Robotics Domain Task Force Final Agenda ver1.0.5 — robotics/2007-12-01

OMG Technical Meeting - Burlingame, CA, USA -- Dec. 10-14 , 2007

http://robotics.omg.org/

		TF/SIG				
		Host	Joint (Invited)	Agenda Item	Purpose	Room
Monday: Robotics Plenary(am) and WG activites(pm)						
9:00	9:45	Robotics		Robotics Steering Committee	Arrangement	Sandpebble B, Lobby Lvl
9:45	10:00	Robotics		Robotics-DTF Plenary Opening Session	Robotics plenary openning	Sandpebble B, Lobby Lvl
10:00	11:00			Robotic Localization Service - Initial Submission Presentation (1) - Kyuseo Han (ETRI) and Yeon Ho Kim (Samsung)	presentation and discussion	
11:00	12:00			Robotic Localization Service - Initial Submission Presentation (2) - Shuich Nishio (JARA/ATR)	presentation and discussion	
12:00	13:00	**LUNCH**				Cascades, Atgrium Lvl
13:00	18:00			Architecture Board Plenary		
13:00	18:00	Robotics		Robotic Localization Services WG (5h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	Sandpebble B, Lobby Lvl
				Services WG(5h): Human Robot Interaction RFP draft Meeting - Su-Young Chi	discussion	Sandpebble A, Lobby Lvl
Tuesday: WG activities (am) and Robotics Plenary (pm)						
9:00	11:30	Robotics		Robotic Localization Services WG (2.5h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	Sandpebble B, Lobby Lvl
				Services WG(2.5h): Human Robot Interaction RFP draft Meeting - Su-Young Chi	discussion	Sandpebble A, Lobby Lvl
11:30	12:00			**Real World Robot Challenge in Tsukuba (RWRC2007)** **- Takashi Tsubouchi (Univ. of Tsukuba)**	presentation and discussion	Sandpebble B, Lobby Lvl
12:00	13:00	**LUNCH**				Cascades, Atgrium Lvl
13:00	14:00	Robotics		WG Reports and Roadmap Discussion (Service WG, Profile WG, Robotic Localization Service WG)	reporting and discussion	Sandpebble B, Lobby Lvl
14:00	15:00	Robotics		**Special Talk: Introduction to Robotc Technology Component Specification and some potential RFPs (Tentative)** **- Noriaki Ando, Takeshi Sakamoto and (Rick Warren?)**	presentation and discussion	
				Break (30min)		
15:30	16:30	Robotics		**Special Talk: "Open source software models for robotics"** **- Eric Berger (Willow Garage)**	presentation and discussion	
16:30	17:10	Robotics		Contact Reports: - Makoto Mizukawa(Shibaura-IT), and Yun-Koo Chung(ETRI)	Information Exchange	
17:10	17:30	Robotics		**DTF Co-Chair election** and Next meeting Agenda Discussion	Robotics plenary closing	
17:30				Adjourn joint plenary meeting		
17:30	18:00	Robotics		Robotics WG Co-chairs Planning Session (Preliminary Agenda for next TM, Draft report for Friday	planning for next meeting	Sandpebble B, Lobby Lvl
Wednesday WG activity follow-up						
9:00	12:00	Robotics		Robotic Localization Services WG (3h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	Evergreen, Atrium Lvl
				Services WG(3h): Human Robot Interaction RFP draft Meeting - Su-Young Chi	discussion	Boardroom 4, Atrium Lvl
12:00	14:00	**LUNCH and OMG Plenary**				Poolside Pavilion
14:00	18:00	Robotics		Robotic Localization Services WG (3h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	Evergreen, Atrium Lvl
18:00	20:00	**OMG Reception**				Grand Peninsula Foyer,
Thursday						
12:00	13:00	**LUNCH**				Cascades, Atgrium Lvl
13:00	18:00			Architecture Board Plenary		Harbour B, Lobby Lvl
Friday						
8:30	12:00			AB, DTC, PTC		Grand Peninsula AB,
12:00	13:00	**LUNCH**				Cascades, Atgrium Lvl

Other Meetings of Interest

Monday						
8:00	8:45	OMG		New Attendee Orientation		Grand Peninsula C,
9:00	12:00	OMG		Tutorial - Introduction to OMG's meeting and Middlewere Specifications		Grand Peninsula C,
13:00	17:00	OMG		Tutorial - An Overview of UML 2.0		Grand Peninsula C,
18:00	19:00	OMG		New Attendee Reception (by invitation only)		Sclini's Terrace, Atrium
Tuesday						
7:30	9:00	OMG		Liaison ABSC		Boadroom 3, Atrium Lvl
8:00	12:00	OMG		Object DB Technology Users & Vendors Roundtable		Grand Peninsula C,
13:00	17:30	OMG		Joint Session on Ontology/Vocabulary Standardization & Management at OMG		Grand Peninsula A,
13:00	17:30	OMG		Tutorial - Introduction to the OMG Systems Modeling Language (OMG SysML™)		Grand Peninsula C,
17:00	18:00	OMG		RTF-FTF Chair's Workshop		Sumac, Atrium Lvl
Wednesday						
8:30	17:30	OMG		Modeling Analysis of Real-time and Embedded Systems (MARTE) Information Day		Grand Peninsla A, Lobby
Thursday						
8:00	9:00	OMG		Ottawa TM Infrormation Days Planning Meeting		Bayside B, Lobby Lvl

Minutes of the Robotics-DTF Meeting --- Approved
September 26, 2007, Jacksonville, FL, USA
robotics/2007-12-02

Minutes Highlights

- The final report of Robotic Technology Component (RTC) FTF was approved in AB and recommended in PTC. [ptc/2007-08-17]
- Several scenarios to evaluate proposals of the Robotic Localization Service RFP was discussed. [robotics/2007-09-13]
- The Human-Robot Interaction Service was under discussion as a potential RFP. [robotics/2007-09-14]
- Robotic Localization Service WG was set up for making a revised proposal of Robotic Localization Service RFP.
- Additional DTF Co-Chair election was announced.

List of Generated Documents

robotics/2007-09-01 Final Agenda (Tetsuo Kotoku)
robotics/2007-09-02 Brussels Meeting Minutes [approved] (Yun-Koo Chung and Fumio Ozaki)
robotics/2007-09-03 Steering Committee Presentation (Tetsuo Kotoku)
robotics/2007-09-04 Roadmap for Robotics Activities (Tetsuo Kotoku)
robotics/2007-09-05 Introduction to HriAPI RFP (Su-Young Chi)
robotics/2007-09-06 A quick view of Robotic Localization Service Proposal (Kyuseo Han)
robotics/2007-09-07 User Identification for HRI (Su-Young Chi)
robotics/2007-09-08 Robotic Localization Service Proposal Overview (draft, in Progress) (Shuichi Nishio)
robotics/2007-09-09 Typical Examples from Tsubouchi (Takashi Tsubouchi)
robotics/2007-09-10 Scenarios for Comparison of Proposals (Kyuseo Han)
robotics/2007-09-11 Opening Presentation (Tetsuo Kotoku)
robotics/2007-09-12 Robotic Localization Services WG Status Report (Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio)
robotics/2007-09-13 Typical Case Scenarios for the Robotic Localization Service (Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio)
robotics/2007-09-14 Robotic Functional Services WG Report (Su-Young Chi)
robotics/2007-09-15 ISO TC184 SC2 Contact Report (Yun-Koo Chung)
robotics/2007-09-16 Contact Report (Makoto Mizukawa)
robotics/2007-09-17 Result of Flier Voting (Yun-Koo Chung)
robotics/2007-09-18 Closing Presentation (Tetsuo Kotoku)
robotics/2007-09-19 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)
robotics/2007-09-20 DTC Report Presentation (Tetsuo Kotoku)
robotics/2007-09-21 Jacksonville Meeting Minutes - DRAFT (Shuichi Nishio and Su-Young Chi)

Minutes

September 26th, 2007 Wednesday, City Terrace 5, 3rd floor

09:00-09:00 Plenary Opening [robotics/2007-09-11]
- Approval of the Brussels Minutes
  .Brussels Minutes (Dr. Chung and Dr. Ozaki) [robotics/2007-09-02]
  .European peoples and IEEE people interested in OMG standardization activation
  .AIST (motion), Shibaura-IT (second), Tech. Arts (white ballot)
  .motion passed

- Jacksonville Meeting: Quorum: 5
  .joined organizations: AIST/ETRI/JARA/Samsung/Shibaura-IT/Technologic Arts
  .proxy: NEDO

- Minutes takers : Dr. Nishio and Dr. Chi

09:10-10:00 WG reports and Roadmap Discussion
** Robotic Localization Service WG (Dr. Nishio) [robotics/2007-09-12, -13]
- discussion summary
- 3 sample scenarios for comparing submissions
- next meeting schedule

** Robotic Functional Services WG (Dr. Chi) [robotics/2007-09-14]
- HRI Draft RFP
  - discussion summary
  - Issues to be discussed (on next meeting)
    - user's view vs developer's view
    - ISO standard study
  - Roadmap
    - Burlingame: discussion
    - Washington: RFP 1st draft
    - Ottawa: 2nd draft
    - Orlando: 1st review
    - Santa Clara: 2nd review / issue

** Robotics-DTF Roadmap (Dr. Kotoku) [robotics/2007-09-04]
- Dr. Kotoku suggest to change schedule for the HRI RFP
  - omit the 2nd draft in Ottawa;
  - 1st review in Ottawa, 2nd in Orlando

10:00-10:20 Contact Reports
** ISO/TC184/SC2 Contact Report (Dr. Chung) [robotics/2007-09-15]
- no activity after Brussels meeting
- next SC2 meeting held in Tokyo, Japan, 26/11/07-29/11/07
- advisory group (Mon):
- explore needs and new items for stand. in 'service robots'
- PT3(Tue): newly started
- revise ISO 8373:1994 "robots and robotic devices"
- original: industrial, add definitions for service robots
- PT2(Wed-Thu) Safety for Personal Care Robot
- International Robot Exhibition (IREX2007) in Tokyo, 28/11/07-01/12/07
- main focus on industrial robot

** ISO/TC 184 (Prof. Mizukawa) [robotics/2007-09-16]
- SC5/WG6 Oct 1,2 (Frankfurt)

- correspondence from CANopen (31/Aug)
- start development for a system specification
- application profile or additional specific device profiles (for robots)
- chance to cope with them
- upcoming conferences
  .IROS (29/Oct-2/Nov, San Diego)
  .ICCAS 2007 (17-20/Oct, Seoul)

10:20-10:30 HRI focus discussion (Dr. Kim; no presentation)
- short explanation on topics to be discussed on HRI-RFP at next meeting
- topics to be discussed
  - UI(user identification) component
  - output = user ID
  - input = speech/image?
  - capture/process/match steps inside the component
  - UI standardize contains developer view and inner module API comments:
- Normally, the word 'HRI' means focus on interaction; 'interaction' people are more interested in the output (user ID, etc.) of the component, not what's happening inside the component. (Dr. Nishio)
- Our main focus is on the inside of the component, such as face recognition or speech recognition, and not on the output. (Dr. Kim)
- As for the output, not only ID but gender, or other attributes might as well be concerned. (Dr. Nishio)
- It is still impossible to clarify the necessary output items. This is still under research. Thus, we want to start by limiting functionalities, in a specific area. (Dr. Kim)
- The state-of-out for the facial/speech recognition for robotics, still seems immature. That seems to be the difference with the Localization RFP (Prof. Tsubouchi)
- Still, making the API standard will be helpful. (Dr. Kim)
- In Korea, speaker/face recognition, user identification API, in URC (networked robot) environment is standardized. (Dr. Kim)
- Is there any related RFI, related this item? (Prof. Tsubouchi)
- There is a summary of RFI report by Olivier. Person Recognition and Human Interface are one of the topics.
- If you need, new RFI can be issued. (Dr. Kotoku)
- We should concern the relationship with the Profile WG (Dr. Tsubouchi)
- Dr. Chi is thinking of this (Dr. Kim)

10:30-11:00 Publicity Sub-Committee Report (Dr. Chung) [robotics/2007-09-17]
- flier voting result
  .9 votes
  .draft 2 selected (the blue one)
- the front photograph doesn't look like a robot
  .change photograph
- in Nov., the final version will be sent out
  .substitute photo will be sent in the next couple of weeks
- information day
  .targeted on Ottawa meeting

11:00-11:30 Plenary Closing (Dr. Kotoku) [robotics/2007-09-18]
- volunteer changes
  - Dr. Pham , Dr, Kim and Dr. Lee resigned
  - Setup new Robotic Localization Service WG (mission oriented WG)
    -Co-Chair: Dr. Yeon-Ho Kim (Samsung), Mr. Kyuseo Han (ETRI), Dr. Shuichi Nishio (JARA/ATR)
    * AIST (motion) ETRI (second) Shibaura-IT (white ballot)
    - motion passed
  - Dr. Hyunsoo Kim (Samsung) newly joined as Robotic Functional Services WG co-chair
    * ETRI (motion) Shibaura-IT (second) Tech. Arts (white ballot)
    - motion passed
- call for volunteer
  - additional volunteer of the Robotics-DTF co-chair

- Co-Chair election will be held in Burlingame
- next meeting
  - Mon: (AM) steering committee / RLS initial submission presentations
  - Tue: (PM) Robotics-DTF plenary
  - HRI RFP discussion Monday to Thursday

11:30 Adjourn plenary meeting

Plenary Meeting Attendee (Sigh-in): 11

- Hyun-Soo Kim (Samsung)
- Kyuseo Han (ETRI)
- Makoto Mizukawa(S.I.T.)
- Noriaki Ando (AIST)
- Shuichi Nishio (JARA/ATR)
- Su-Young Chi (ETRI)
- Takashi Tsubouchi (Tsukuba Univ.)
- Takeshi Sakamoto (Technologic Arts)
- Tetsuo Kotoku (AIST)
- Toshio Hori (AIST)
- Yun-Koo Chung (ETRI)

Prepared and submitted by Su-Young Chi (ETRI) and Shuichi Nishio (JARA/ATR)

Robotics Domain Task Force
Steering Committee Meeting

December 10th, 2007

Burlingame, CA, USA

Hyatt Regency San Francisco Airport

Jacksonville Meeting Summary

- **Robotic Localization Service WG:**
  - **Typical case scenarios for the Robotic Localization Service** [robotics/2007-09-13]
- **Robotics Plenary:** (11 participants)
  - **2 WG Reports** [robotics/2007-09-12,14]
  - **2 Contact Reports** [robotics/2007-09-15,16]
  - **Publicity SC Report** [robotics/2007-09-17]

Agenda

- Agenda Review
- Minutes and Minutes Taker
- Publicity
- Roadmap Discussion
- Next meeting Schedule

Agenda Review

Mon(Dec. 10):

Steering Committee,
RLS-RFP initial submission presentations(AM)
WG activities(PM)

Tue(Dec. 11):

WG activities(AM)
Robotics-DTF Plenary(PM)

Wed(Dec. 12) and Thu(Dec.13):

WG activities

please check our up-to-date agenda
http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Minutes and Minutes Taker

- Process:
  - Make a draft with in 5days
  - Send the initial draft to robotics-chairs@omg.org
  - Post the draft to the OMG server within a week
  - Make an announcement to robotics@omg.org
  - Send comments to robotics@omg.org
  - Approve the revised minutes at the Next meeting

- Volunteers for this Meeting
  - Geoffrey Biggs (AIST)
  - Yun Koo Chung (ETRI)

We have to post our meeting minutes within a week!

Publicity Activities

- Robotics-DTF fly sheet
- Robotics-DTF :
  Homepage: http://robotics.omg.org/
  Wiki: http://portals.omg.org/robotics
  Mailing List: robotics@omg.org

- Robotics Infrastructure WG:
  Wiki: http://portals.omg.org/robotics/InfrastructureWG
  Mailing List: omg-infrastructure@m.aist.go.jp
- Robotics Data and Device Profiles WG:
  Wiki: http://portals.omg.org/robotics/ProfileWG
  Mailing List: omg-profile@m.aist.go.jp
- Robotics Functional Services WG:
  Wiki: http://portals.omg.org/robotics/ServiceWG
  Mailing List: omg-service@m.aist.go.jp
- Robotics Localization Service WG:
  Wiki: http://portals.omg.org/robotics/LocalizationWG
  Mailing List: omg-localization@m.aist.go.jp

Roadmap Discussion

- Confirm the process of working items
- Create new items
  (we need volunteers)

- Information Day (Seminar) in 2008 Ottawa TM
  => Cancel (no volunteer)
- Cancel 2008 Orlando TM
  - IROS2008 (Nice, France)
  - January 25, 2008 Proposals for Tutorials/Workshops

Organization

- **Robotics-DTF**: Yun-Koo Chung (ETRI, Korea), Tetsuo Kotoku (AIST, Japan), Call for volunteer
  - **Steering Committee**: All volunteers
    - **Publicity Sub-Committee**: Abheek Bose (ADA Software, Indea), Masayoshi Yokomachi (NEDO, Japan), Yun-Koo Chung (ETRI, Korea)
    - **Contacts Sub-Committee**: Makoto Mizukawa (Shibaura-IT, Japan), Yun-Koo Chung (ETRI, Korea)
  - ***Technical WGs***
    - **Infrastructure WG**: Noriaki Ando（AIST, Japan), Call for volunteers
    - **Robotic Functional Services WG**: Soo-Young Chi (ETRI, Korea), Shuichi Nishio (JARA/ATR, Japan), Hyunsoo Kim (Samsung, Korea)
    - **Robotic Data and Profiles WG**: Bruce Boyes (Systronix, USA), Call for volunteers
    - **Robotic Localization Services WG**: Kyenseo Han (ETRI, Korea), Yeon-Ho Kim (Samsung, Korea), Shuichi Nishio (JARA/ATR, Japan)

Next Meeting Agenda

March 10-14 (Washington, CA, USA)

Monday:

Steering Committee (morning)
WG activity [Parallel WG Session] (pm)

Tuesday:

WG activity [Parallel WG Session] (am)
Robotics-DTF Plenary Meeting (pm)
- Guest and Member Presentation
- Contact reports

Wednesday:

WG activity follow-up [if necessary]

Special Talk Candidates

- Report of RoboDevelopment 2007
- Introduction to JCX robotics project (Tentative)
  - Bruce Boyes (Systronix)

- Someone from local area

Roadmap for Robotics Activities

robotics/2007-12-04

Item	Status	Jacksonville Sep-2007	Burlingame Dec-2007	Washington DC Mar-2008	Ottawa Jun-2008	Orlando (CANCEL) Sep-2008	Santa Clara Dec-2008	Washington DC Mar-2009	TBD Jun-2009	POC / Comment
Flyer of Robotics-DTF [Publicity Sub-Committee]	In Process	discussion	issue ver.1.0							Abheek(ADA Software)
Robotic Localization Service RFP [Robotic Localization Service WG]	In Process		Initial Submittion	Pre-review	Revised Submittion		adoption			Shuichi Nishio (JARA/ATR) Kyuseo Han (ETRI) Yeon-Ho Kim (Samsung)
Human Robot Interaction RFP [Robotic Functional Services WG]	In Process	discussion	discussion	1st Draft	1st review RFP		RFP		Initial Submittion	Su-Young Chi (ETRI)
Hardware-level Resources: define resource profiles RFP [Profile WG]	Planned			discussion	1st review RFP		RFP		Initial Submittion	Bruce Boyes (Systronix)
etc…	Future									to be discussed
Robotics Information Day [Technology Showcase]	Planned				Seminar (CANCEL)					Yokomachi(NEDO), Kotoku(AIST)
RTC Finalization Task Force	done Sep-2007	Report								Noriaki(AIST) and Rick(RTI)
Related Events						IROS2008				

Robotics-DTF Plenary Meeting
Opening Session

December 10th, 2007

Burlingame, CA, USA

Hyatt Regency San Francisco Airport

Approval of the Jacksonville Minutes

Meeting Quorum : 4

AIST, ETRI, JARA, John Deere, Samsung, Shibaura-IT, Technologic Arts,

Minutes taker(s):

- Geoffrey Biggs (AIST)
- Yun Koo Chung (ETRI)

Minutes review

- **Localization Service WG:**
  - **Typical case scenarios for the Robotic Localization Service** [robotics/2007-09-13]
- **Robotics Plenary:** (11 participants)
  - **2 WG Reports** [robotics/2007-09-12,14]
  - **2 Contact Reports** [robotics/2007-09-15,16]
  - **Publicity SC Report** [robotics/2007-09-17]

Agenda Review

Mon:

09:45-10:00 Opening Session
10:00-12:00 Initial Submission Presentation

Tue:

11:30-12:00 Volunteer Talk
13:00-14:00 WG Reports and Roadmap Discussion
14:00-16:30 Special Talks
16:30-17:10 Contact Reports
17:10-17:30 DTF Co-Chair election, Publicity,
Next meeting Agenda Discussion
17:30 Adjourn joint plenary meeting

17:30-18:00 WG Co-chairs Planning Session

please check our up-to-date agenda
http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf

Robotic Localization Service -OMG Initial Submission

2007-12-10
Electronics and Telecommunications Research Institute
Samsung Electronics, Co.*
Kyuseo Han, Wonpil Yu, and Yeonho Kim*

Contents

What will we need?

