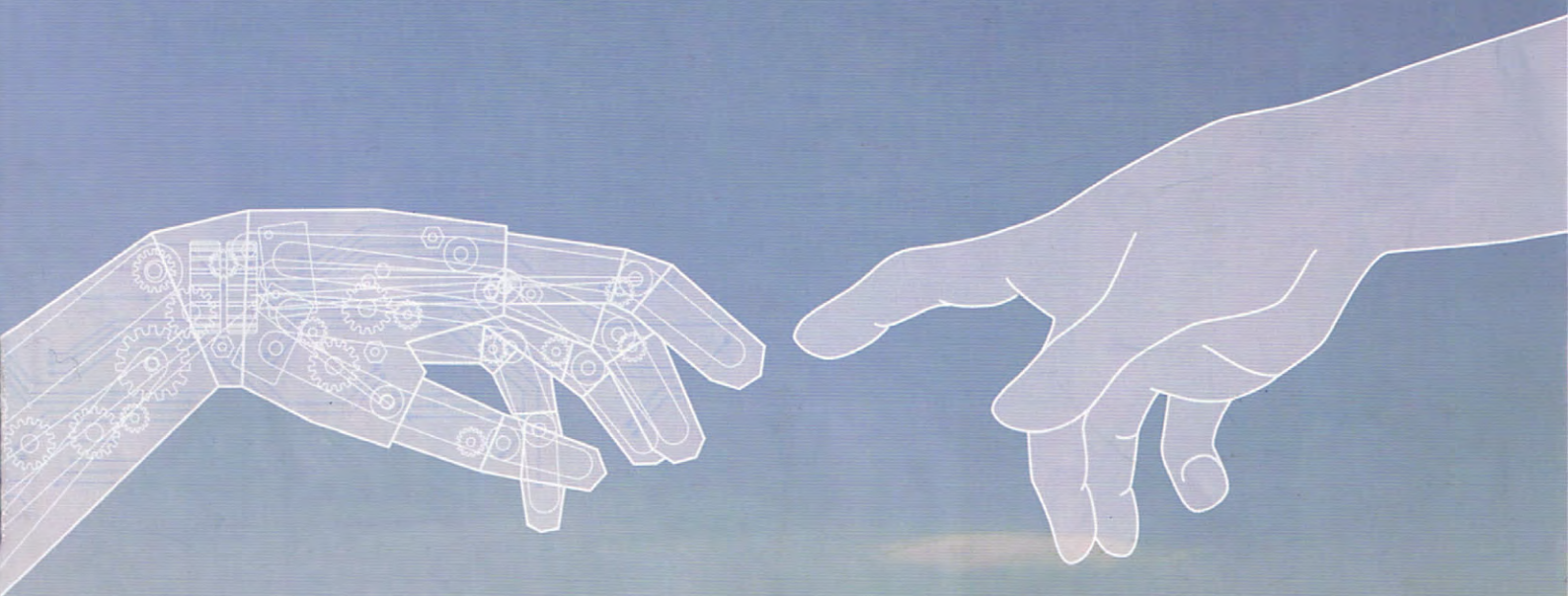


講演概要集



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RT middleware and it's International Standardization Activity in OMG

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Abstract: There is considerable potential need for non-industrial next generation robots used in facilities such as hospitals and nursing centers and at home and disaster sites. 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. Thus, the new challenge to expand the robot market in other fields by developing a common basis software had been started. And also, in order to demystify and popularize this technology in worldwide basis, the international standardization activity has been conducted in OMG.

Keywords: RT middleware and International Standardization

1. Introduction and Background

Significant change in social conditions leads to potential need for robot utilization in various fields.

- Aging society and women's participation in society
- Growing demand for public safety
- Labor shortage in the manufacturing sector resulting from the retirement of the baby boomer generations, etc.