- To generate localization result without any severe considerations
- To obtain optimal location estimate, when a variety of sensors are cooperating with each other
- To handle coordinate systems as automatic as possible
- To attach/detach sensor

OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

Basic Concepts

- Simple Structure
  - 4 Basic components
- Supportable to various configurations
  - Providing various services
- Compatible with other standards
  - Supporting WGS84 coordinate system
  - Possibly migrating in RTC

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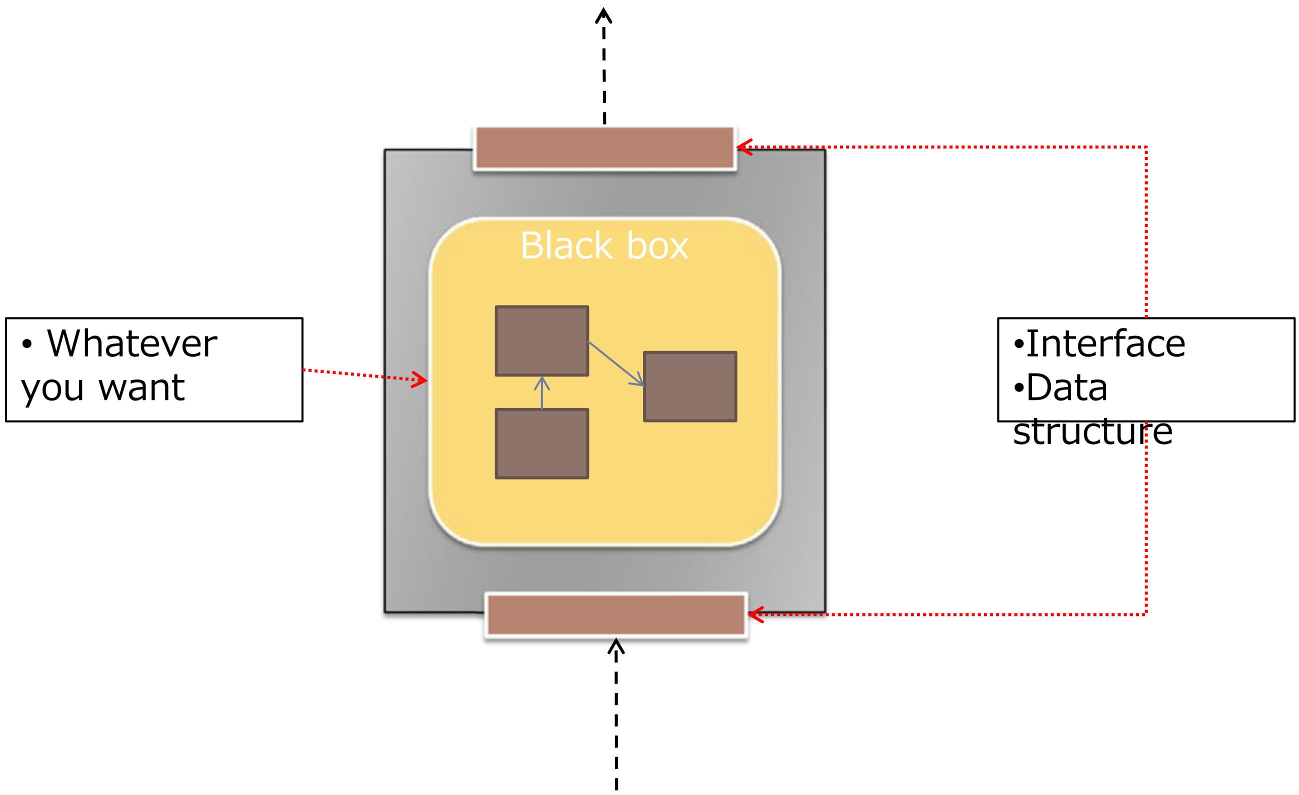
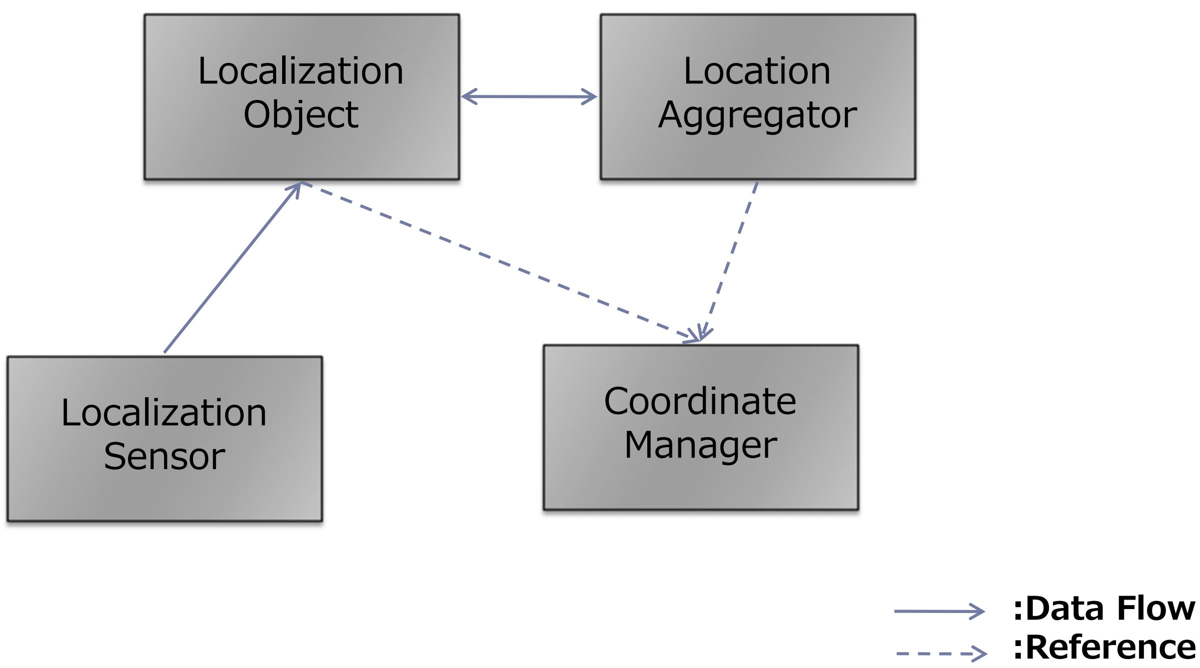
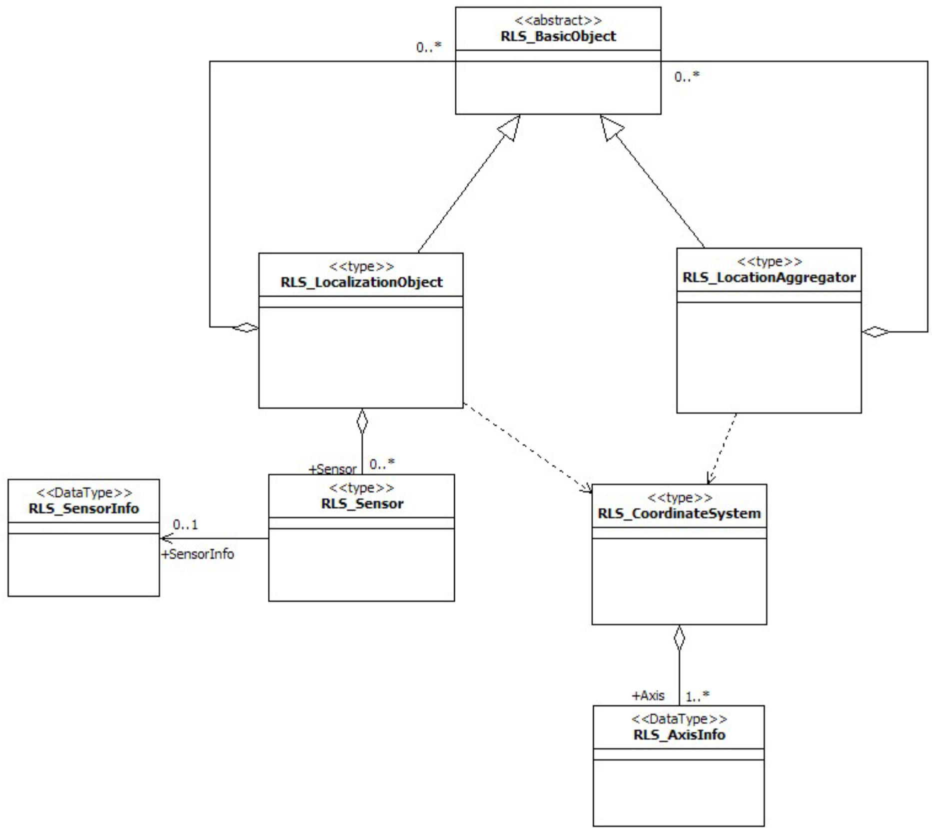
Basic Component



Abstract Structure

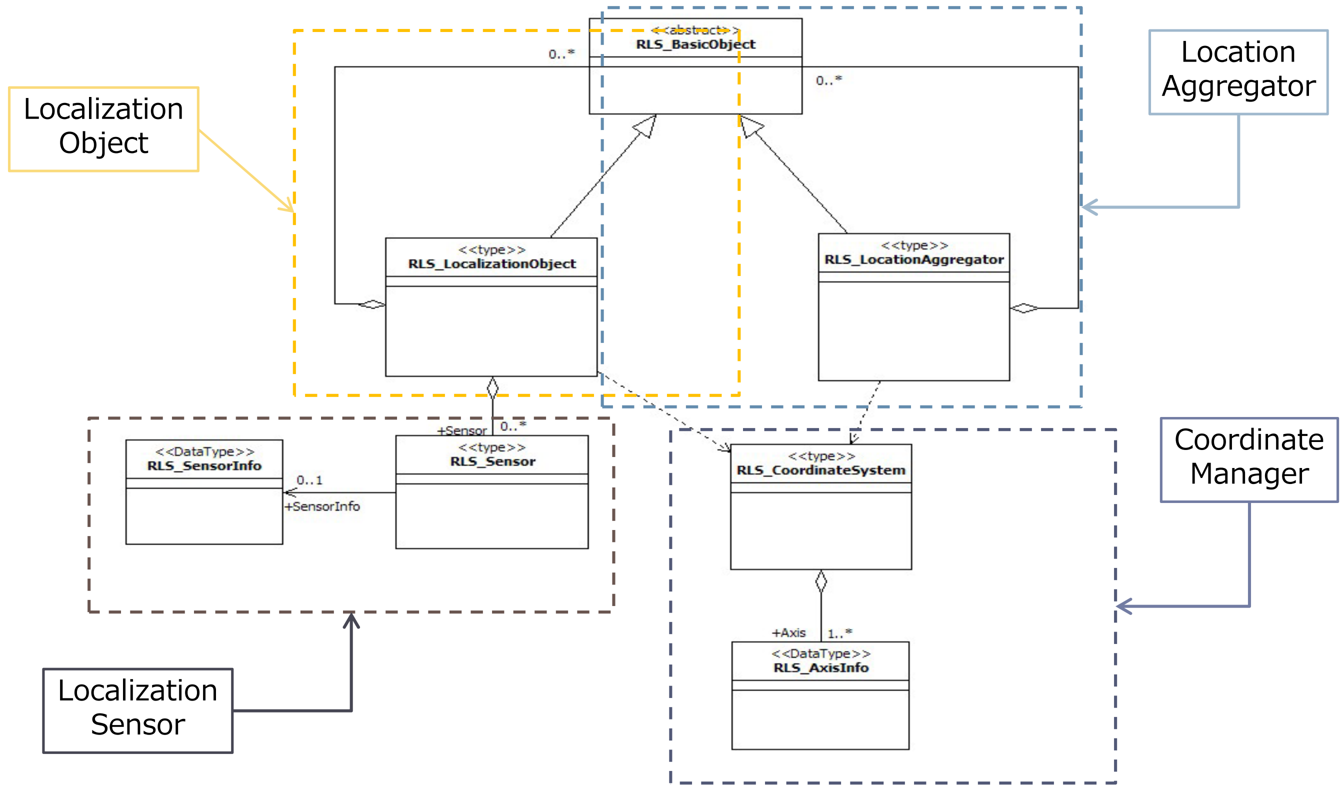


UML diagram for our proposal structure



OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

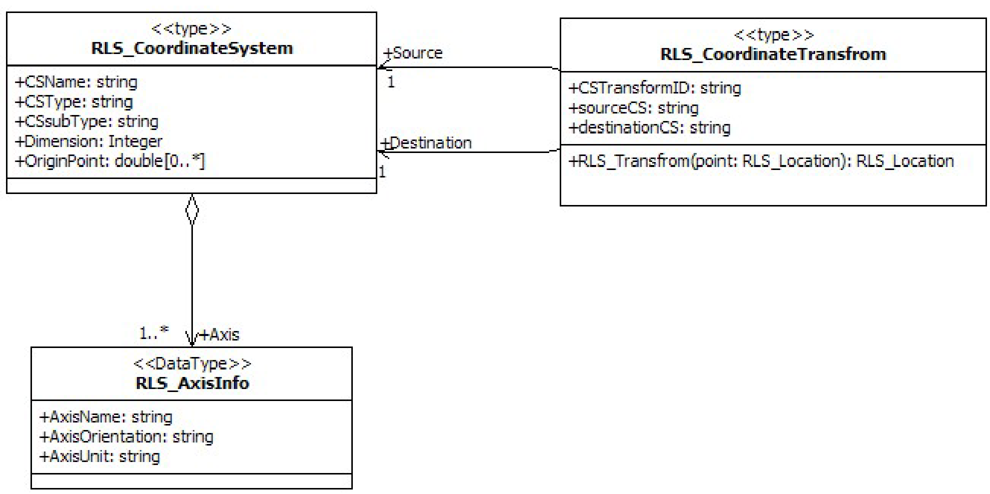
Classes Vs. Components



Coordinate System

- Basic Coordinate System
  - 3- Dimensional Cartesian coordinate system
- Supporting coordinate system
  - WGS84
  - Local coordinate system (user-defined)
- Supporting transformation among coordinate systems.

UML Diagram



RLS_CoordinateSystem

- To describe coordinate system

- **Attributes**
  - **CSName**:the coordinate system name(e.g.,mycoord1)
  - **CSType**:the type of coordinate system

Value
RLS_CS_CARTESIAN
RLS_CS_WGS84
RLS_CS_LOCAL

  - **CSsubType**:the sub type of coordinate system(e.g.,geodetic)
  - **Dimension**:the dimension of coordinate system
  - **OriginPoint**:the origin point coordinate value

OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

RLS_AxisInfo

- Description of axis
- Characterization of coordinate system

- **Attributes**
  - **AxisName** :
    specifies the name of axis
  - **AxisOrientation** :
    specifies orientation of axis
    (e.g., "clockwise from true north")
  - **AxisUnit** :
    specifies the unit of measure
    (e.g., degree, radian, and meter)

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RLS_CoordinateTransform

- Changing coordinate values from one coordinate system to another
- **Attributes**
  - **CSTransformID** :the unique identifier
  - **sourceCS** :specifies source coordinate system
  - **destinationCS** : specifies target coordinate system
- **Operation**
  - **RLS_Transformation([in]point)**

    point: RLS_Location

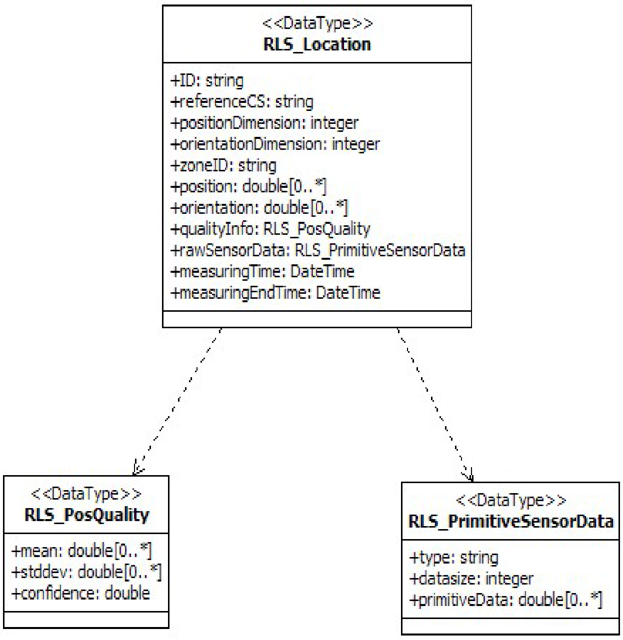
    Return value: RLS_Location

    Semantic: transform or covert coordinate value

RLS_Location

- Data structure for describing location data
- Including auxiliary information related with location
  - Coordinate system
  - Measuring time
  - Confidence of data
  - Quality …

UML Diagram



- ID: Object ID
- referenceCS: reference coordinate system
- positionDimension: positional dimension
- orientationDimension: directional dimension
- zoneID: zone description
- Position: values of position
- Orientation: values of direction
- Qualityinfo: statistical confident values
- RawSensorData: sensor data
- measuringTime: time at occurring measurement
- measuringEndTime: time at finishing measurement

DateTime: UTC format (e.g.,20071102T143050.345Z)

An Example of RLS_Location

- Possible representation for NMEA-0183

<<NMEA-0183>>

data type	value
time in UTC	123519.00
latitude, north	3601.038247,N
longitude, east	13631.324523,E
GPS quality indication	1
number of satellites	08
HDOP	1.2
height from average sea level	68.42
unit<meter>	M
height from WGS-84epllisode	46.93
unit<meter>	M

<<RLS_Location>>

data type	value
measuringTime	yyyymmddT123519.00Z
Position[4]	{3601.038247, 13631.324523, 68.42, 46.93}
referenceCS	RLS_CS_WGS84
qualityinfo	confidence:1.2
rawSensorData	data

data type	value
type	Number of satellites
datasize	1
primitiveData	8

An Example of RLS_Location

<<NMEA-0183>>

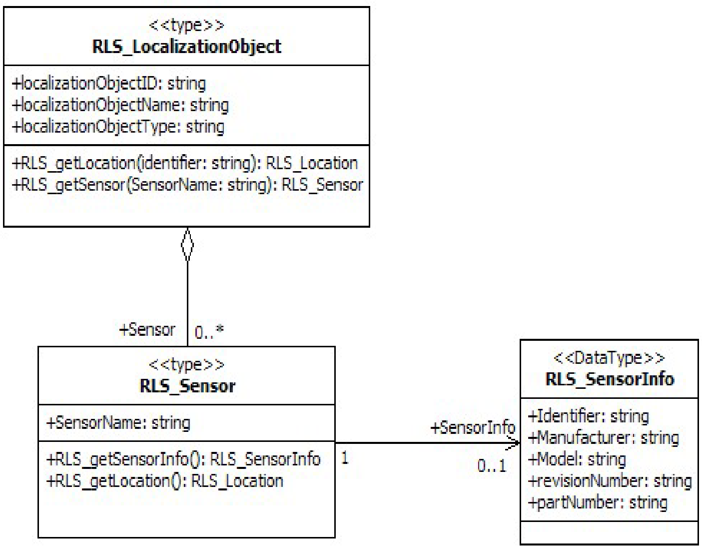
data type	value
time in UTC	123519.00
latitude, north	3601.038247,N
longitude, east	13631.324523,E
GPS quality indication	1
number of satellites	08
HDOP	1.2
height from average sea level	68.42
unit<meter>	M
height from WGS-84epllisode	46.93
unit<meter>	M

<<RLS_Location>>

data type	value
referenceCS	RLS_CS_WGS84
rawSensorData	data

data type	value
type	NMEA-1083
datasize	1
primitiveData	…

RLS_Sensor (with UML Diagram)



- Connecting with Sensor hardware/ driver
- Creating Raw sensor data or position data
- Supplying Hardware specification

RLS_Sensor

- Providing location or raw sensor data

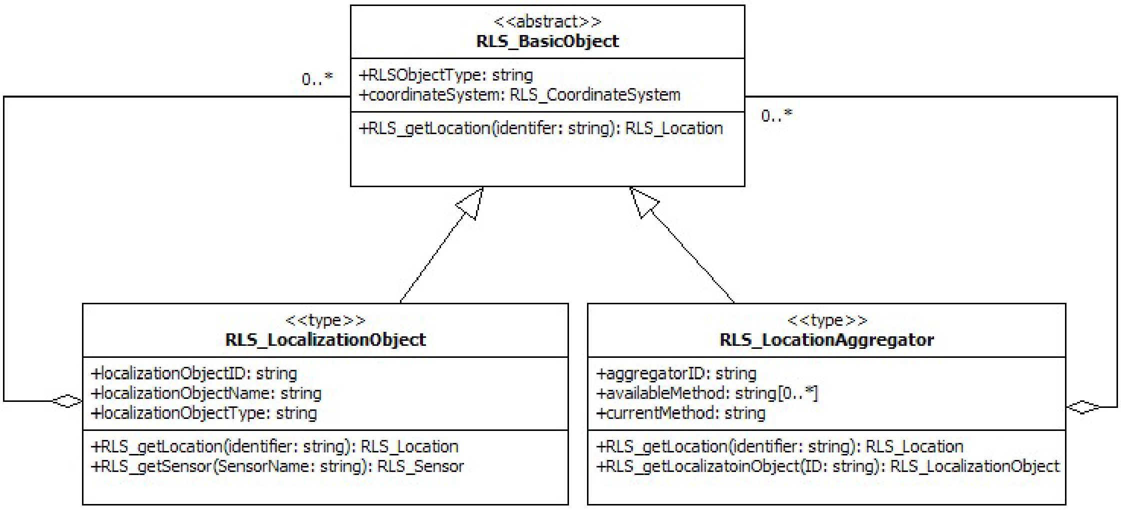
- **Attribute**
  - **SensorName** :specifies identifier (e.g, name, number or others)
- **Operations**
  - **RLS_getSensorInfo()**
    Return value: an instance of RLS_SensorInfo
    Semantic: obtaining sensor information
  - **RLS_getLocation()**
    Return value: RLS_Location
    Semantic: returning location or raw sensor data

RLS_SensorInfo

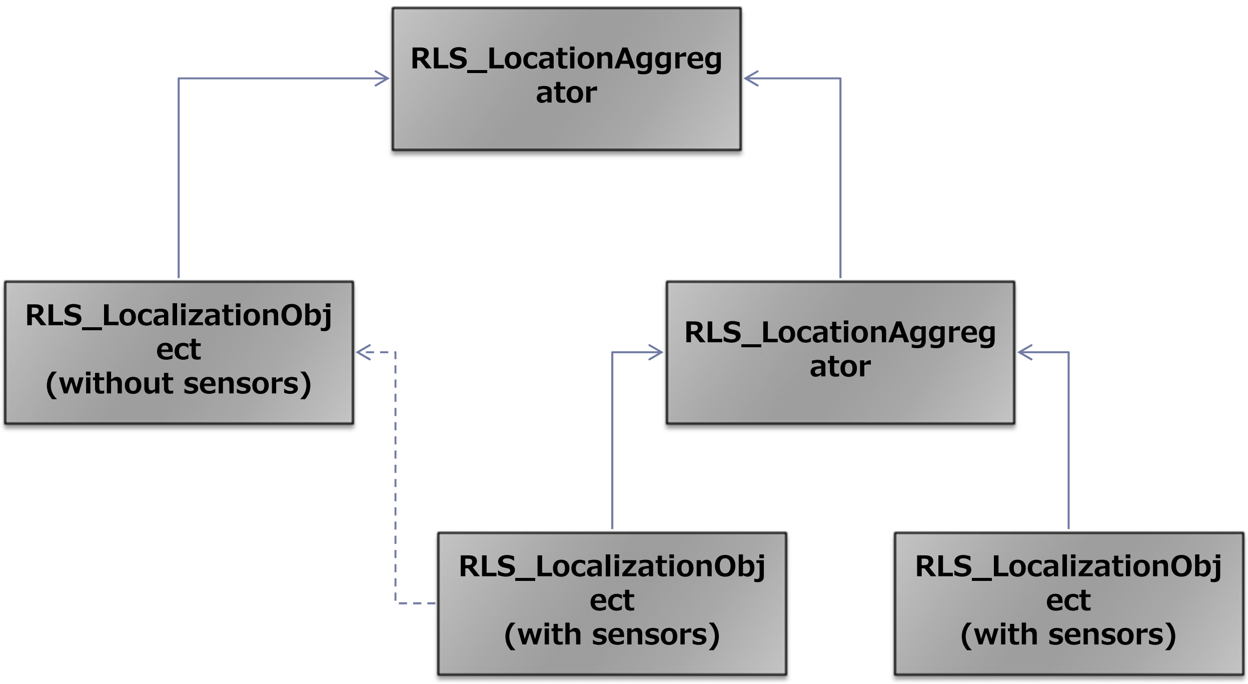
- Providing sensor information

- **Attributes**
  - **Identifier** :the unique identifier
  - **Manufacturer** :the identifier of sensor manufacturer
  - **Model** : the model name or number of sensor
  - **revisionNumber** : sensor version or revision number
  - **partNumber** : manufacturer's part number

RLS_LocalizationObject, RLS_LocationAggregator



Hierarchical Structure



Example code for composite pattern

```
Interface RLS_BascicObject {
        public RLS_Position RLS_getPosition(string Identifier);
}

class RLS_LocalizationObject : implements RLS_BasicObject {
        private ArrayList<RLS_BasicObject> mChildObject = new ArrayList<RLS_BasicObject>();

        public RLS_Position RLS_getPosition(string Identifier){
                // internal algorithm for obtaining location data
        }

        public void add(RLS_BasicObject object){
                mChildObject.add(object);
        }
}
public class Program {
        public static void main() {
                RLS_LocalizationObject object1 = new RLS_LocalizationObject();
                RLS_LocalizationObject object2 = new RLS_LocalizationObject();
                //compose the RLS_BasicObject
                object1.add(object2);
        }
}
```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RLS_BasicObject

- The base class of RLS_LocalizationObject and RLS_LocationAggregator

- **Attributes**
  - **RLSObjectType** :the type of RLS_BasicObject

Value	Description
RLS_LO	RLS_LocalizationObject
RLS_LA	RLS_LocationAggregator

  - **coordinateSystem** :current coordinate system

- **Operations**
  - **RLS_getLocation([in]identifier)**

  Semantic: virtual operation; retuning RLS_Location

RLS_LocalizationObject

- Core component of RLS
- Creating location data connected to RLS_Sensor
- Including developer's own techniques
- Delivering location data to external applications or location aggregator
- Supporting flexible configurability by Hierarchical structure

RLS_LocalizationObject (class description)

- **Attributes**
  - **localizationObejctID** : the indentifier
  - **localizationObjectName** :human readable name
  - **localizationObjectType** :type of localization object

Value	Description
RLS_LO_SERVICE	It enables to provide location generated by using data from connected localization sensors (e.g., A mobile robot in which laser range finder is installed)
RLS_LO_ENTITY	It enables to provide location generated by using data from other connected localization object or location aggregator. It has no connected localization sensors (e.g., A cup on which a passive RFID tag is attached)

RLS_LocalizationObject (class description)

- **Operations**
  - **RLS_getLocation([in]identifier)**

    identifier: an identifier for localization object to be retrieved

    Return value: RLS_Location

    Semantic: providing an instance of RLS_Location

  - **RLS_getSensor([in]SensorName)**

    SensorName: an identifier for localization sensor to be retrieved

    Return value: RLS_Sensor

    Semantic: providing an instance of RLS_Sensor with SensorName attribute matching the value of SensorName argument

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RLS_LocationAggregator

- Creating optimal location estimate of target entity
- Data fusion techniques
- Supporting flexible configurability by Hierarchical structure

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RLS_LocationAggregator (class description)

- **Attributes**
  - **aggregatorID** : an identifier
  - **availableMethod** : identifiers of available aggregation methods
  - **currentMethod** :current aggregation method

- **Operations**
  - **RLS_getLocation([in]identifier)**
    identifier: an identifier for localization object to be retrieved
    Return value: RLS_Location
    Semantic: providing aggregated location data
  - **RLS_getLocalizationObject([in]ID)**
    ID: an identifier for localization object to be retrieved
    Return value: RLS_LocalizationObject
    Semantic: returning an instance of RLS_LocalizationObject with localizationObjectID matching the value of ID argument

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Proposal Vs. Mandatory Requirements

Mandatory Requirement	Classes or functions in Proposal
1.1 specifying a set of data and/or their structure necessary to represent location infomation	**RLS_Location** **RLS_PosQuiality** **RLS_PrimitiveSensorData**
1.2 specifying a set of methods and/or their parameters to access localization information	**RLS_LocalizationObject** **RLS_LocationAggregator** **RLS_Sensor**
2.1 specifying the interface for accepting the request for localization result	**RLS_getLocation (function)**
2.2 specifying the interface for publishing the localization result	**RLS_getLocation (function)**
3.1 conversion of location information from one coordinate system to another	**RLS_CoordinateSystem** **RLS_CoordinateTransform**
3.2 aggregation of multiple location information	**RLS_LocationAggregator**

Proposal Vs. Optional Requirements

1.Advertizing what types of entities can be localized and/or what entities are being localized

No explicit operations. It is, however, possible to obtain similar information through investigating **RLS_LocalizationObject** with *localizationObjectID* or *localizationObjectName* attribute

2. Advertizing what kind of sensor data can be used and/or what sensor are used

`RLS_getSensor` operation in **RLS_LocalizationObject**
`RLS_getSensorInfo` operation in **RLS_Sensor**

3. Incorporating additional information for localization or aggregation, such as for notifying the LS about some entities that moved in/out of its range

No explicit operations. The combination of `RLS_getLocalizationObject` in **RLS_LocationAggregator** and **RLS_LocalizationObject** with *localizationObjectID* or *localizationObjectName* attribute enables to identify entities

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Proposal Vs. Optional Requirements

4.Managing the difference coordinate systems and frames defined in a robotic system, as well as their physical relationship

No explicit operations or managing mechanism

5. Managing the instances of Localizing Object or Localization Service in the robotic system

No explicit operations or managing mechanism

6. Controlling the internal parameter for the location fusion algorithms used in aggregating locations. With this interface, the algorithm used for location aggregation can be implemented as a module. In this way, developers can easily exchange this algorithm module by modules with other algorithms when necessary

As a module for location aggregation, **RLS_LocationAggregator** is proposed

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Proposal Vs. Issues to be discussed

1. Demonstrating its feasibility by using a specific application based on the proposed model
This proposal has already applied in various robot applications.
2. Demonstrating its applicability to existing technology such as RLTS(Real-time Location System)
One of implementations has been using Zigbee network. The proposal shall support for adopted to existing technologies.
3. Discussing simplicity of implementation
See an example code in page 22 in this presentation. Developers should ignore of how many or what kind of component will be attached in future.

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Proposal Vs. Issues to be discussed

4. Discussing the possibility to apply the proposed model to other existing fields/projects of interest that utilize location information, such as Sensor Network Project
This proposal has already been implemented based on Zigbee network.
5. Discussing the possibility of providing standard mechanism to access map data
None. Accessing map data and relating mechanisms will be next standardization item.
6. Discussing their relation and dependency to existing communication protocols or middleware standards, such as CORBA or DDS
As using Zigbee network, the RLS has accessed to a Zigbee network server through TCP/IP protocols.

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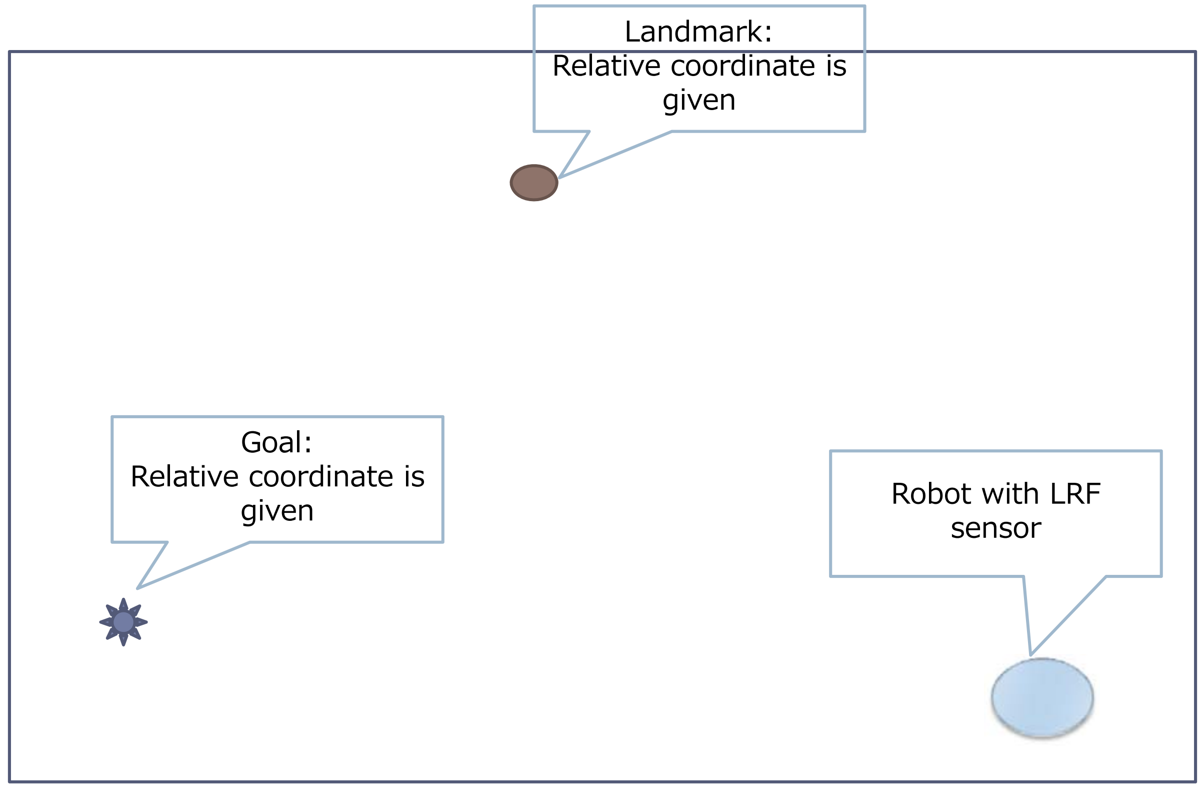
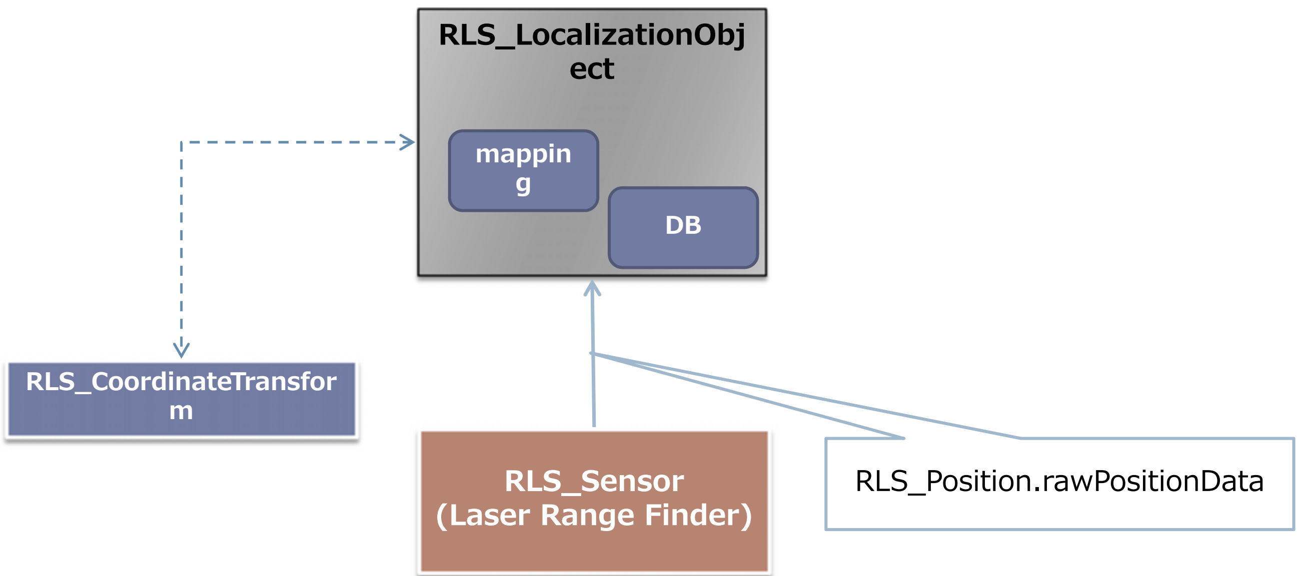
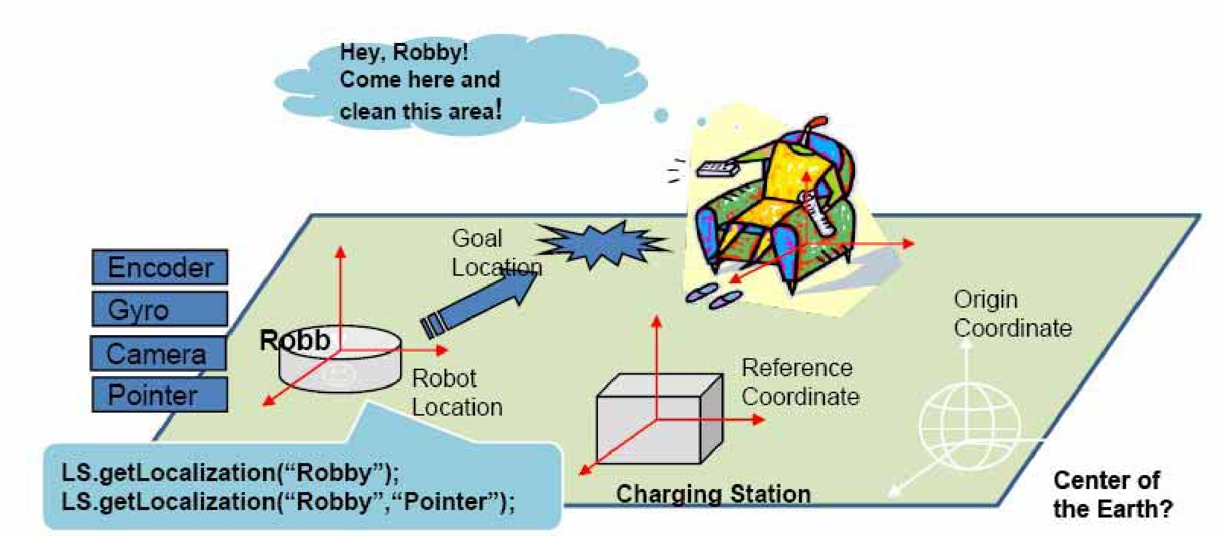
Scenario -1



RLS(scenario 1)



Scenario - 2



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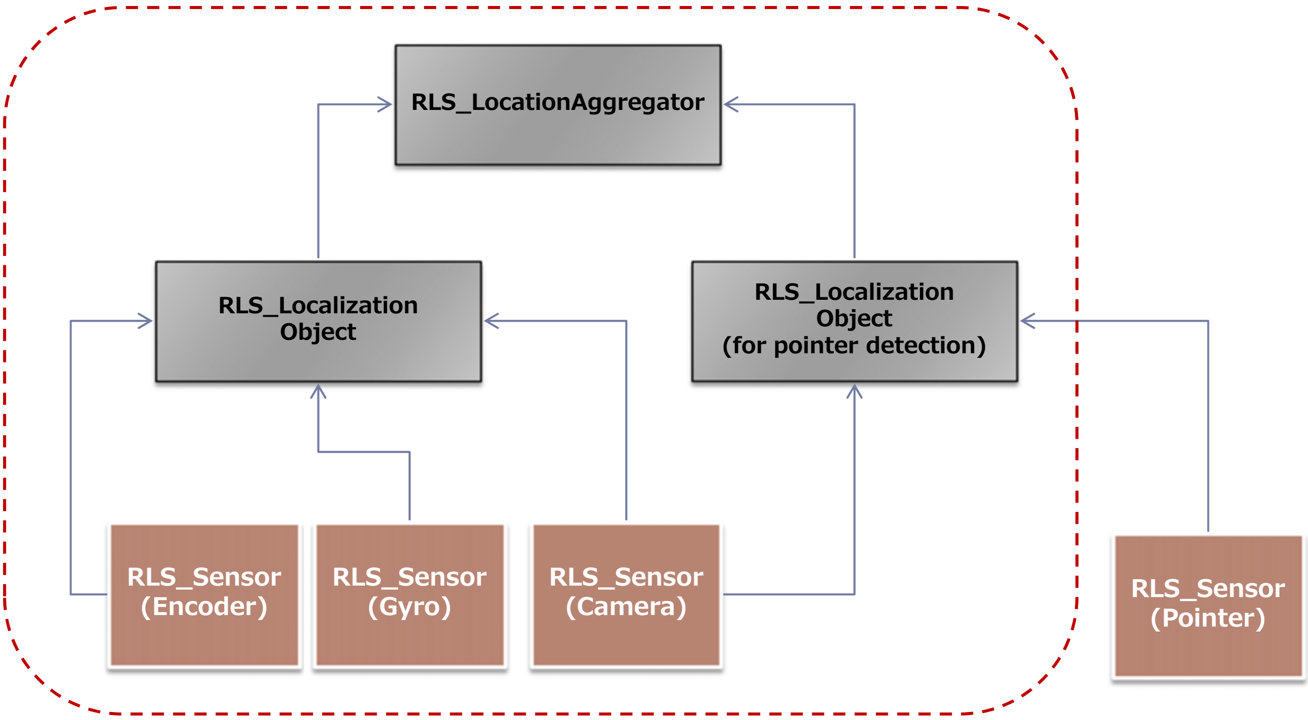
RLS (Scenario 2)



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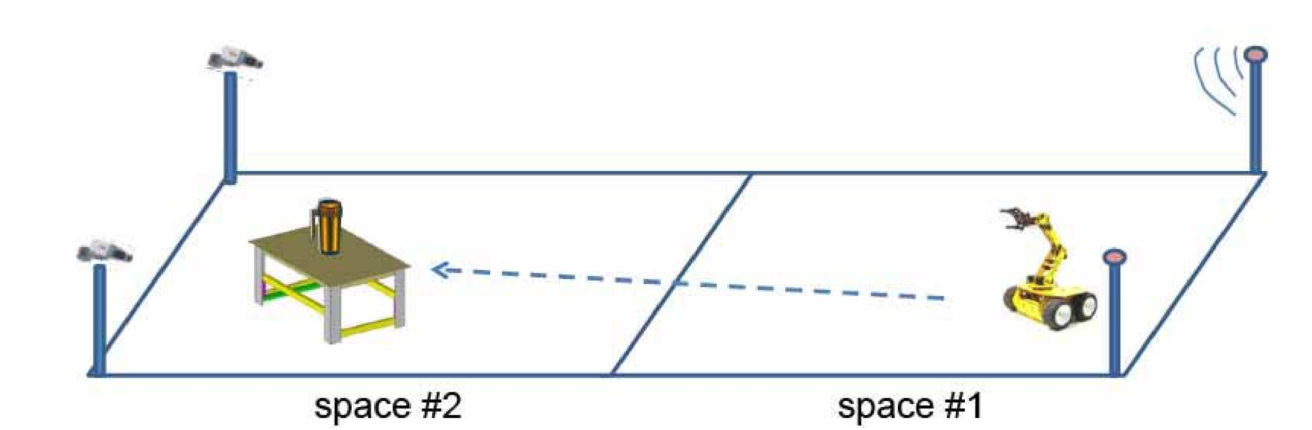
Scenario - 3



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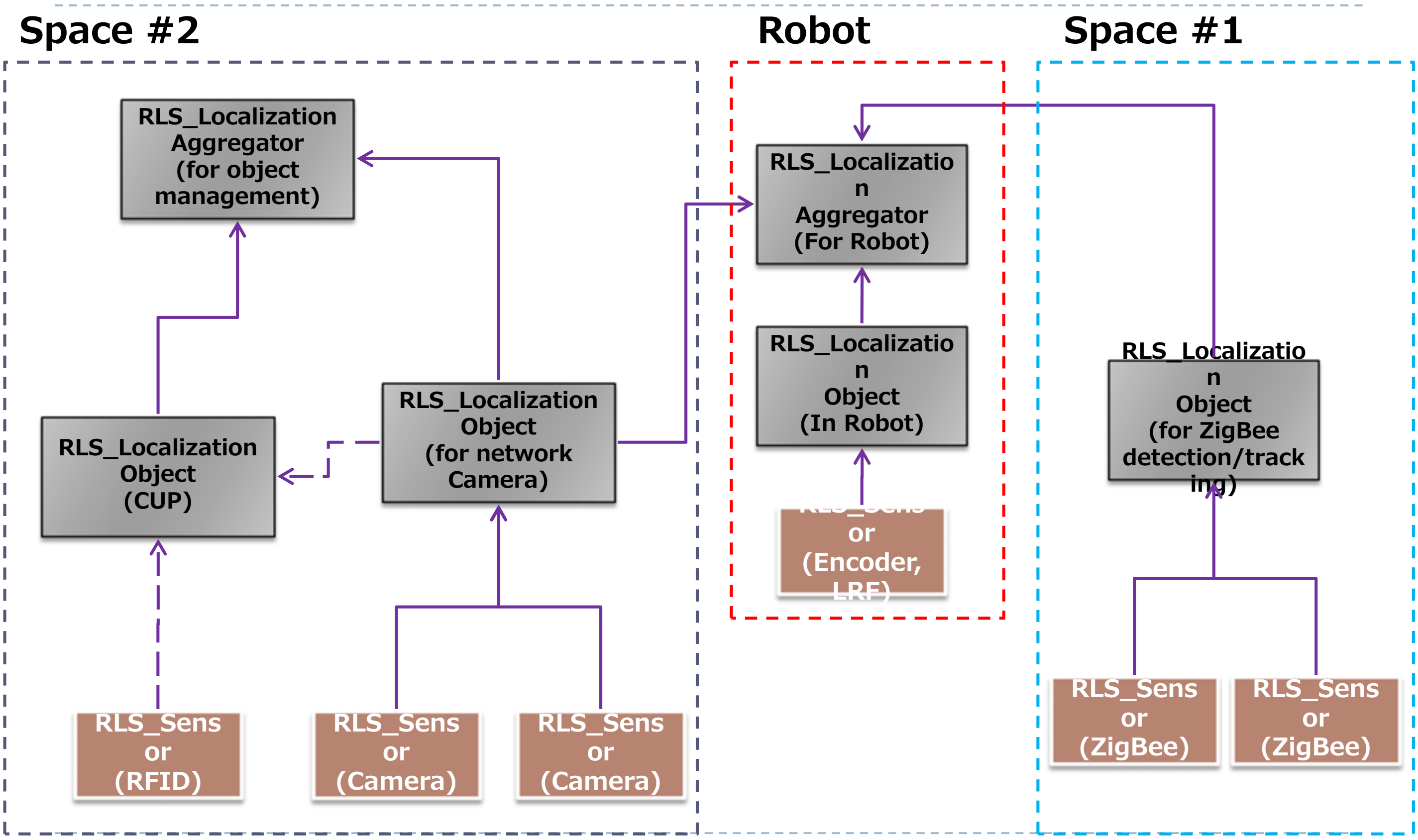
RLS (Scenario 3)



Conclusion

- Robotic Localization Service
  - Composed with 4 basic components.
- Supporting localization for robot or object in a given environment
- Flexible configurability

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Q & A

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JARA initial submission to Robotic Localization Service RFP

10 Dec, 2007

NISHIO Shuichi

Japan Robot Association (JARA) /

ATR Intelligent Robotics and Communication Laboratories

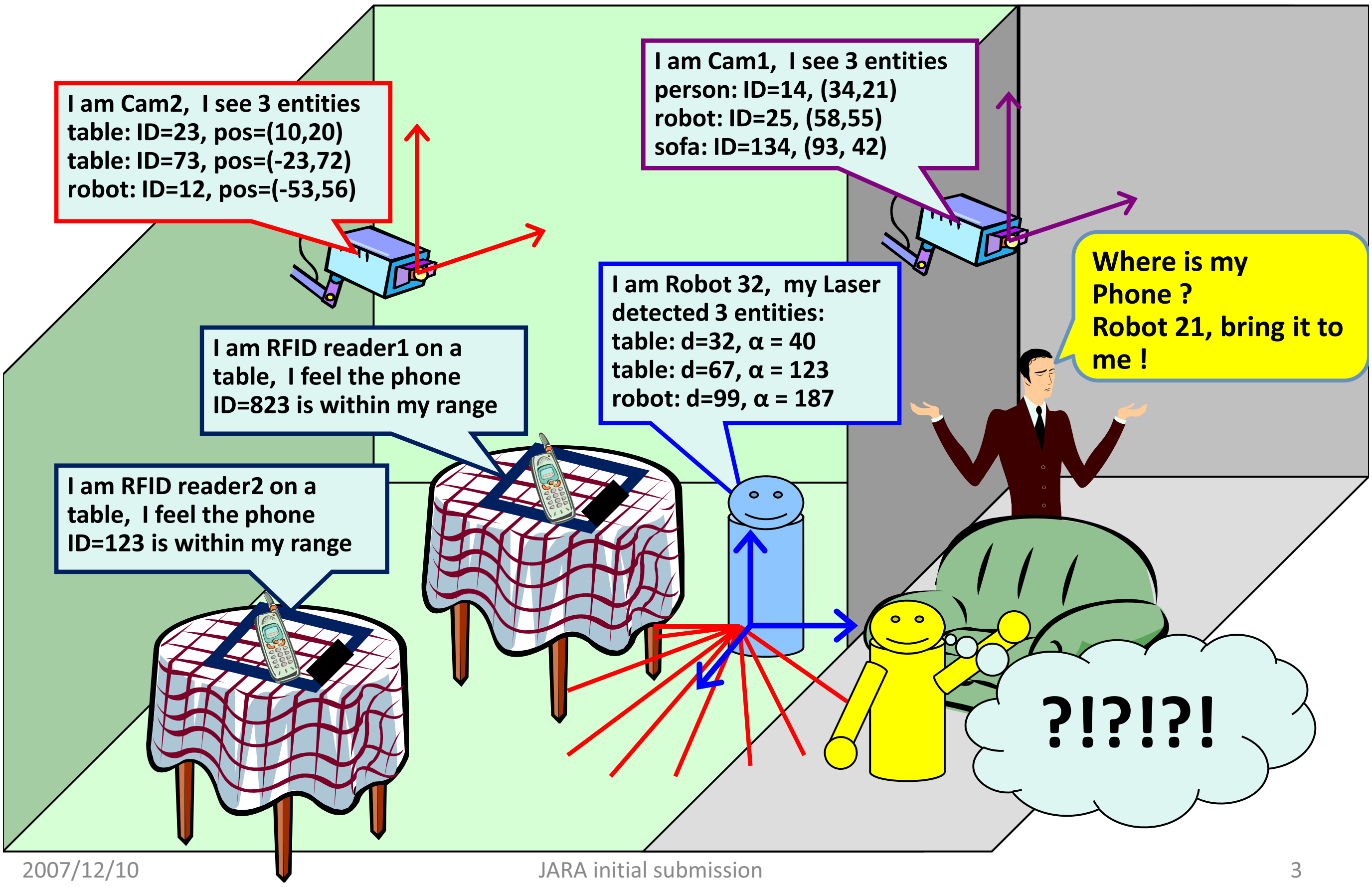
Robotic Localization Service RFP

Purpose:

Specification of Localization Service that provide

- A set of common information to **represent location**
- **Common interfaces** for Localization Service to transfer data and commands

RFP example of Robotic Service



Background / Scope of RLS-RFP

- Localization Service **independent to specific sensors or algorithms**
- Robots may use info from equipped sensors as well as those **from other robots or sensors in the environment** (**Network Robot**)
- Robots may perform **services to people** (**Service Robot**, not just industrial robots)
- Treat location information of **people or objects** (not just the robot itself)

Key issues in JARA proposal

A) Generic and flexible representation for robotic localization information

– independent to specific sensors / algorithms

– reorganization of various usage in robots

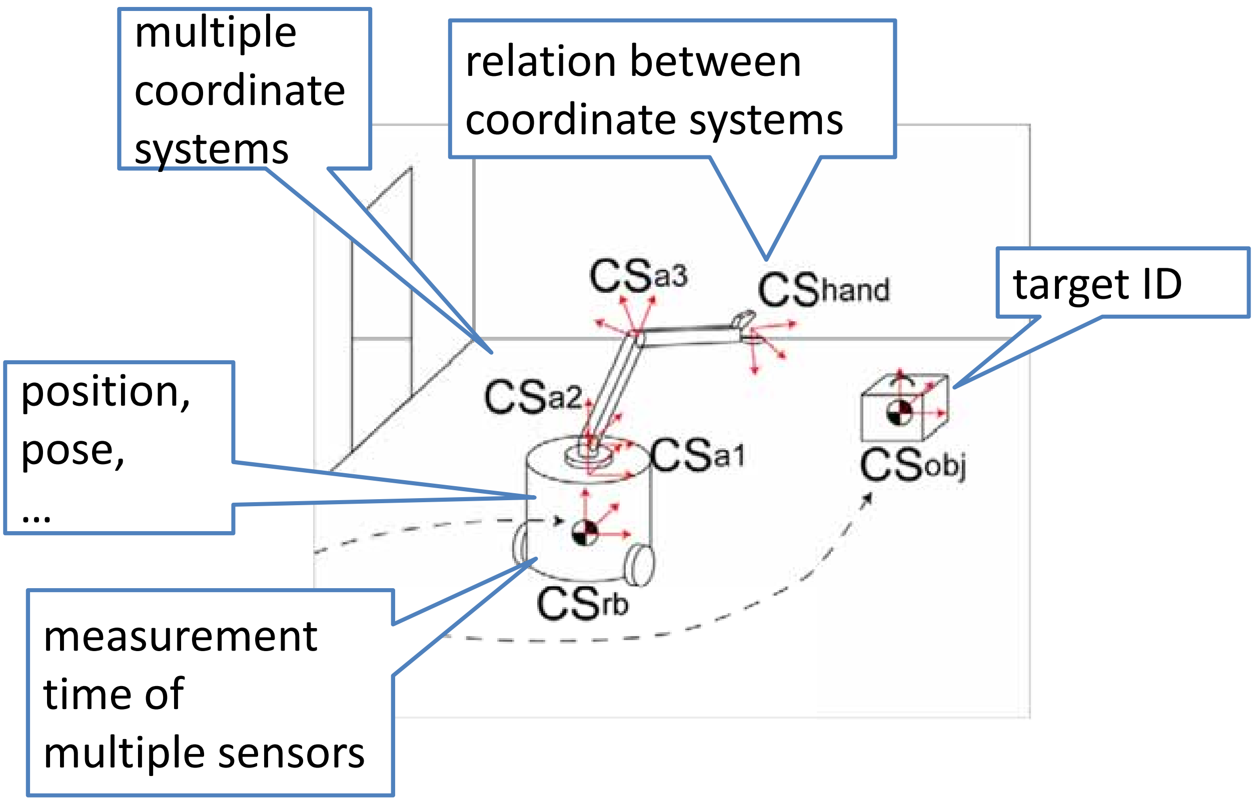
B) Framework for high reusability / easy development

– Interoperability with existing systems

– meta-level information for exchanging module capability

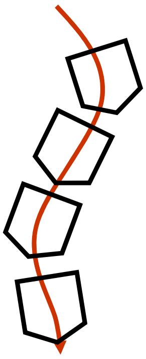
– prepare for plug-and-play composition

Requirements in Robotics (1)



Requirements in Robotics (2)

- Navigation or Manipulation requires **High-Precision** localization
  - **Measurement Time** and **Error Information** is Essential
  - Especially when mixing multiple sensor outputs



Robot position

time	x	y	θ
10	2	6	10
12	0	4	-10
14	-4	2	-9
16	-3	0	1

Sensory data

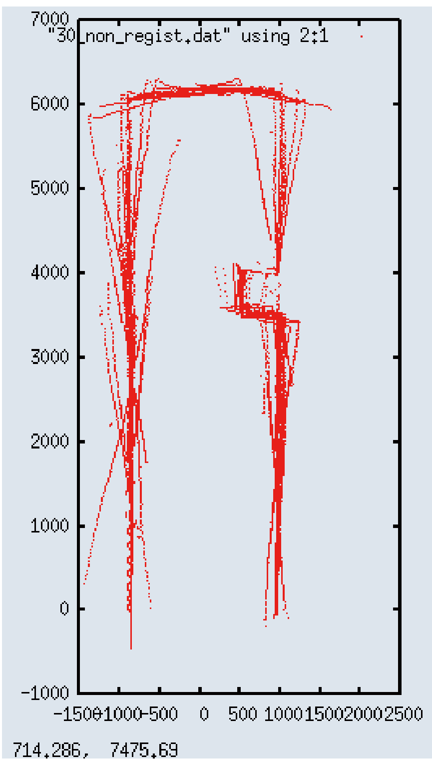
time	d
10	5
13	10
15	12

Takeuchi, Tsubouchi, Yuta 2005

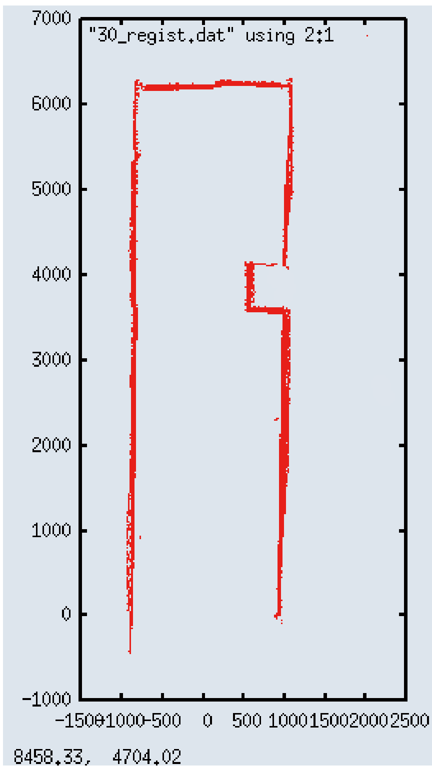
Example: Effect of Time Error

Ueda, Kawata, Tomizawa, Ooya, Yuta, 2005

A robot measures its surroundings using 2 sensors: LRF and odometer. Map is created by fusing two observations.



No Synchronization



With Synchronization

Requirements in Robotics (3)

Interaction with people require:

- **Positioning** and **Identification** of people
- Robotic behaviors based on people position
  - approach, eye contact, …

Related Standards

- OpenGIS standards
  - Standards for Geographic Information Systems
  - Define position / shape representation on earth
- ISO 9283:1998 “Manipulating industrial robots - Performance criteria and related test methods”
  - *pose* = position (3D) + orientation (3D)
- ISO 9787:1999 “Manipulating industrial robots - Coordinate systems and motion”
  - define a few coordinate system representation (world coordinate system, etc.)

OpenGIS coordinate systems

- basically "***referenced***"

  … can only treat absolutely defined positions on earth
- limited to 1D/2D/3D coordinates
- no relative/mobile coordinate system
- no error representation
- no explicit target ID representation
- repository of definitions
  – allows automatic inter-coordinate translation

Example: OpenGIS definition

```
<Conversion xmlns="http://www.opengis.net/gml" ...>
  <metaDataProperty>
    <epsg:CommonMetaData>
      <epsg:type>conversion</epsg:type>
      <epsg:alias alias="Japan zone VI" code="725"
              codeSpace="urn:x-ogc:def:naming-system:EPSG:7302"/>
      <epsg:informationSource>Ministry of Construction;
      Japan…</epsg:informationSource>…
  </epsg:CommonMetaData>
  </metaDataProperty>
  <identifier codeSpace="EPSG">urn:x-
    ogc:def:coordinateOperation:EPSG:17806</identifier>
  <method xlink:href="urn:x-ogc:def:method:EPSG:9807"/>
  <parameterValue>
    <ParameterValue>
      <value uom="urn:x-ogc:def:uom:EPSG:9102">36.0</value>
      <operationParameter xlink:href="urn:x-ogc:def:parameter:EPSG:8801"/>
    </ParameterValue>
  </parameterValue>
  <parameterValue>
    <ParameterValue>
      <value uom="urn:x-ogc:def:uom:EPSG:9102">136.0</value>
      <operationParameter xlink:href="urn:x-ogc:def:parameter:EPSG:8802"/>
    </ParameterValue>
  </parameterValue>
  …
</Conversion>
```

Coordinate System ID

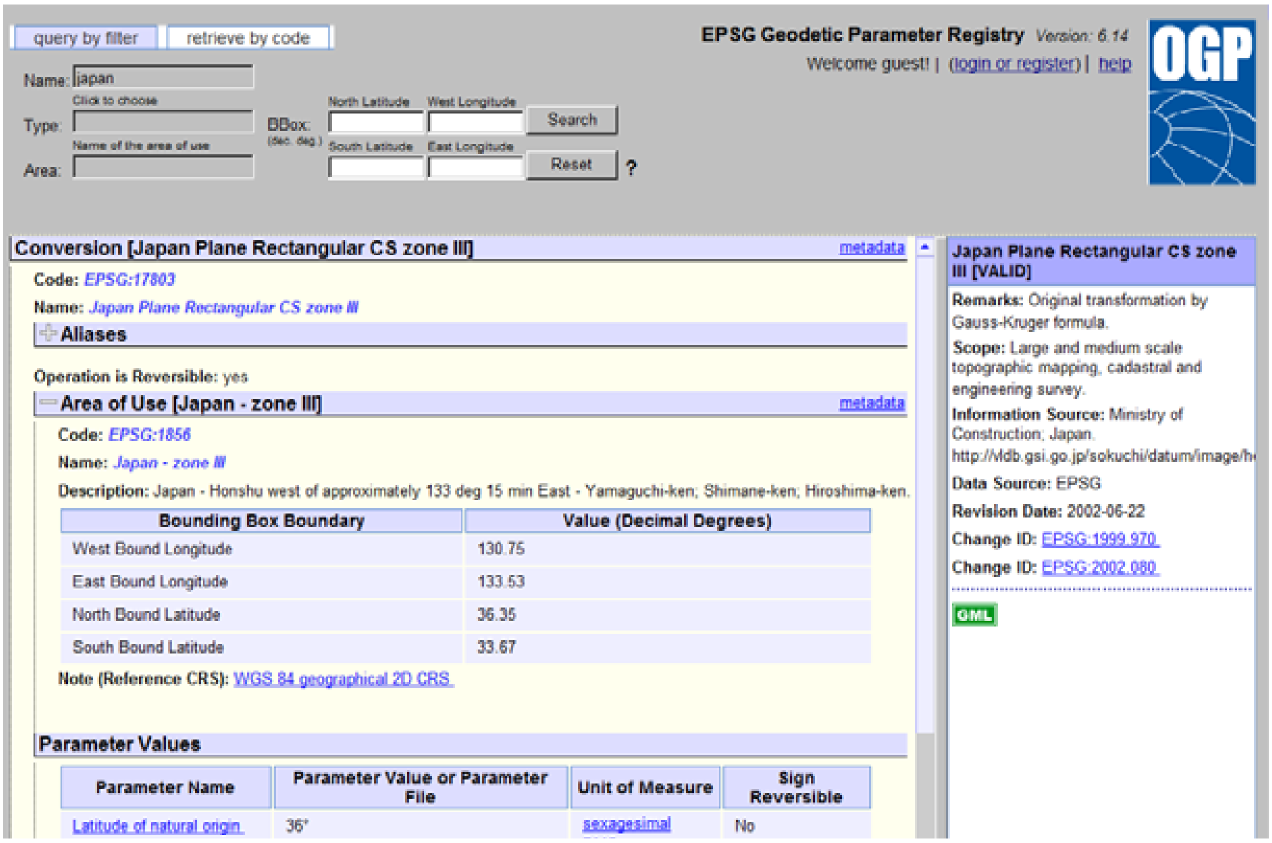
Transverse Mercator

signed degree

latitude of origin

longitude of origin

EPSG repository



Requirements in robotics

- Extend OpenGIS framework to
  - allow relative/mobile coordinate systems
  - allow incomplete location
  - allow arbitrary dimensions
  - allow uniform representation of related infos
- Retain auto-translation feature of OpenGIS
  - can translate to GIS coordinates, if necessary

Extensions for Robotics

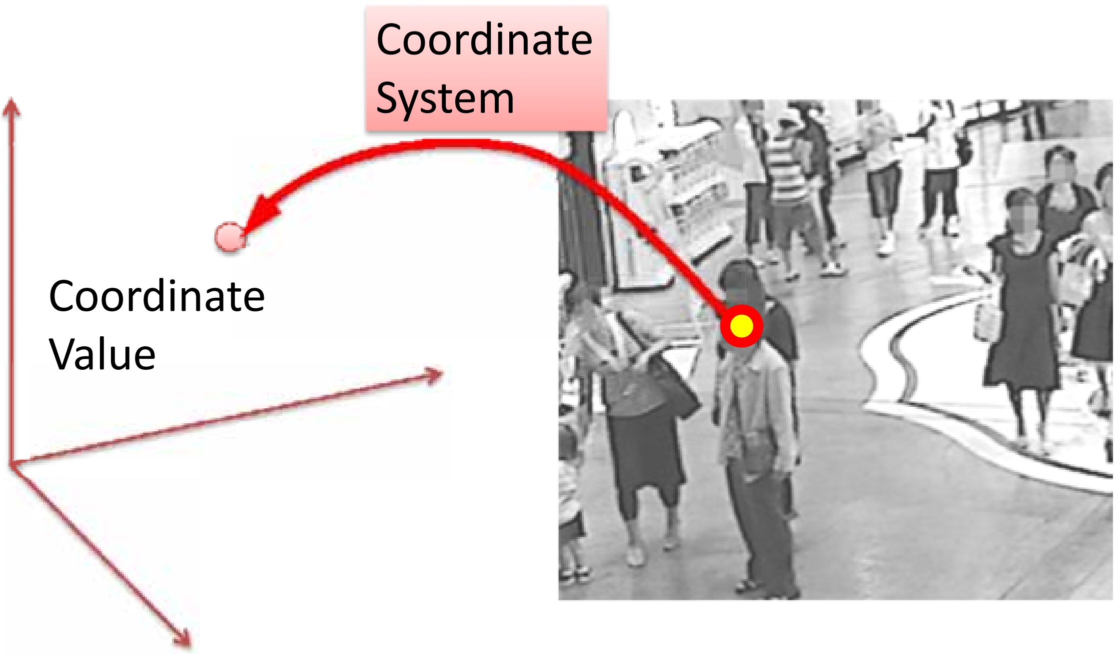
- Definition of Information Structures
  - ***Composite Robotic Coordinate Information Set***
- Representation of Error information and IDs
- Allow Mobile & Relative Coordinate Systems
  - Coordinate Systems are defined by *transforms*
  - Transformation Parameters can be *dynamic*
- Allow flexible Data Formats
  - Data formats are also defined by *transforms*
- Require modules to provide *capability information*
  - for plug-n-play and easy development

Representing Location Information

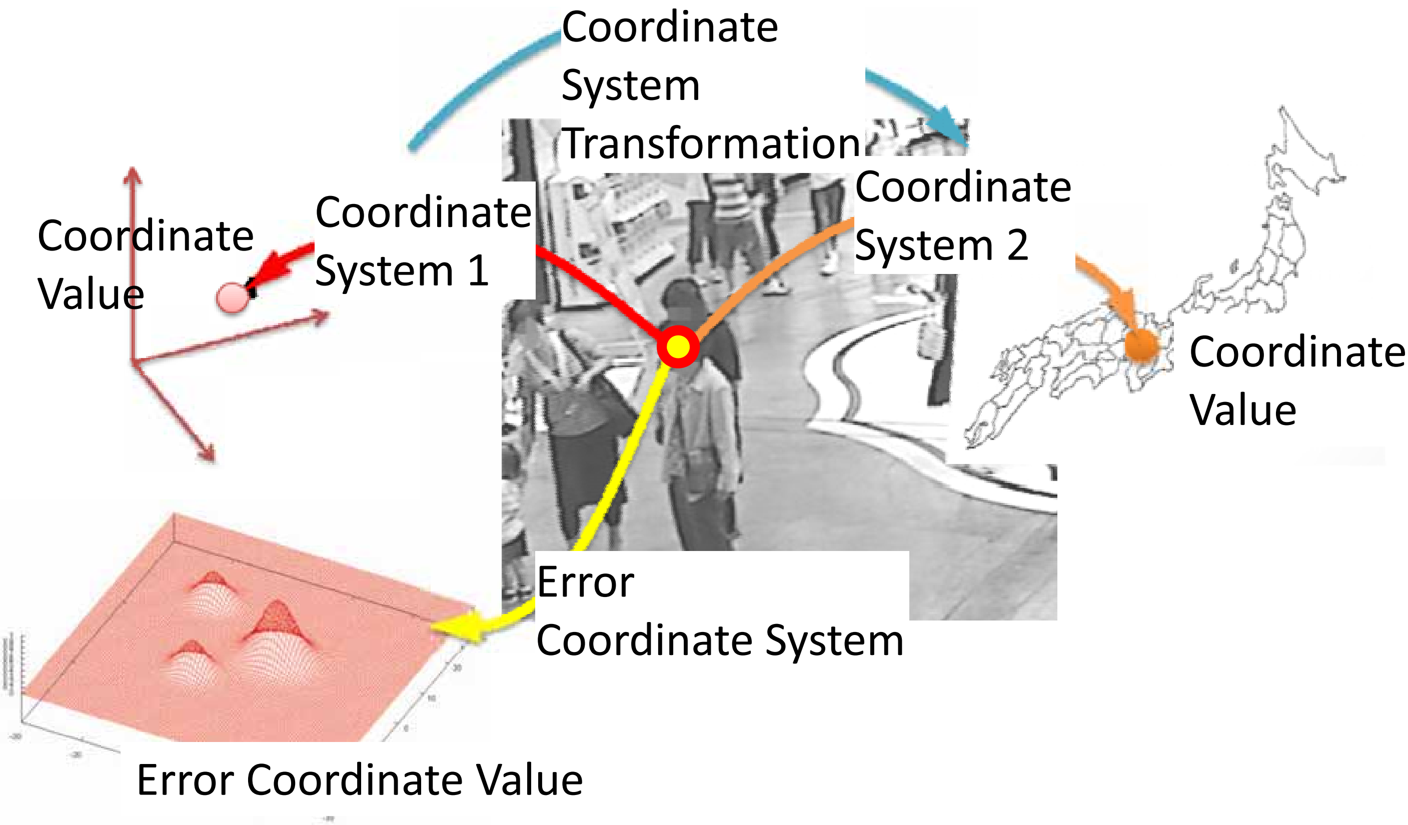
- Location information

  = coordinate system + coordinate value
  - *a coordinate system* defines *how* information is represented and may define *what* it means
- Coordinate System:
  - map real-world features to *some* representations
- Identity information (ID)
  - allow coordinate system axes to be defined over arbitrary set of symbols

Coordinate System



Measurement Data

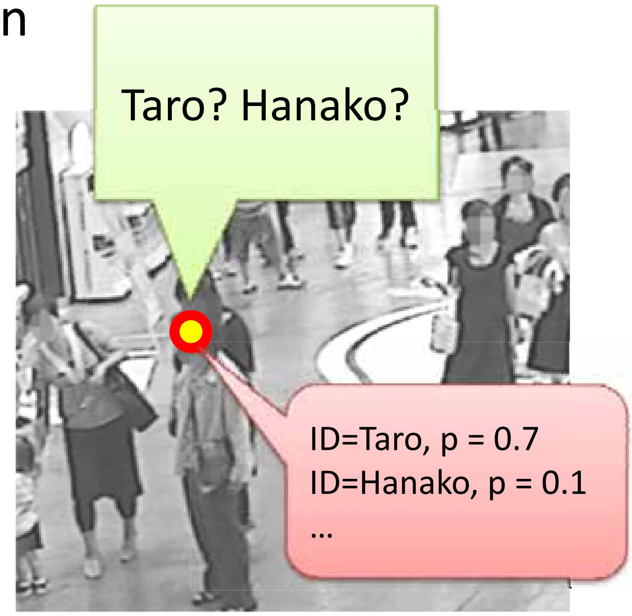


“Location” is probabilistic

- Measured localization results are *always* probabilistic
  - error information required
- flexible, extendable framework for error representation required
  - reliability / covariance matrix / MoG / particles…
- By keeping the trace of hypothesis history, post-processing (smoothing) can be handled

ID is probabilistic

- ambiguity in identity information may exist
- Identity information shall be treated just like other location-related information