2. Current Situation and Challenges in the Robot Technology Field

2.1 Current Situation

Manufacturing Sector

- Slowdown in the industrial robot market (about ¥500 billion)
- Shift in production system strategy (mass production of limited products → variable amount production of a wide variety of products such as a cell production system and a mixed production system)

Non-manufacturing Sector

- Robot business has not been established except for some building cleaning robots
- Potential need for service robots (business, family life, nursing, etc.)
- Development of infrastructure for the social system is insufficient

Japan's Robot Technology

- Japan's technology is at the world's highest level, especially in the manufacturing sector

2.2 Forecast of Robot Market

According to METI's market survey, there is considerable potential need for non-industrial next generation robots used in facilities such as hospitals and nursing centers and at home and disaster sites.

(Trillion yen)

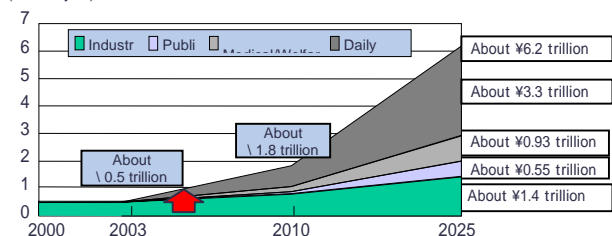


Fig1 Forecast of Robot Market

2.3 Challenges

- Development of technology that can create new robot markets and cultivate the robot industry while responding to changes in social conditions
- Technology development for practical application of service robots
- Exploration and development of key technology for maintaining international competitiveness

3. R&D on a Common Basis and Standardization of Robot Technology

3.1 RT Middleware Development Project (FY2002-2004)

- 1) Because current robots use a central processing system, their processing speed and extensibility are low. To solve this problem, there is a need for

RT middleware that facilitates and improves the efficiency of robot system development by modularizing functional components, adopting a parallel processing system and standardizing a component connection system.

- 2) In the RT Middleware Development Project (FY2002-2004), RT middleware (OpenRTM-aist) that modularizes functional components was developed as basic software technology to realize an open robot architecture and made public for evaluation.

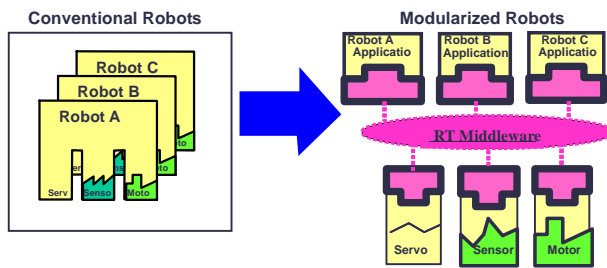


Fig2 RT Middleware Development

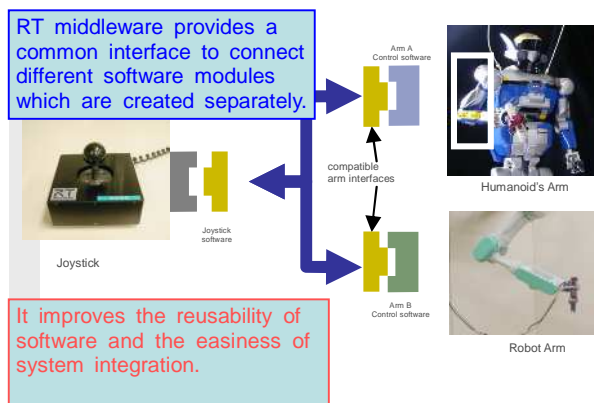


Fig3 RT Middleware

3.2 RT Middleware and Robotics Technology International Standardization activities in OMG

- 1) Based on these results, NEDO aims to make the developed RT component technology as an international standard. For that purpose, NEDO is now establishing a working group led by Japan in the Object Management Group (OMG) that is an international standardization organization for software technology. The purpose of the standardization activities is to foster the integration of robotics systems from modular components through the adoption of OMG standards such as MDA, UML, XMI, CORBA etc.