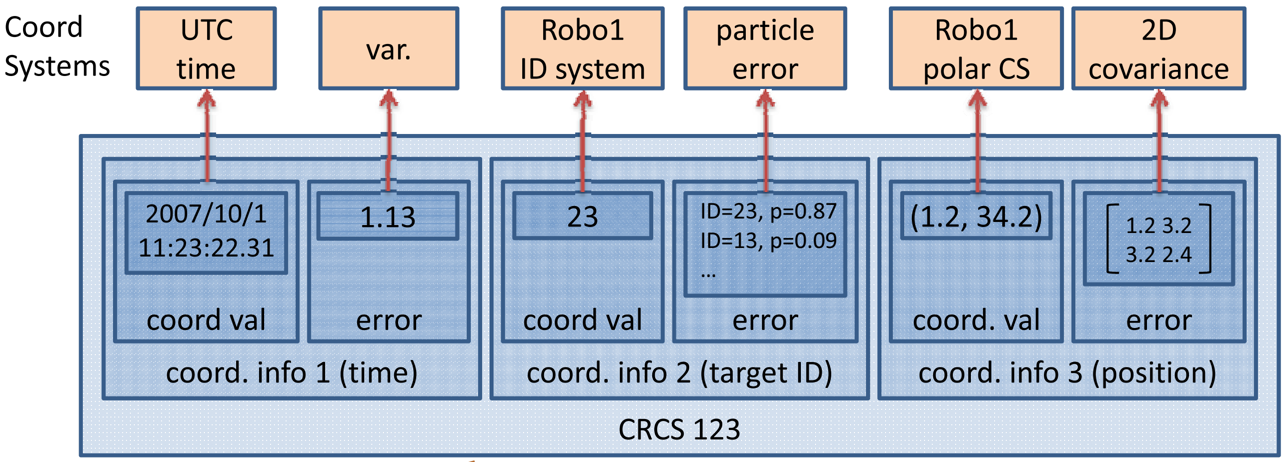


Structure of Robotic Localization Info

- Prepare a generic framework for representing various robotic location information
  - measurement time, position, orientation, ID, …
- Explicit representation of information structure
  - ***Coordinate Values*** are related to a ***Coordinate System***
  - ***Coordinate Values*** may be combined with ***Error Information***: ***Coordinate Information***
  - Set of related Coordinate Information:

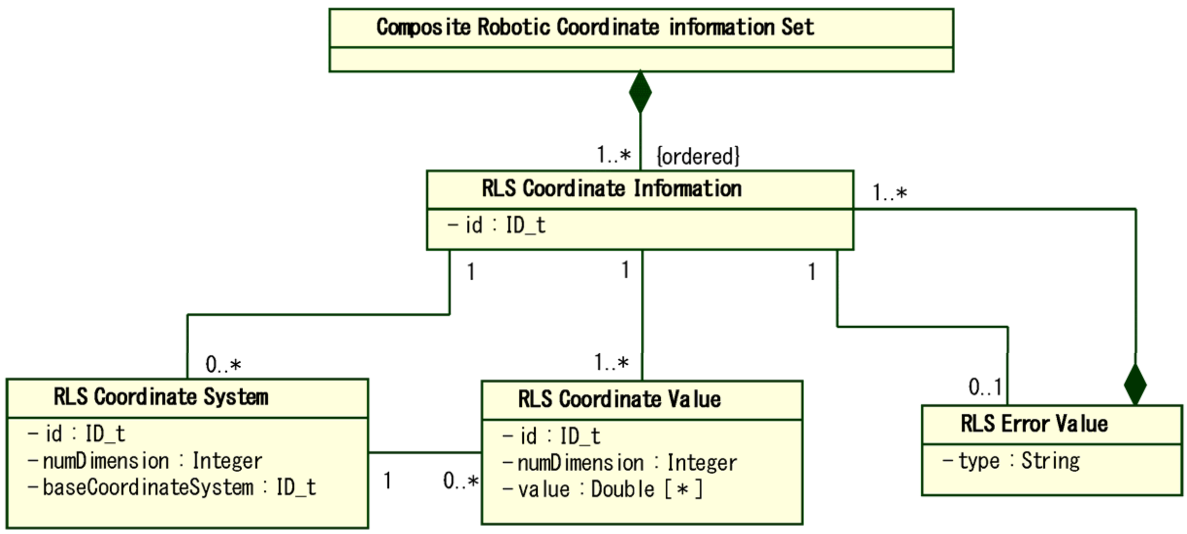
    Composite Robotic Coordinate Information Set

Composite Robotic Coordinate Information Set (CRCS)



Treat various types of location-related information in ***a uniform manner***

Structure of Robotic Localization Info



Example: GPS receiver output

- Sample NMEA output

$GPGGA,123519.00,3601.038247,N,13631.324523,E,1,08,1.2,68.42,M,46.93,M,, *42

<data type>, <time in UTC>, <latitude>, <north>, <longitude>, <east>, <GPS quality indication>,<number of satellites>, <HDOP>, <height from average sea level>, <unit (meter)>,<height from WGS-84ellipsode>, <unit(meter)>

coordinate system of RLS_cs_UTC
dimension: 1

coordinate system of RLS_cs_WGS84
dimension: 2

coordinate system of RLS_cs_indication
dimension: 1

coordinate system of RLS_cs_number_of_sattellites
dimension: 1

coordinate system of HDOP
dimension: 1

coordinate system of RLS_cs_sealevel_hight
dimension: 1

Data Formats

- Data Formats are defined by ***transforms*** to/from existing data formats
- Format options
  - descriptive, highly exchangeable format
    - XML-based (can use EXL for efficiency)
  - lightweight, binary format
    - CORBA Common Data Representation (CDR)
  - vendor-specific / traditional formats
    - e.g. NMEA-0183

Robotic Localization Meta Language (RLML)

- define a new format based on GML
- for easy data exchange
  - can use existing parsers / XML-DB systems
  - easy translation to GML
- EXL (binary XML by W3C) be used for compression

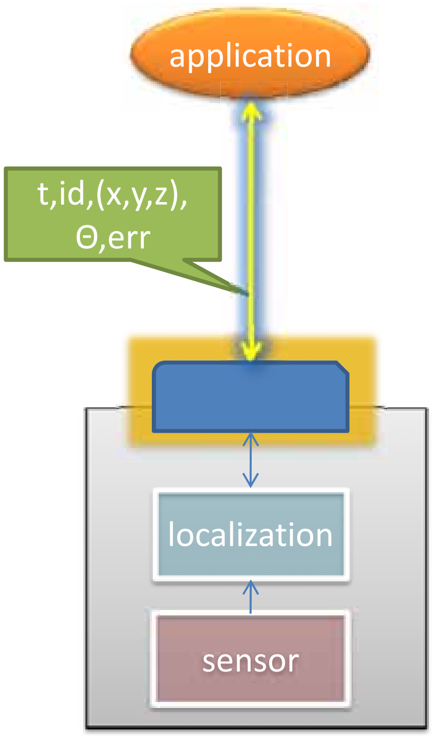
RLML format: example

```
<rlml:Point srsName=“Test_environment:fmt131”id="KJLSDF234123413421">
  <!-- time / no error info -->
  <rlml:PointElement name="time" value="20070925T062312.1231"/>
  <!-- target ID / particle error -->
  <rlml:PointElement name="id">
    <rlml:value>LID_123121</rlml:value>
    <rlml:EstimatedError srsName="urn:Test_environment:particle131">
      <rlml:particleList>...</rlml:particleList>
  </rlml:PointElement>
  <rlml:PointElement name="position">
    <rlml:value>123.121 312.121 1.2313</rlml:value>
  </rlml:PointElement>
  …
  <!-- covariance matrix for position/velocity estimation -->
  <rlml:EstimatedError srsName="urn:Test_environment:TT_CovMat6D">
    <rlml:lowerTriangularMatrix>0.11 ...</rlml:lowerTriangularMatrix>
  </rlml:EstimatedError>
</rlml:Point>
```


Framework for Reusability

- simple, generic module structure
  - basic, common functionalities with extendablity
  - avoid vendor / algorithm specific items
- machine-readable capability description
  - components self-describe their abilities
- online module description repositories
  - for ease of component-based robotic system development
  - prepare for plug-and-play and dynamic network robot configuration

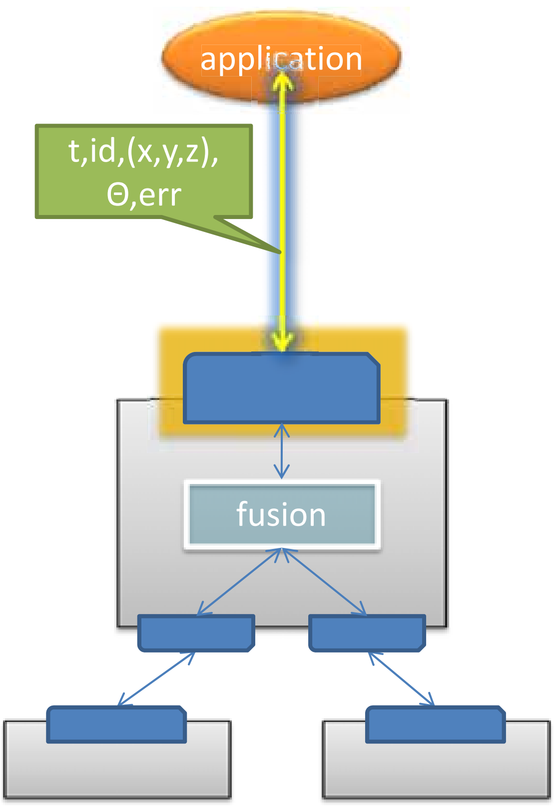
Basic Component: Measurement



- native sensors, maps, etc. hidden inside the component
- treated as a 'black-box'

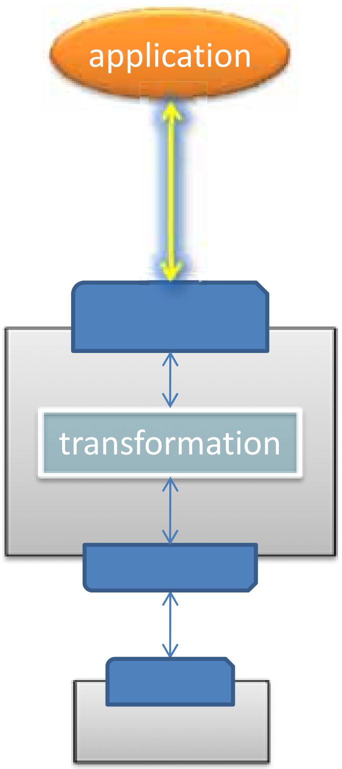
Localization Module

Aggregation



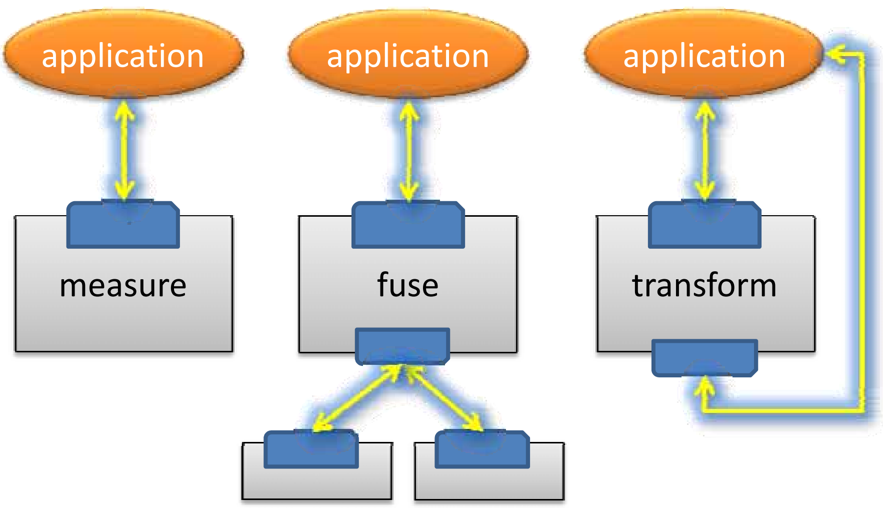
- the aggregator appears as basic localization component
  - what's happening inside is not important for users
- use the same interface as basic component
  - detailed aggregation parameters set by vendor interface
- holds also input interfaces

Coordinate Transformation



- the transform module also appears as basic localization component (to application)
  - what's happening inside is not important for users
- use the same interface as basic component
  - detailed transformation parameters set by similar configuration interface
- holds also input interfaces

uniform architecture



Homogeneous n-input, 1-output interface

- High reusability
- Allow recursive or cascading connection

Ability Exchange

- Provide description on RLS modules
  - what it does (**functionality**)
  - how well can it operate (**capability**)
  - how it can be configured (**parameters**)
  - **input / output CRCS** structure it can handle
  - **data formats** it can handle
- Formal description of module specification
  - machine readable description
  - for plug-n-play and dynamic configuration

Ability exchange

Request:


```
<?xml version="1.0" encoding="UTF-8"?>
<GetCapabilities xmlns="http://www.hoge.org/rls/1.0">
  <Sections Section="All">
</GetCapabilities>
```


Response:


```
<?xml version="1.0" encoding="UTF-8"?>
<Capabilities xmlns="http://www.hoge.net/rls/1.0" xmlns:rls="http://www.hoge.net/rls/1.0"
      xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
      xsi:schemaLocation="http://www.hoge.net/rls/1.0 fragmentGetCapabilitiesResponse.xsd">

  <ServiceIdentification>
    <Title xml:lang="ja">SICK LRF output module</Title>
    <Abstract xml:lang="en">
      output module for Laser Range finder xxxx series
      Contact: webmaster@hoge.co.jp
    </Abstract>
    <ServiceType>OMG:RLS</ServiceType>
    <ServiceTypeVersion>1.0.0</ServiceTypeVersion>
    <NumInputs value="1" />
    <NumOutputs><max-value>3</max-value></NumOutputs>
  </ServiceIdentification>
  <ServiceProvider>
    <ProviderName>foobar corporation</ProviderName>
    <ProviderSite xlink:href="http://www.hoge.co.jp/"/>
  </ServiceProvider>
</Capabilities>
```

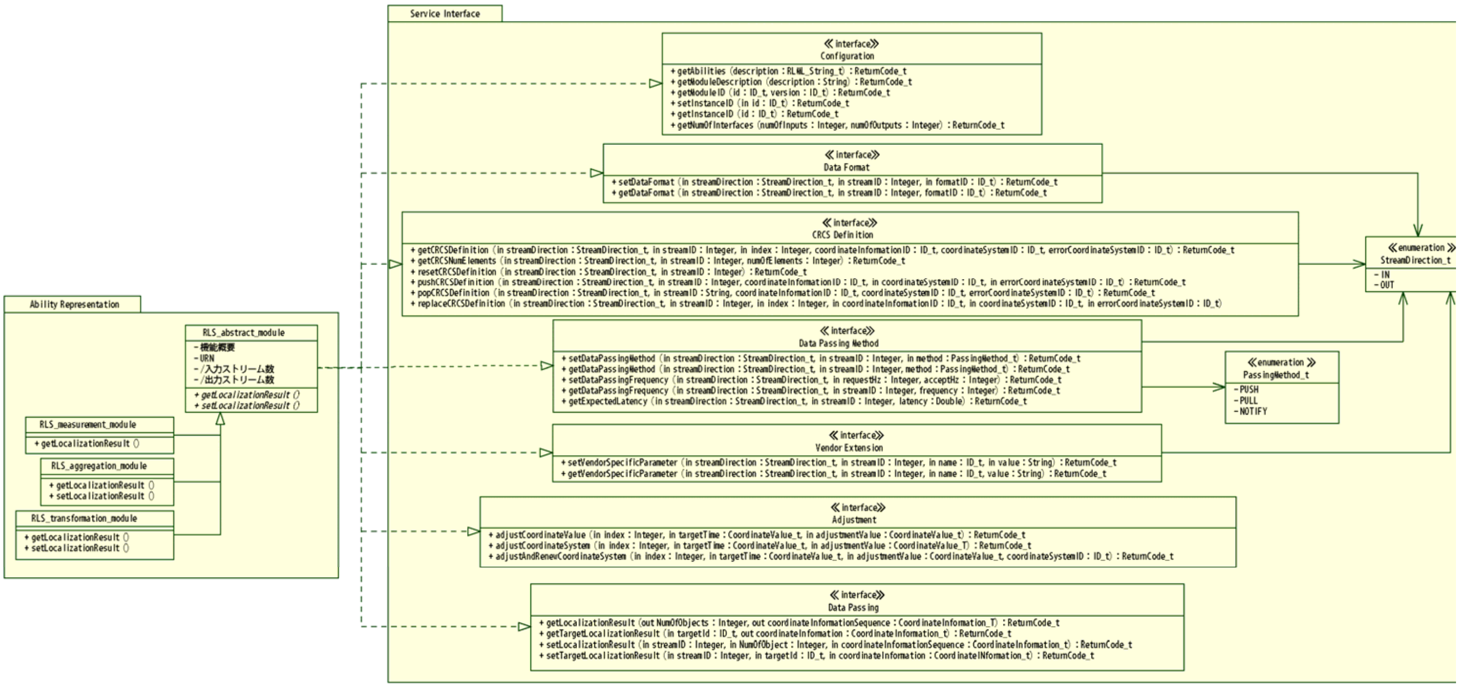
Online Module Repository

- keep coordinate / namespace definitions
  - coordinate system translations, format definitions, etc.
  - Extend GIS definition repository : **interoperability**
- distributed, cross reference architecture
  - based on W3C xlink
- enable easy or automatic translation between coordinate systems

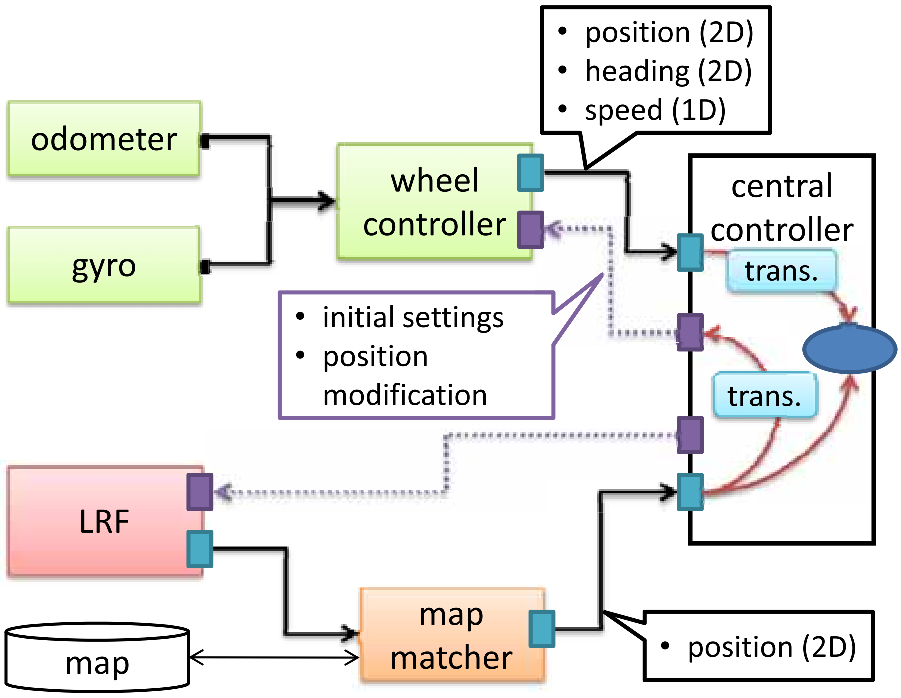
Typical Steps in using RLS modules

1. Exchange module abilities
2. Configure module inputs / outputs
   – specify formats, parameters
3. Setup initial location information values
4. Data passing
   – receive localization outputs
   – place localization inputs
5. Modify location information values

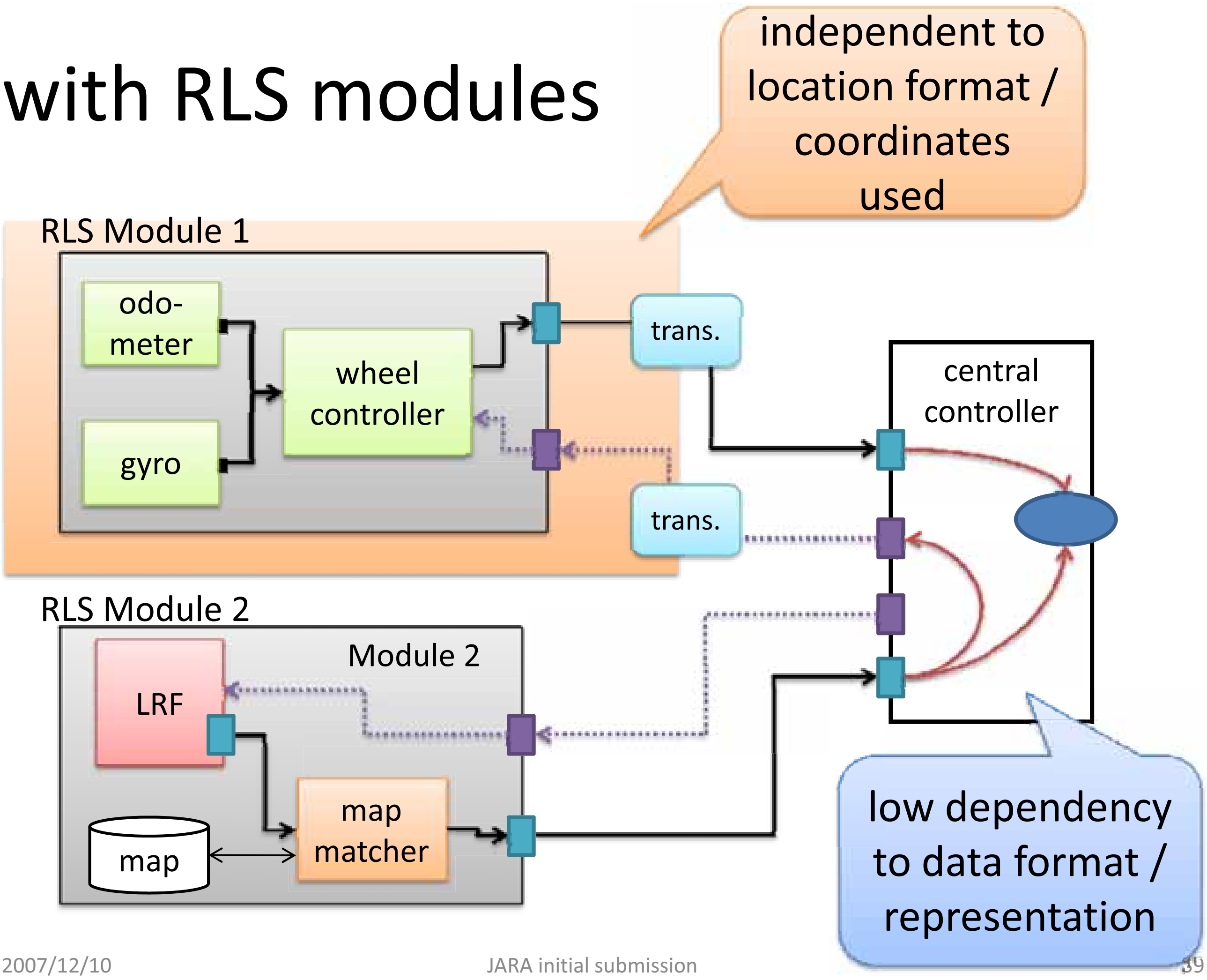
Interfaces



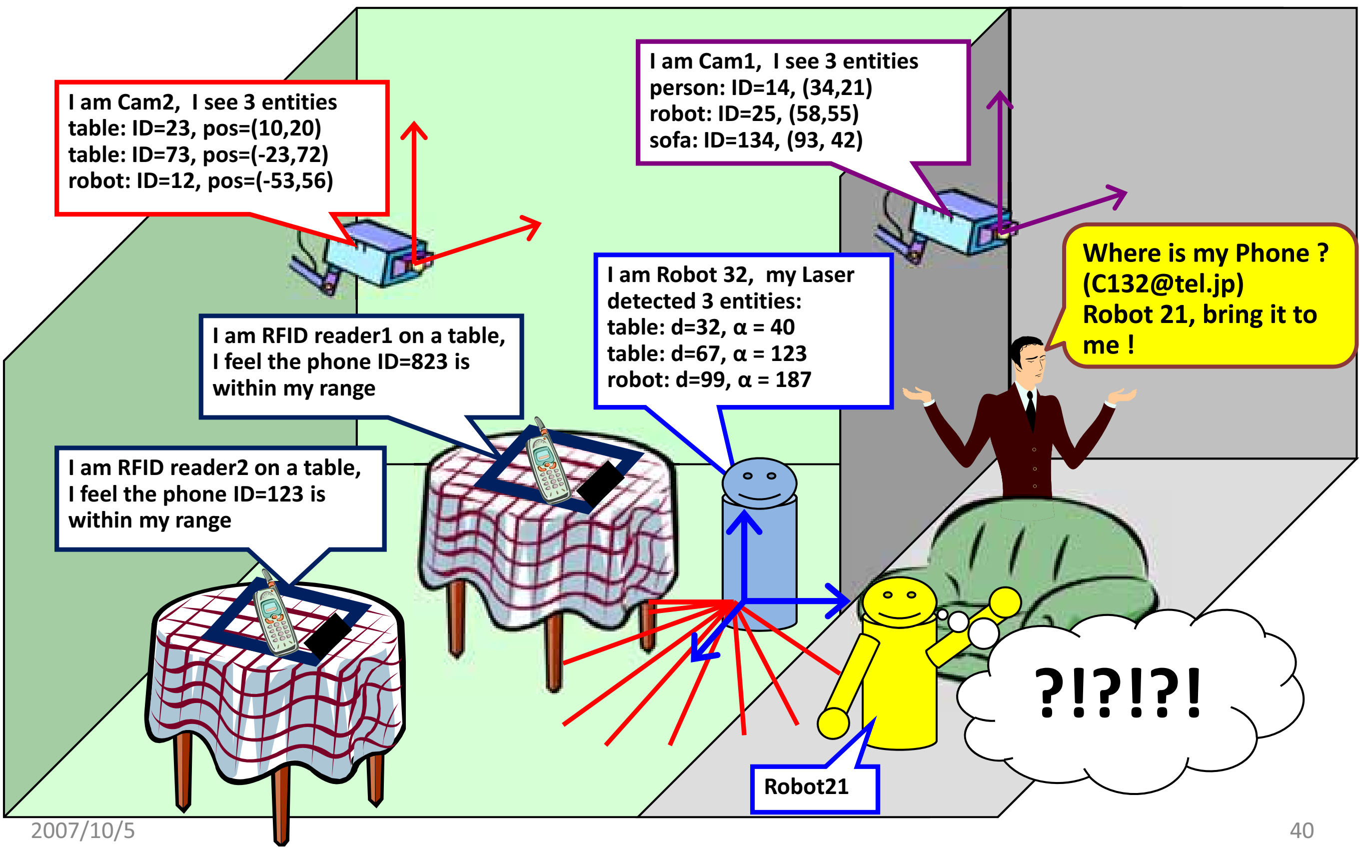
Example



with RLS modules



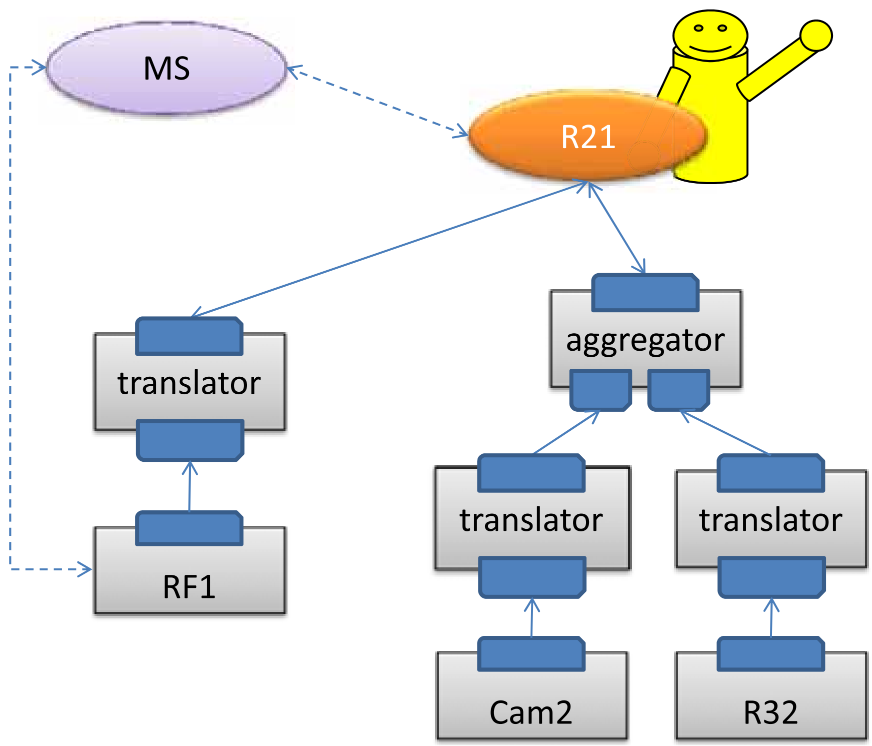
Ex: RFP example



example scenario step

1. R21 searches for entities with MS(in the target area)
2. R21 asks the entities to search for C132@tell.jp
3. RFID-reader 1 (RF1) replies that C132 is “nearby”
4. R21 asks RF1 for its position
5. RF1 searches for entities that can measure itself
6. RF1 asks the resulting entities for its position
7. Cam2 and R32 each returns 2 results
8. RF1 aggregates the results from Cam2 / R32, and returns to R21
9. R21 translates the given locations to its CS, and starts moving toward them for inspection

sample configuration



RFP mandatory requirements

1. *Proposals shall specify a general mechanism for accessing location information of physical entities to be localized.*
   – *Proposals shall specify a set of data and/or their structures necessary to **represent location information** of entities.*
   – *Proposals shall specify a set of methods and/or their parameters to **access location information** of entities.*
2. *Proposals shall specify **interfaces for modules** that perform location calculation.*
   – *Proposals shall specify the interface for **accepting localization request**.*
   – *Proposals shall specify the interface for **publishing the localization result.***
3. *Proposals shall specify the interface of a facility that provides functionalities related to:*
   – ***Conversion of location information** from one coordinate system to another.*
   – ***Aggregation of multiple location information** outputs into one final location.*

RFP Issues to be discussed

- *Proposals shall demonstrate its **feasibility** by using a specific application based on the proposed model.*
- *Proposals shall demonstrate its **applicability to existing technology** such as RTLS (Real-Time Location System).*
- *Proposals shall discuss **simplicity** of implementation.*
- *Proposals shall discuss the possibility of providing standard mechanism to **access map data**.*
- *Proposals shall discuss their relation and dependency to **existing communication protocols or middleware standards**, such as CORBA [CORBA] or DDS [DDS].*

robotics/2007-12-08

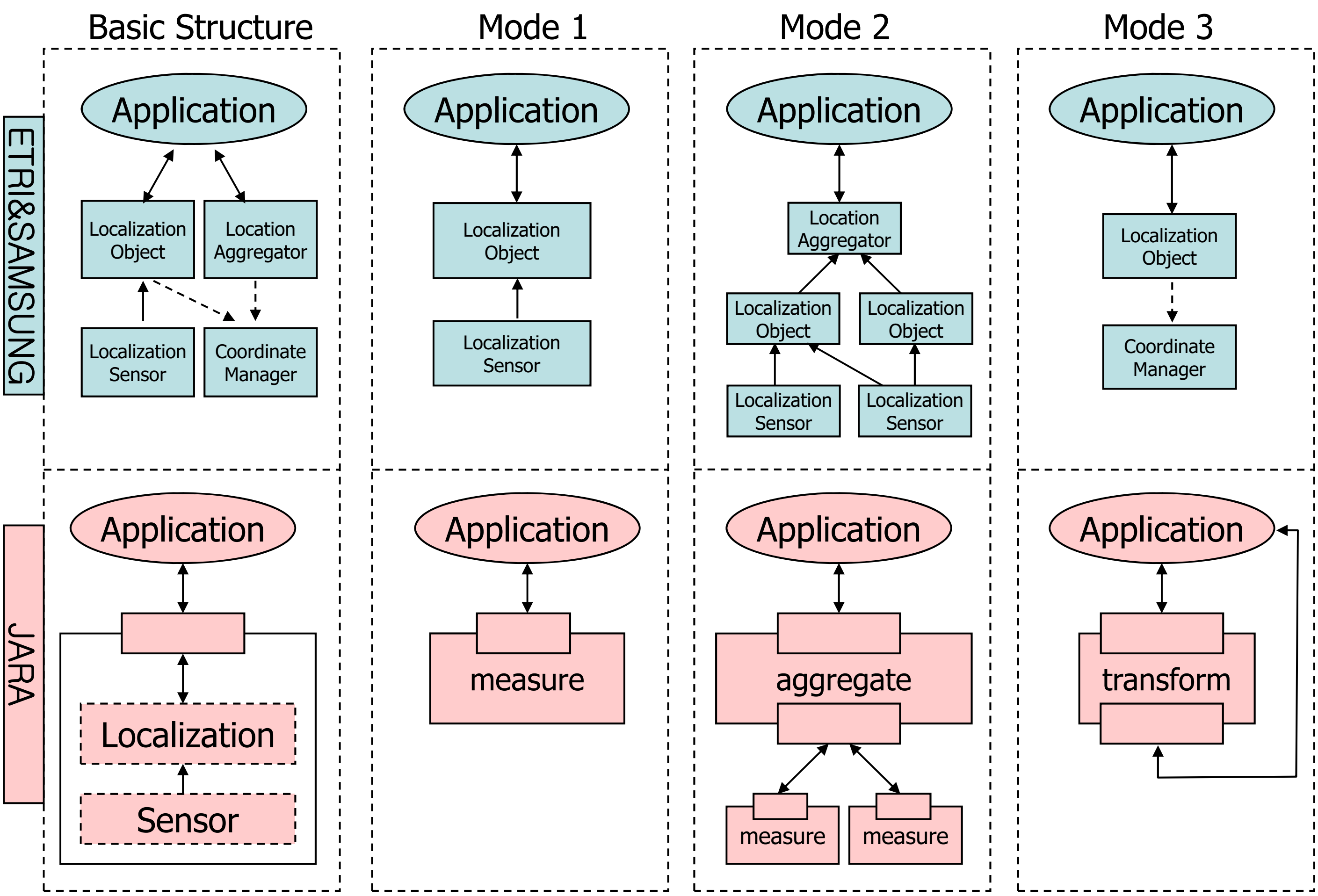
Robotic Localization Service ETRI&SAMSUNG vs. JARA

10 Dec. 2007

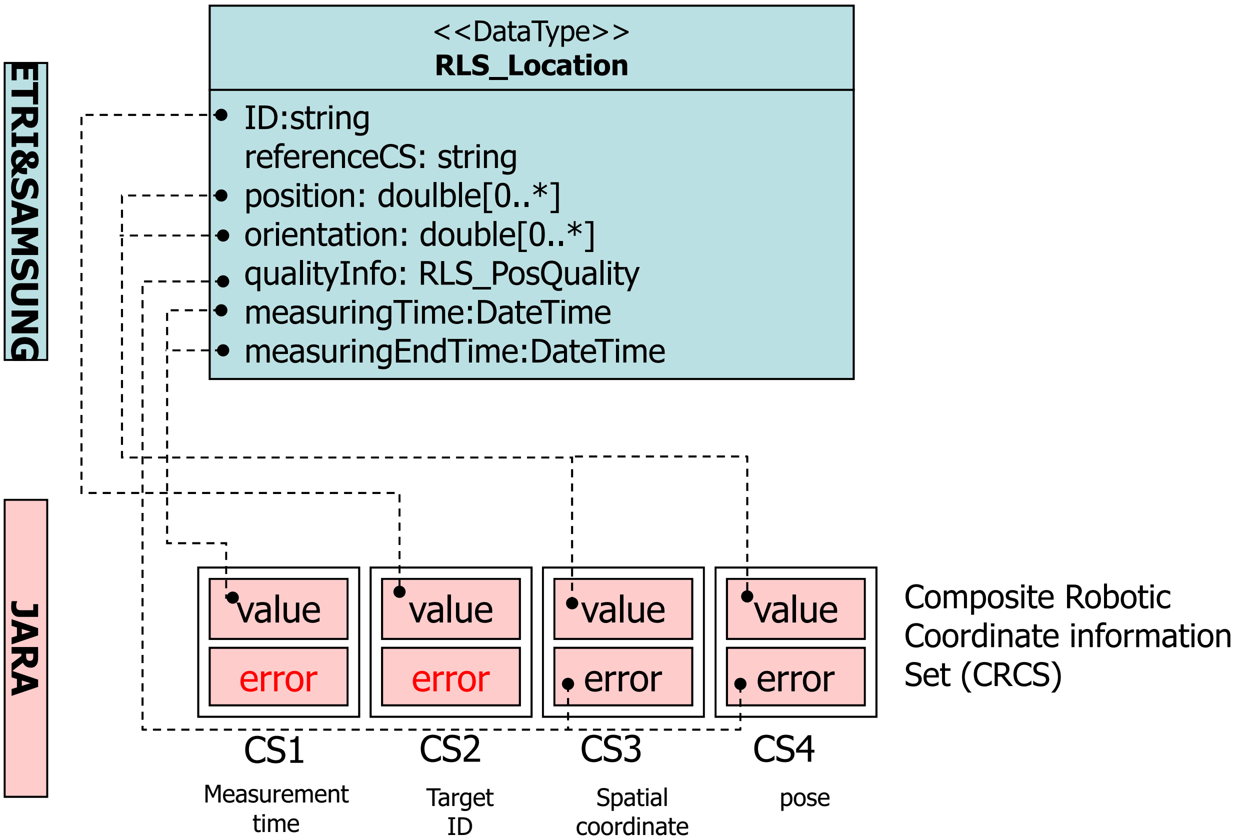
YEON-HO KIM

Samsung Electronics

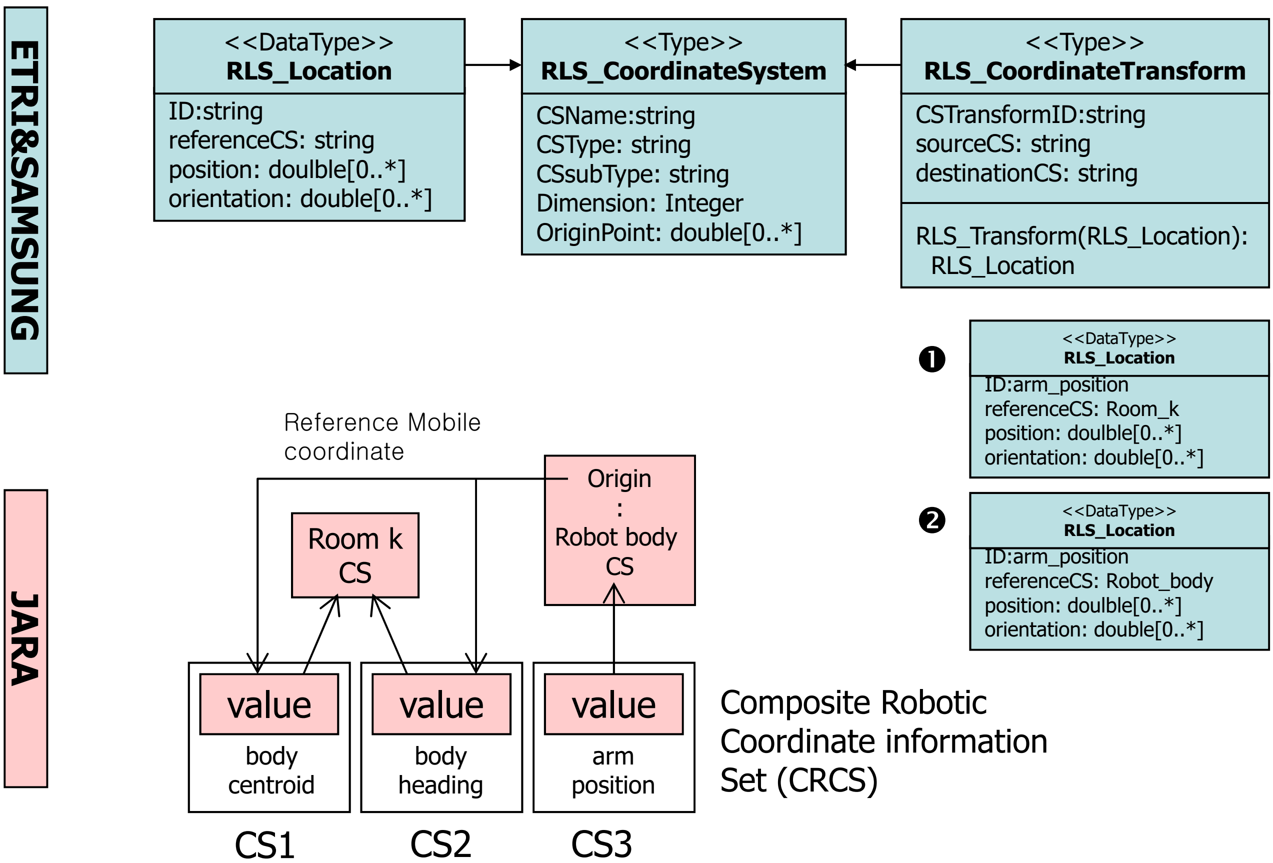
Module Structure



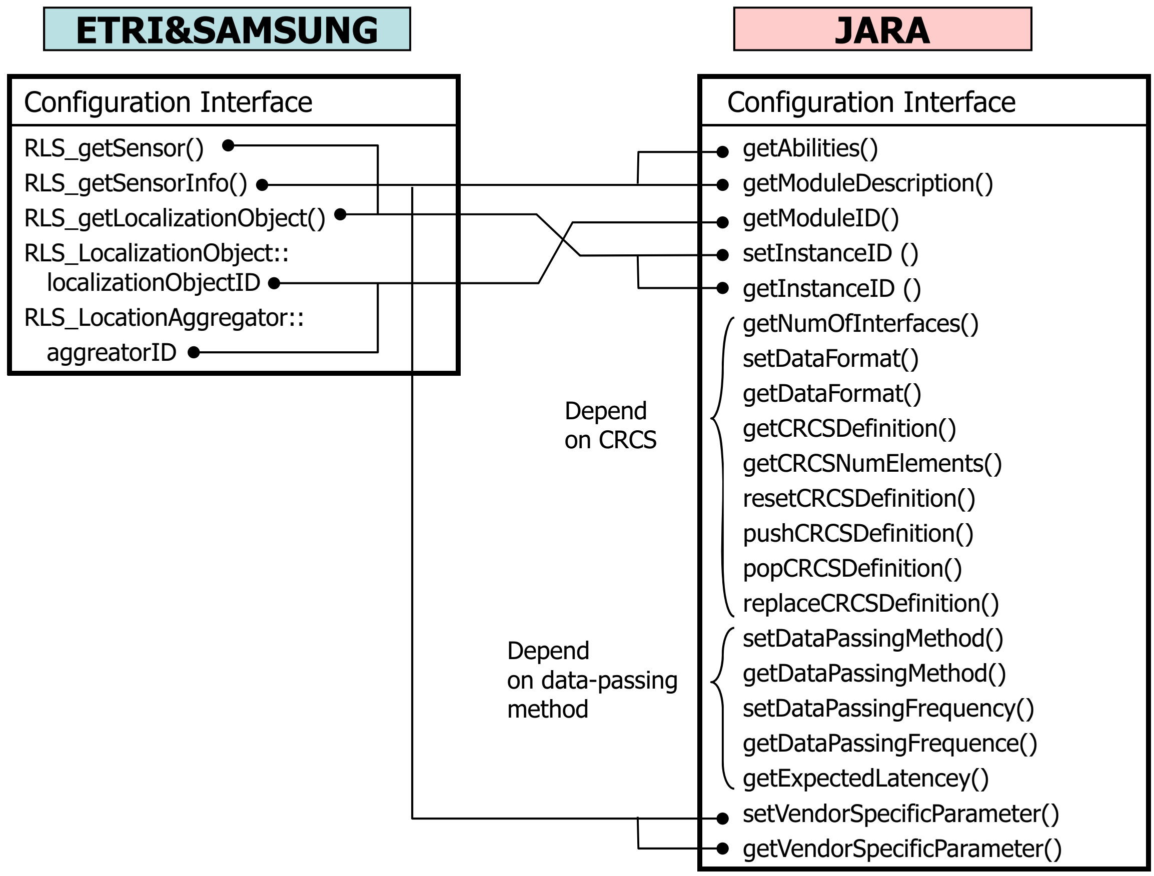
Data Type



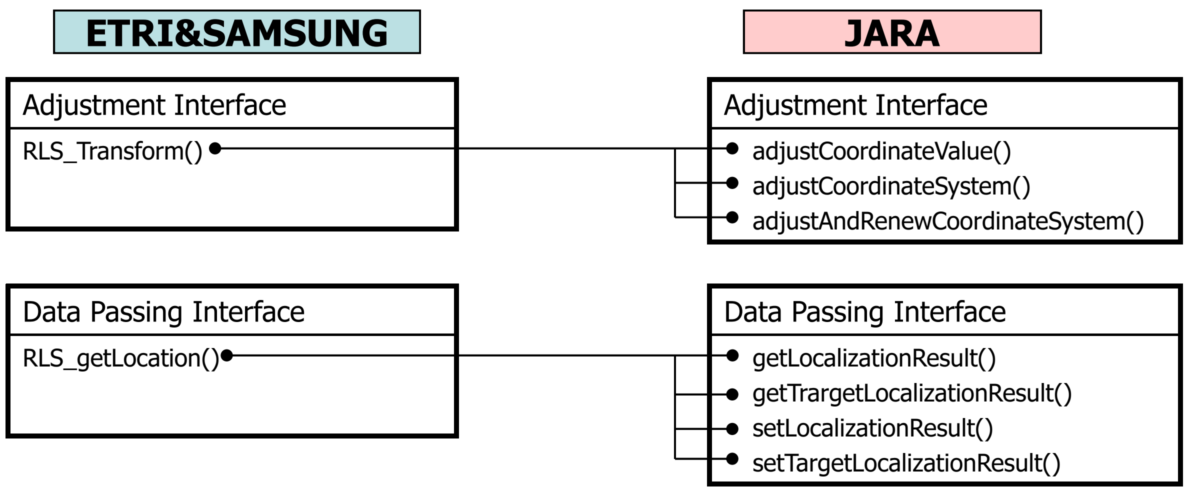
Coordinate System Representation



Service Interface(1)



Service Interface(2)



Considerations for revised submission

2007-12-11
ETRI
Kyuseo Han

Objects

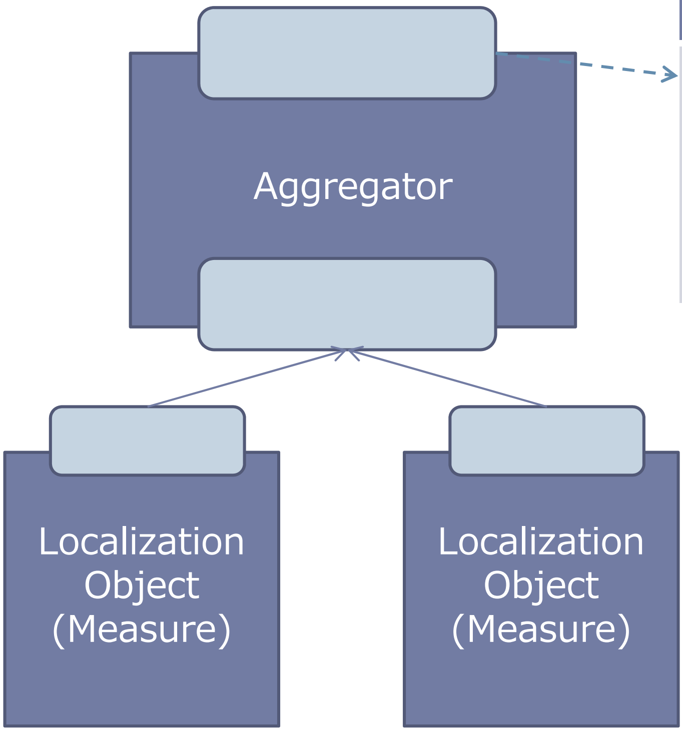
- To combine two proposals chemically as well as physically
- To support both XML-like and WKB-like representations
- To compromise between flexibilities and restrictions

- Problem:
  - One proposal is mainly written by UML format in PIM level, and the other by XML format
  - Hard to compare each other

Spilt Component or Not?