FIG4 OMG and it's standards (From OMG HP)

- 2) Standardization Organizations in OMG
 - To promote an international standardization of RT middleware and Robotics technology, the following organizations have been established.
 - ① SDO Domain SIG
 - This Working Group advances discussion of the Revised Submission when the SDO (Super Distributed Object) model is applied to the robotics domain.
 - ② Robotics Domain Task Force
 - This Task Force carry out various investigations and discussions taking a broad perspective of robots overall, and prepared an RFP (Request for Proposal).
- 3) History of OMG Technical Meeting
 - The history of the OMG Technical Meeting for this standardization activity is as follows.
 - ① In the OMG Technical Meetings held in St. Louis, USA in April 2004, held in Montreal, Canada in June 2004, held in Washington DC in November 2004 and held in Burlingame, USA in February 2005, the first presentation of RT middleware was made. And, the various activities including Robotics Showcase to establish a Working Group for standardization had been made.
 - ② In the OMG Technical Meeting held in Athens, Greece in April 2005, consensus was reached on establishing a Working Group for preparing an RFP aimed at standardization of a framework technology for components for robots and on starting work. In addition, as well as holding the first gathering of the Robotics - DSIG, consensus was reached on establishing a Working Group for preparing an RFI required for robot technologies and on starting work.
 - ③ In the OMG Technical Meeting held in Boston, USA in June 2005, the RFI prepared on the initiative of Japan at Robotics – DSIG was approved, with MARS PTF (middleware technology committee) as the sponsor. As a result, responses are expected with robot-related information from robot-related parties around the world. In future an organization with a number of

Special Working Groups will be established, and it was expected that the DSIG will be upgraded to Task Force.

- ④ In the OMG Technical Meeting held in Atlanta, USA in September 2005, the final draft of the RFP written by the SDO - DSIG was prepared, and it was approved by the OMG PTC (Platform Technology Committee). It was also decided to undertake discussions towards preparation of a draft specification.
- ⑤ In the OMG Technical Meeting held in Burlingame, USA in December 2005, presentations were given regarding responses to the Robotics - DSIG RFI and current development trends and robot technologies. Approval was given to upgrading the Robotics DSIG to the Robotics Task Force.
- ⑥ In the OMG Technical Meeting held in Tampa, USA in February 2006, a joint session of the Robotics - DTF and SDO - DSIG was held, and besides a special lecture from Dr. Matt Long of South Florida University, a discussion was held concerning a presentation on 14 responses to the RFI.
- ⑦ In the OMG Technical Meeting held in St. Louis, USA in April 2006, a joint session of the Robotics - DTF and SDO - DSIG was held, and besides a special lecture from Dr. Chris Gill of Washington University, a discussion was held and 3 Working Groups in Robotics - DTF have been established.
- ⑧ In the OMG Technical Meeting held in Boston, USA in June 2006, the discussion on the flyer of Robotics DTF has been made, and 3 Working Groups have started their discussions on the items which should be standardized in future. In addition to those, the compromised specification of RT component model was put to the ballot in MARS PTF. But, the final approval has not been made in Architecture Board by another reasons.

In the OMG Technical Meeting held in Anaheim, USA in September 2006, the proposed specification was adopted as a ground plan in Architecture Board and Technical Committee. And at the same time, FTF (Finalization Task Force) was established.

After one year's activity in FTF, in the OMG Technical Meeting held in Burlingame, USA in December 2007, the final specification was adopted as Robotic Technology Component Specification 1.0 and it was posted to OMG home page.



Fig5 Adoption of Proposed Specification

- 4) Some examples of finalized specification after the standardization activity
After the hard negotiation in OMG standardization activities, the original “component interfaces” have been changed as shown on the below figure. Namely, several interfaces are added in order to cope with general purposes.

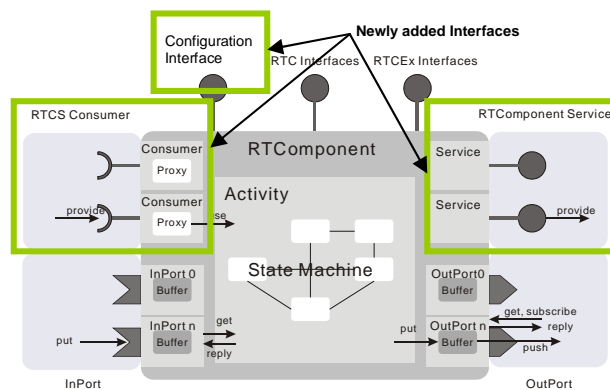


Fig6 Finalized “Component Interfaces”

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