- getAbilities can be used for obtaining full module abilities in RLML format
- Does we really need RLML format?
  - Should every robot have RLML Parser?
- We shall provide alternate ways for proper RLS working even without handling RLML
  - Some operations or parameters are needed for localization object or aggregator, respectively

Aggregator



With RLML	Without RLML
getAbilities	getAvailablemetho d getCurrentmethod getConnectedLocal izationObject…

One set of interface or not?

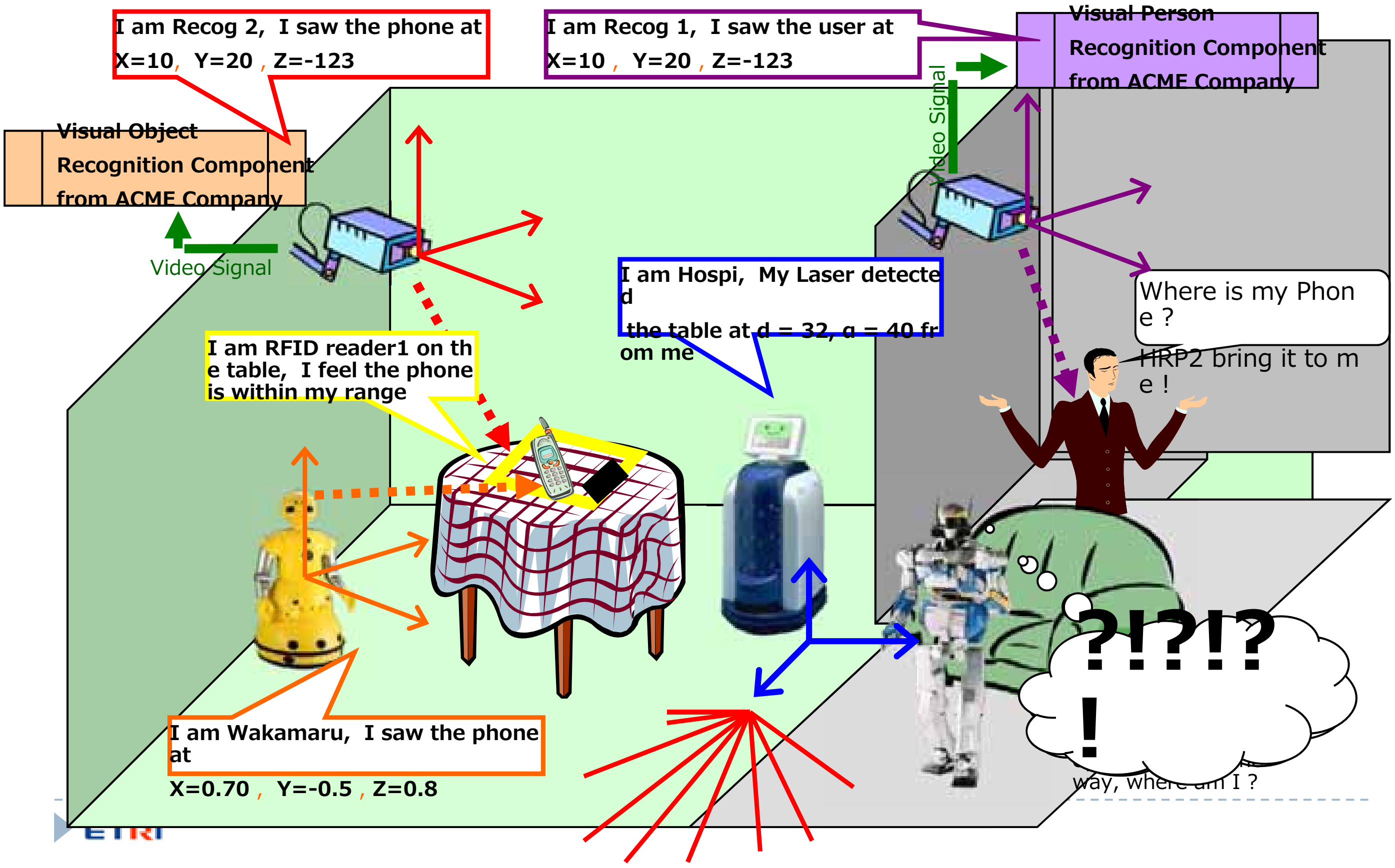
- The interfaces for supporting localization object or aggregator can be one set of interfaces in JARA's proposal
- Without support RLML format,
  - All component must have all interfaces when much of them have been useless
  - It needs to separate interfaces

OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

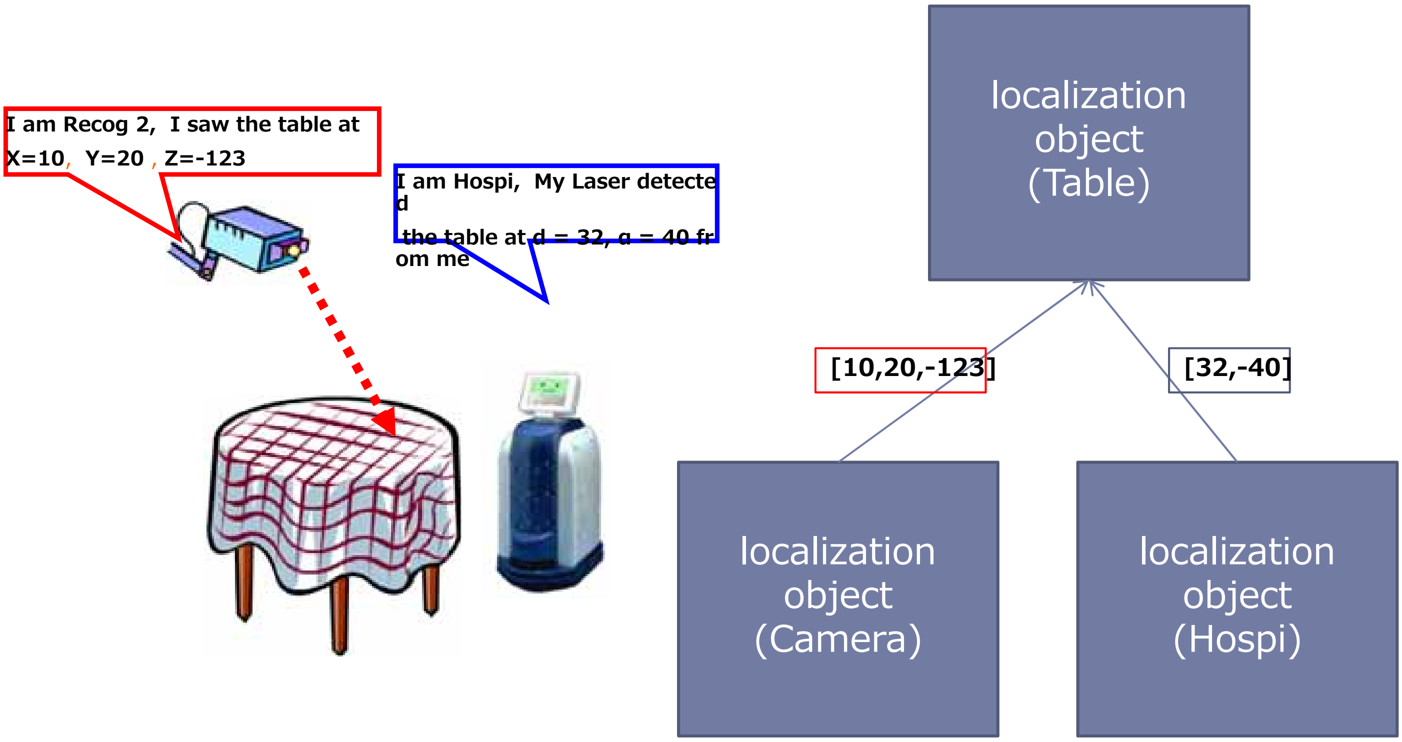
Localization Sensor

- Need to separate from localization object?
- Consider GPS receiver,
  - It provides some location data, such as NMEA data
  - Conceptually, the GPS receiver is sensor or localization object?

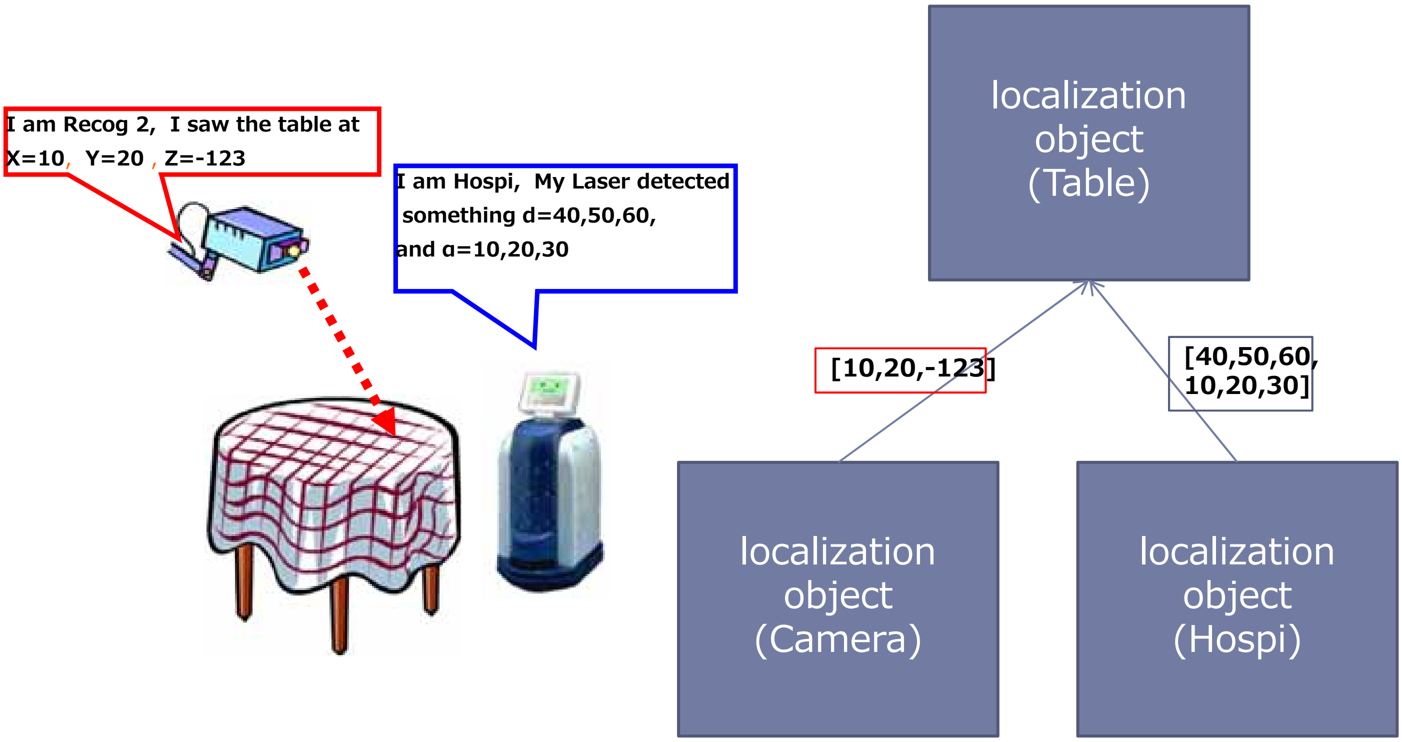
Localization Sensor



Example I

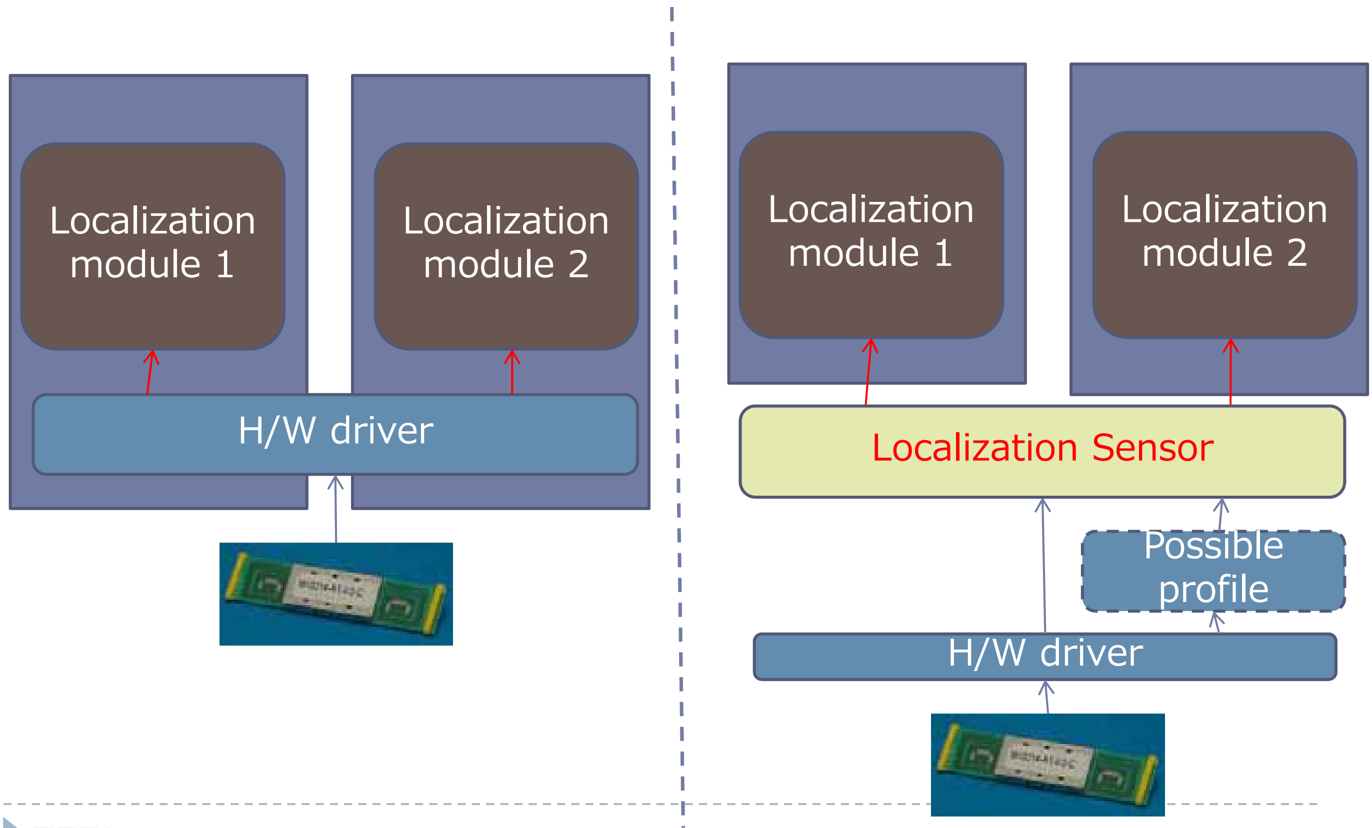


Example II



OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

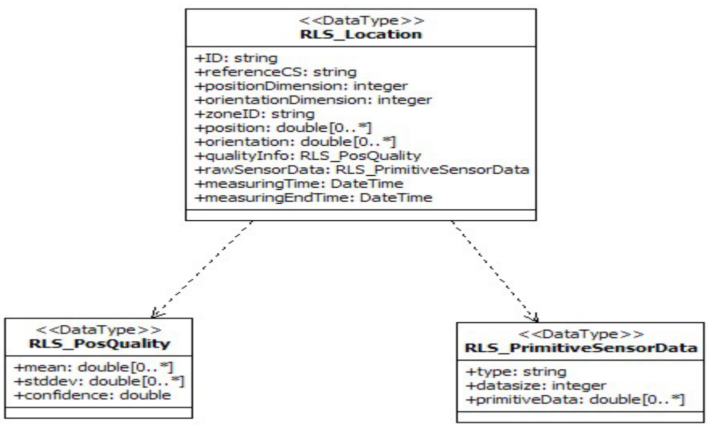
Example



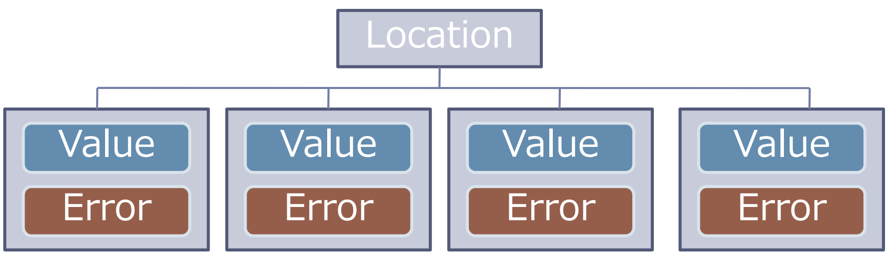
Separation of sensor

- If the data format would be CRCS, are there any problems for separation?
  - In CRCS, we can add any type of data
- For future standard in Profile working group, we need to make rooms for covering future standard
  - getAbilties will make it easy to modify implementation of localization object

Two ways of describing location



- Almost fixed
- Difficult to expand ??



- Free to vary
- Easy to expand ??

Considerations

- From the application view, do really End-users have interested with various types of error representation?
- For example,
  - "Position is [30,40,50], and its error is particle format which values are ……"
  - "Position is [30,40,50], and 90% confidence

Which one is better for end-users?

OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

Robotic Location Descriptor (RLD) Definition

RLD
string uID int value_size vector <T>value int error_size vector <T>error

Pre-defined types of uID

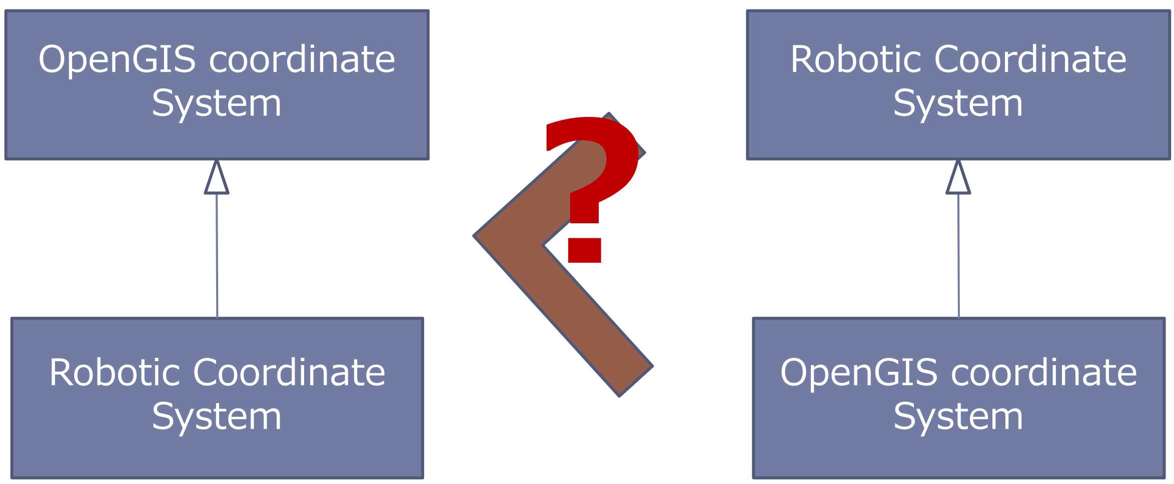
Type	Value_type
Measurement_time	string (UTC format)
Position	vector <double>
Orientation	vector <double>
ID	string

Measurment_Tim e 1 123456.890	Position 3 [45.9, 34.9, 23.0]	ID 1 test	…

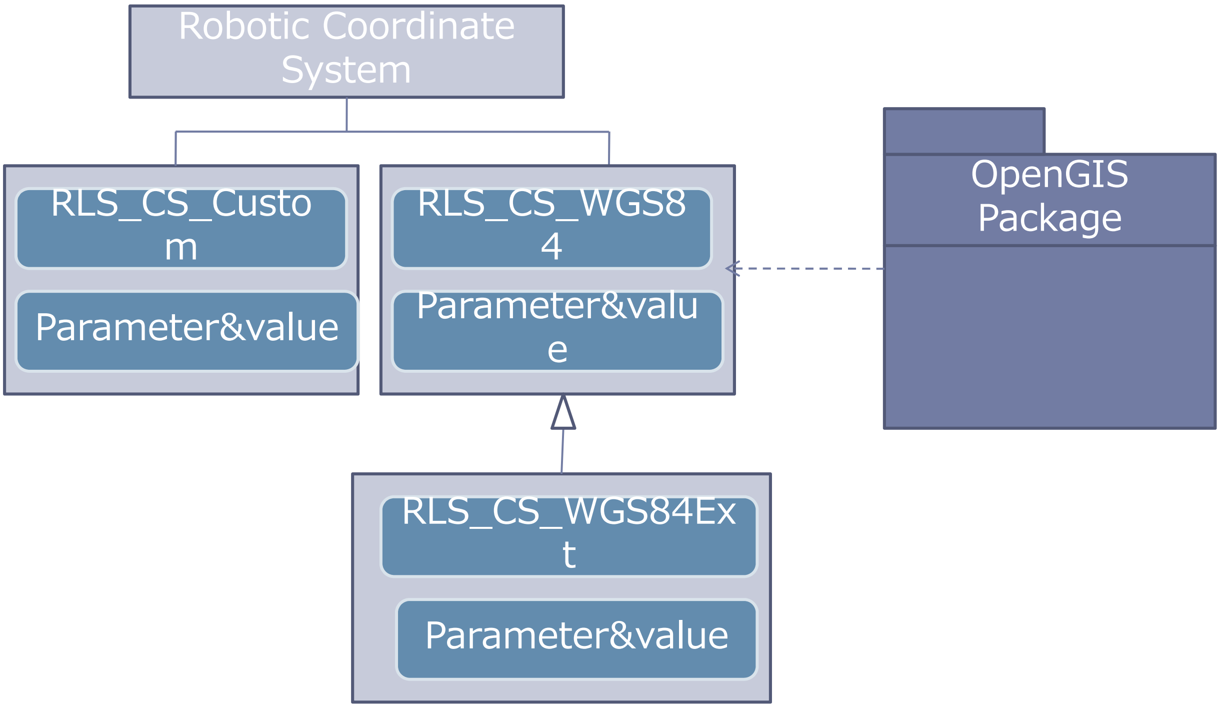
Robotic Localization Descriptor(RLD) stream format

Header numberofRLD	Measurment_Time 1 123456.890	Position 3 [45.9, 34.9, 23.0]	ID 1 test	…

Coordinate system

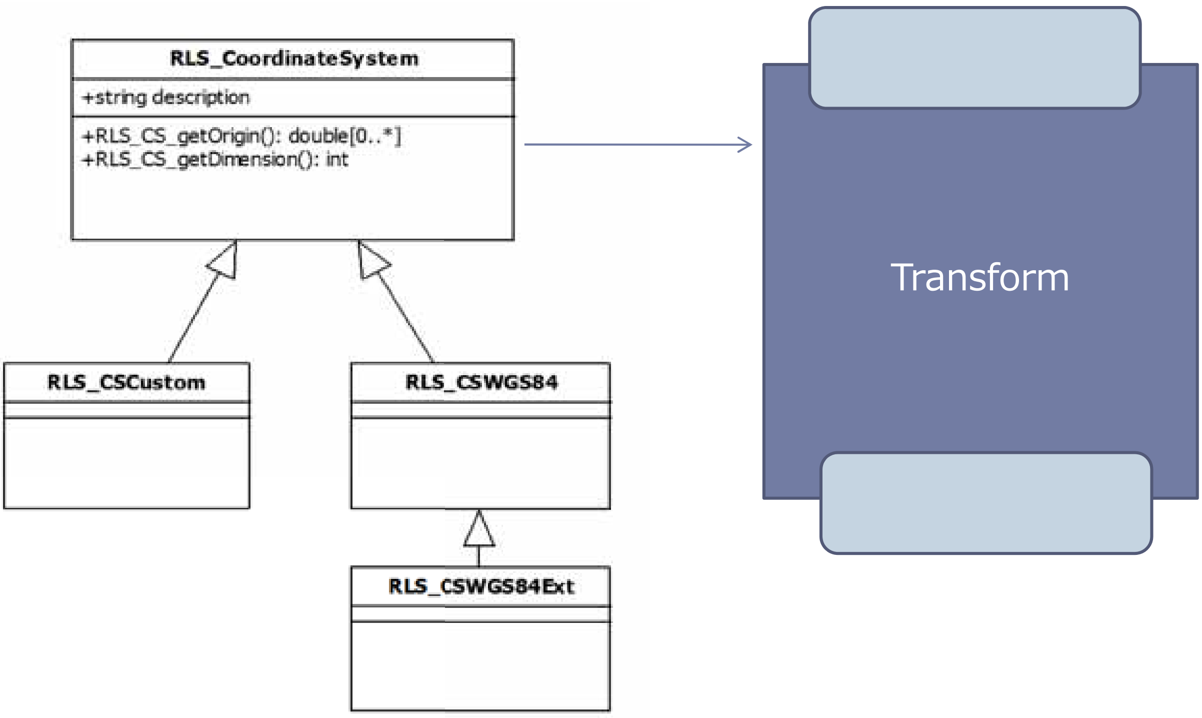


Revised coordinate system



OMG Robotic Localization Service WG meeting in Burlingame, Dec. 2007

Revised Coordinate System



Conclusion

- We have several considerations for revised submission
- For better comparison and combining proposals, we should explain PIM in single format, such as UML
  - In XML, there are needs to display UML diagram (see GML specification)

Real World Robot Challenge in Tsukuba (RWRC 2007)

- Tsukuba Challenge 2007 -

Takashi Tsubouchi, Professor
University of Tsukuba,
and
Makoto Mizukawa, Professor
Shibaura Institute of Technology

robotics/2007-12-10

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Tsukuba Challenge

(November 16 and 17, 2007)

The first challenge event in Japan

Funded by
New Technology Foundation (NTF)
and
Tsukuba City

Tsukuba Challenge

(November 16 and 17, 2007)

Organizers:

Chair: Shin'ichi Yuta, (U. of Tsukuba)
Makoto Mizukawa (Shibaura IT)
Hideki Hashimoto (U. of Tokyo)
Hirofumi Tashiro (NTF)
Prersons from Tsukuba city

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Tsukuba Challenge

- http://www.robomedia.org/challenge/index.html
- Real World Robot Challenge (RWRC)

  - It is not so called "competition"
  - Generalization of robotics technologies by means of "Development of methodology for the mission completion and disclosure of technical information"

Tsukuba Challenge 2007 Mission

- Autonomous run for 1km on the street for pedestrians
- The robot must stop at the goal
- The robot must be self-contained
- Environment as they are
  - No special treatment for the surface of the street
  - No postponed in case of rain
  - There are pedestrians and bicycles
- No CASH Prize

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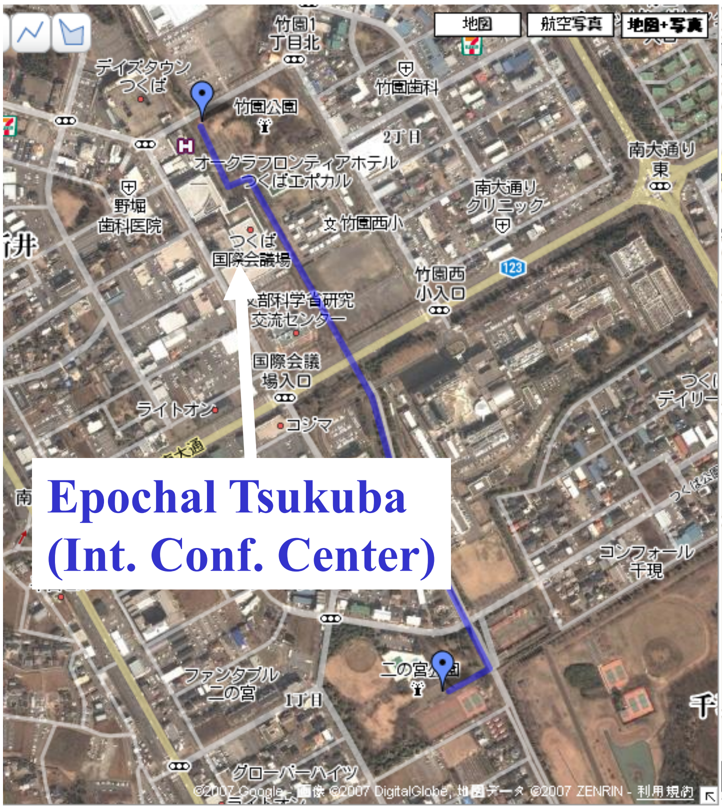
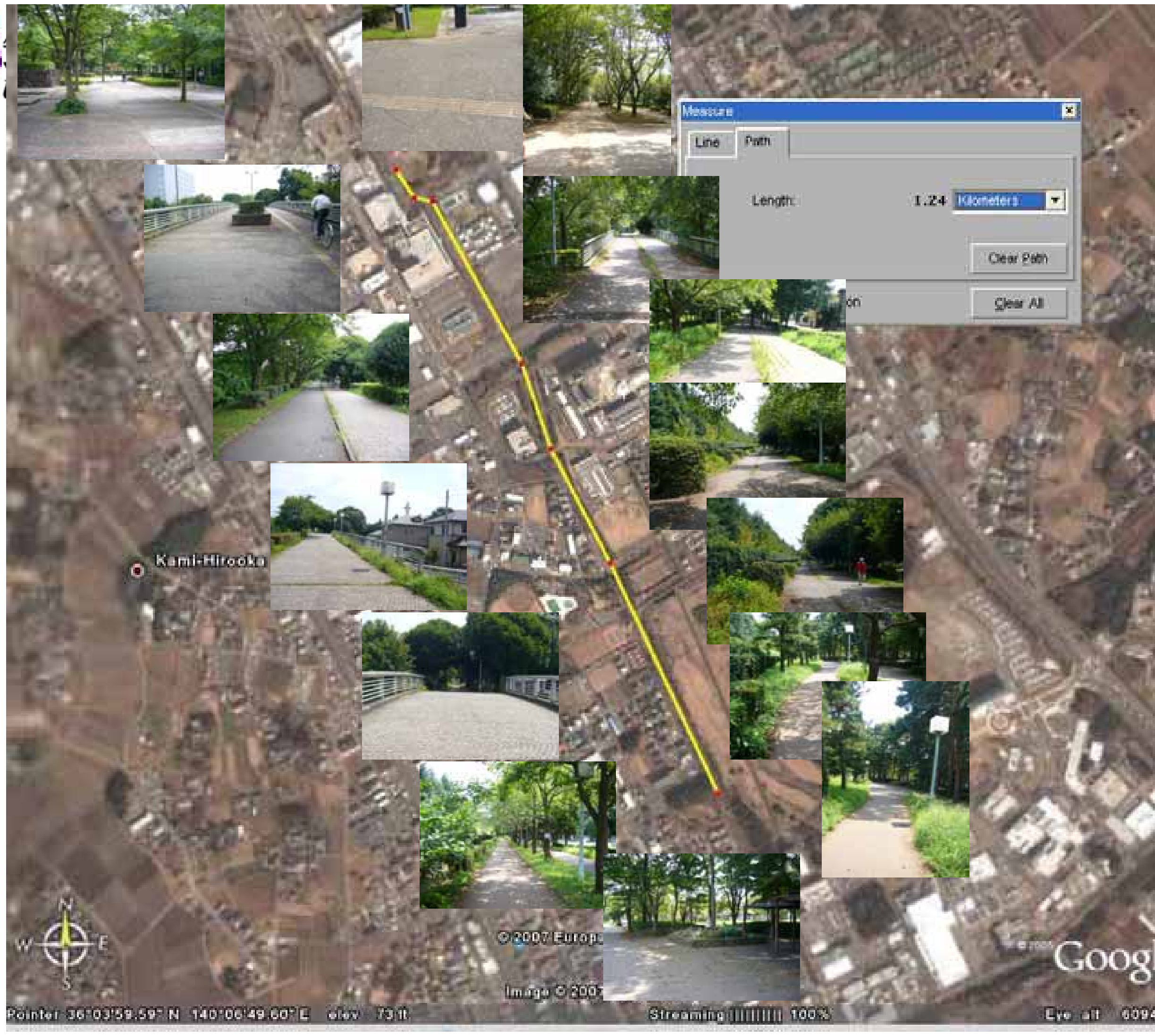
Environment at the Tsukuba Challenge





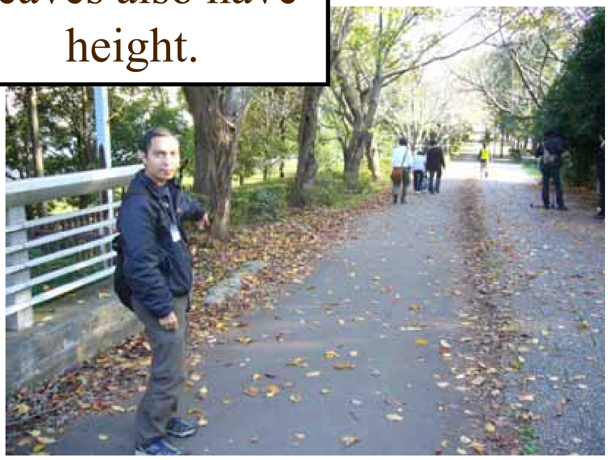
Environment on the Way





So Many Fallen Leaves in Autumn

Leaves also have height.



The leaves must be considered to avoid detection of avoidance in error.

Experiments on Public Street

- The street is governed by Tsukuba City
- Special permission is necessary from the police.
  - The city received the permission. (Aug. 17 - Nov. 18)
- Test Running Days
  - Sept. 2, Oct. 8, Oct. 20, Nov. 11, 14 and 15
  - Nov.16 after Trial (only for the trail passed)
  - Nov. 17 after Final

Regulation

- Robot size within 75cm (W) , 120cm (L), 150cm (H)
- Robot weight within 100kg
- Maximum speed 4km/h
- Emergency stop switch
- Accompanying operator for malfunction when the robot moves with power

- Design the robot in accordance with environmental and ecological attention

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Participants and Results

- 33 groups entry
- On 16 Nov. : Trial Run
  - (100m from start within 12min.)
    - 27 groups tried ／ 11 groups passed
- On 17 Nov. : Final Run
  - (1km from start, within 2hrs.)
  - 3 groups mission completed

    Kanazawa Institute of Technology,
    University of Tsukuba
    (Intelligent Robot Lab. 2 groups)

Kanazawa IT

U. Tsukuba
"Hitotsubo"

U. Tsukuba
"Melos"

University of Tsukuba “Okugaigumi” Trial

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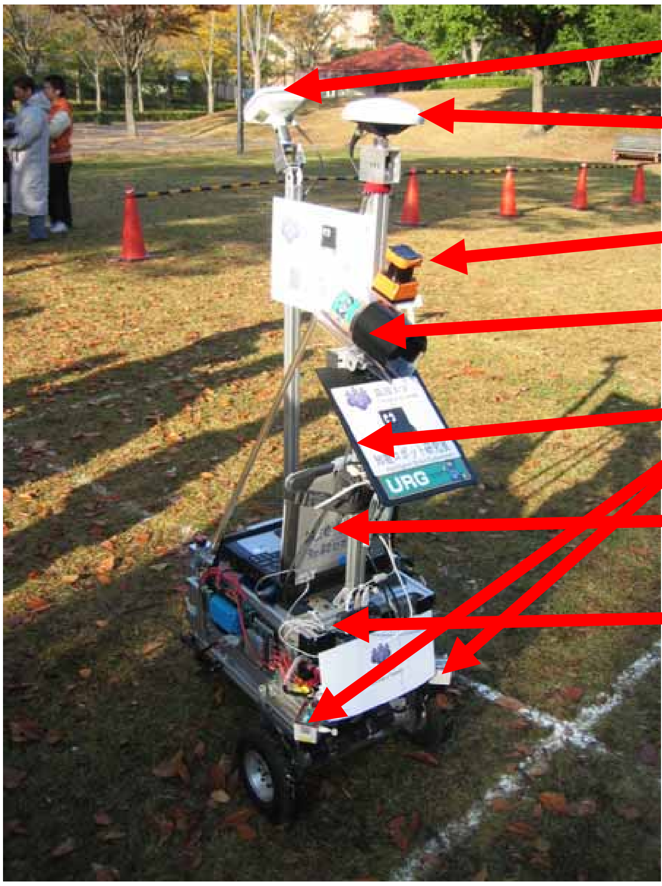
Our Robot “Hitotsubo”



DGPS beacon receiver antenna

DGPS receiver antenna

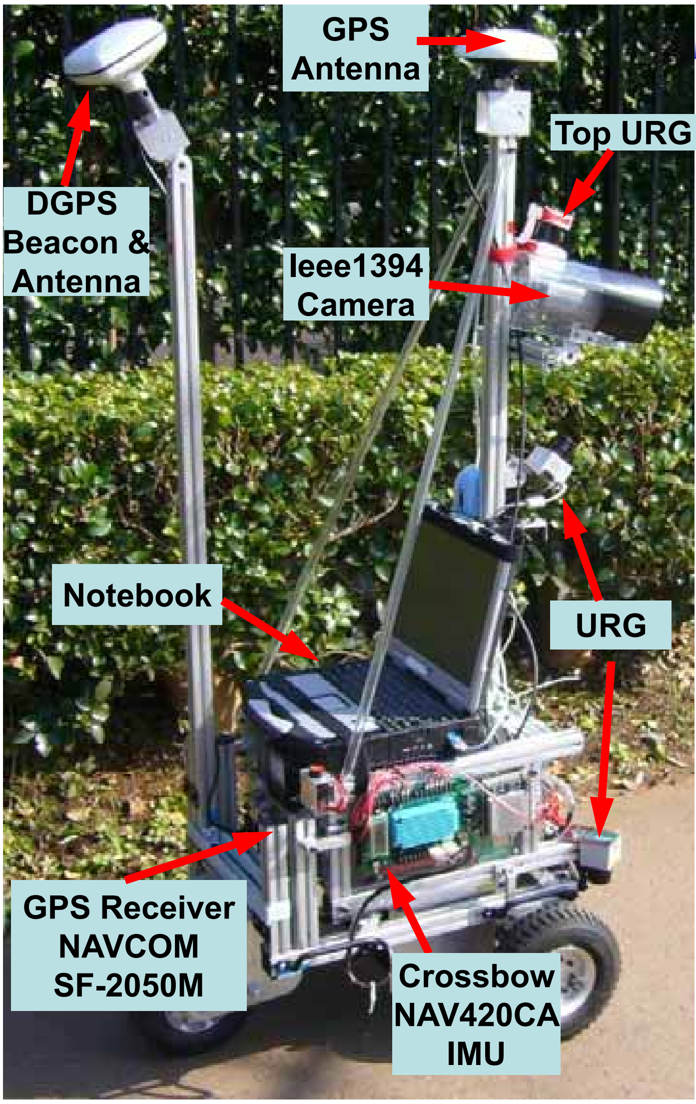
Top-URG laser scanner

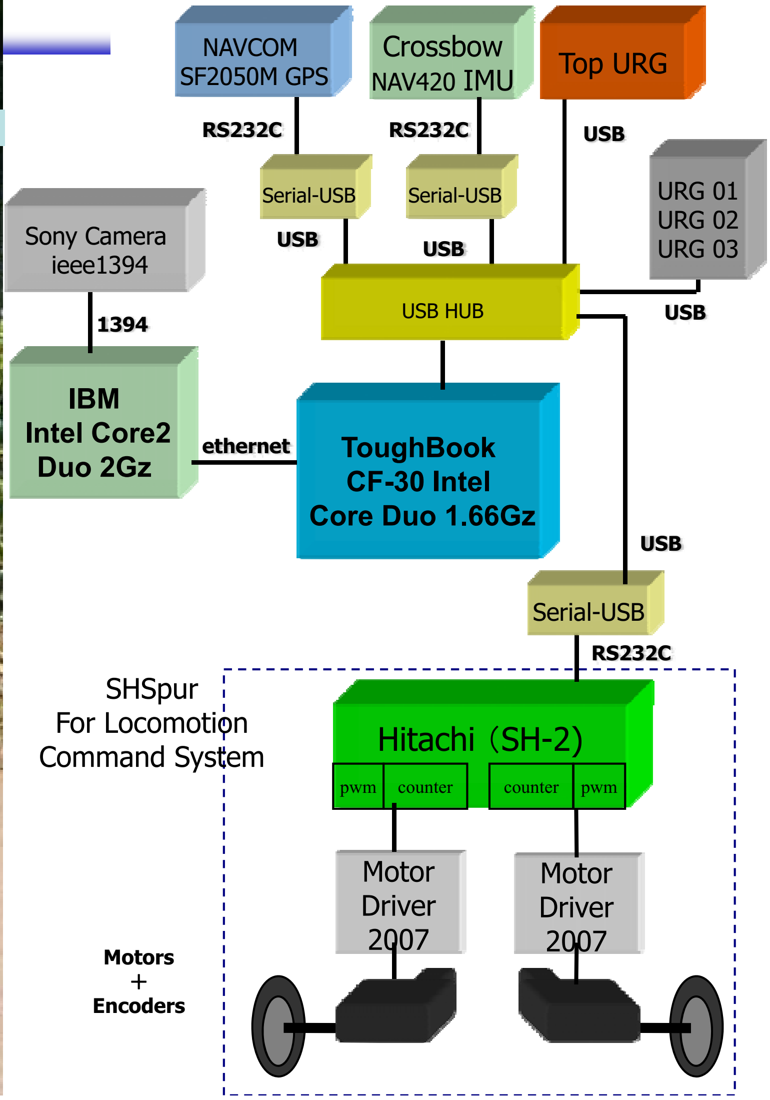
IEEE1394 camera

URG laser scanner

Master control PC

IMU





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Navigation strategy (1)

- Considered attentions
  - GPS is dependable when it is dependable.
  - However, GPS is not always dependable.
  - GPS measurement tends to include big error when radio wave receiving condition rapidly changes while GPS receiver moves.
  - The robot must run even if GPS measurement worse.
  - Position identification based on landmark is also crucial.
  - Put an ability to move along the street (sensor based motion)
  - Avoid collision with human and objects.

Navigation Strategy (2)

•Map and Position Based Navigation

＋ Sensor Interactive Movement along Street

(Sensor Based Navigation)

(Compose Algorithms Working Complementarily)

- Preparation
  - Waypoint map using RTK-GPS stationary measurements in advance
  - Log all the laser scan point crowd along the path by means of remote controlled test run
  - Offline extraction of features from the point crowd to define landmarks [Ohno et al. CRA2004 etc.]

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Navigation Strategy (3)

- Basic ideas
  - Move along line segments connecting waypoints based on online position estimation
  - Cumulative error of dead reckoning is adjusted (EKF)
    - based on DGPS measurement if its quality is good.
    - Based on landmark observation if DGPS quality is worse.
  - Even if the robot suffers from big error covariance and loses the position, sensor interactive motion can be activated to avoid course out.
  - Slowdown, stop or avoid if obstacles or human approaches.

Strategy of Navigation

Localization (for map-based navigation)

- prediction: odometry + IMU
- + correction: GPS + camera TOPURG
  - camera TOPURG: find landmark and correct position

⇕

Obstacle Detection (for sensor-based navigation)

- TOPURG + camera: road (free space) detection, create free space (local) map
- TOPURG + URG

Do: Move along the way with avoiding collision and course out until good estimate of Localization is obtained.

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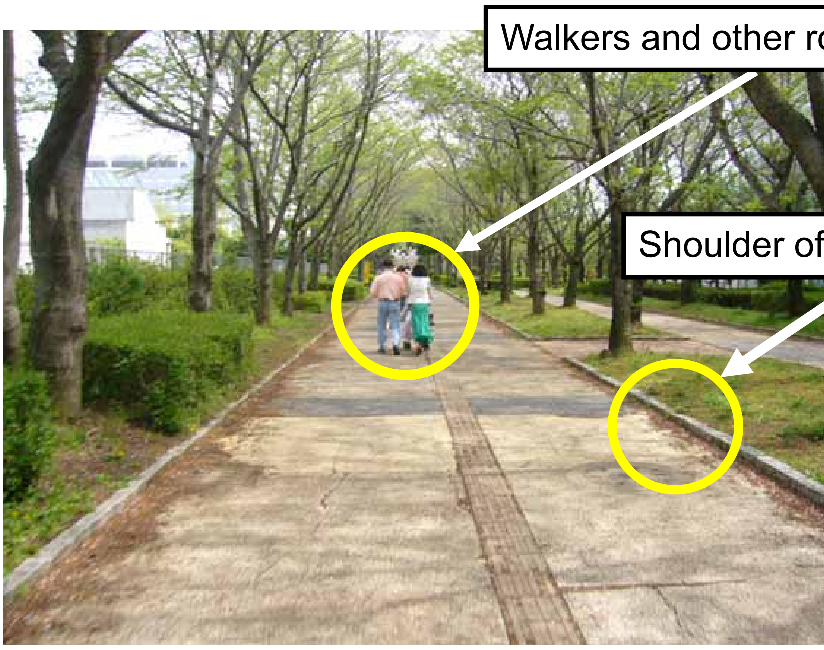
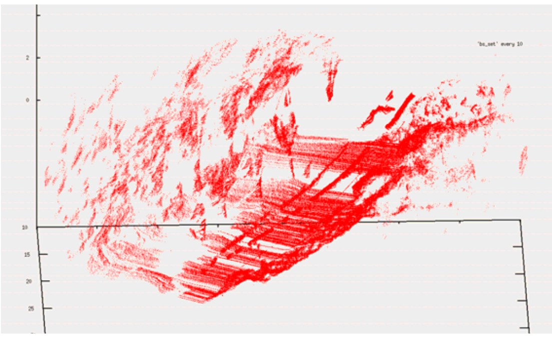
Obstacle Detection - Target

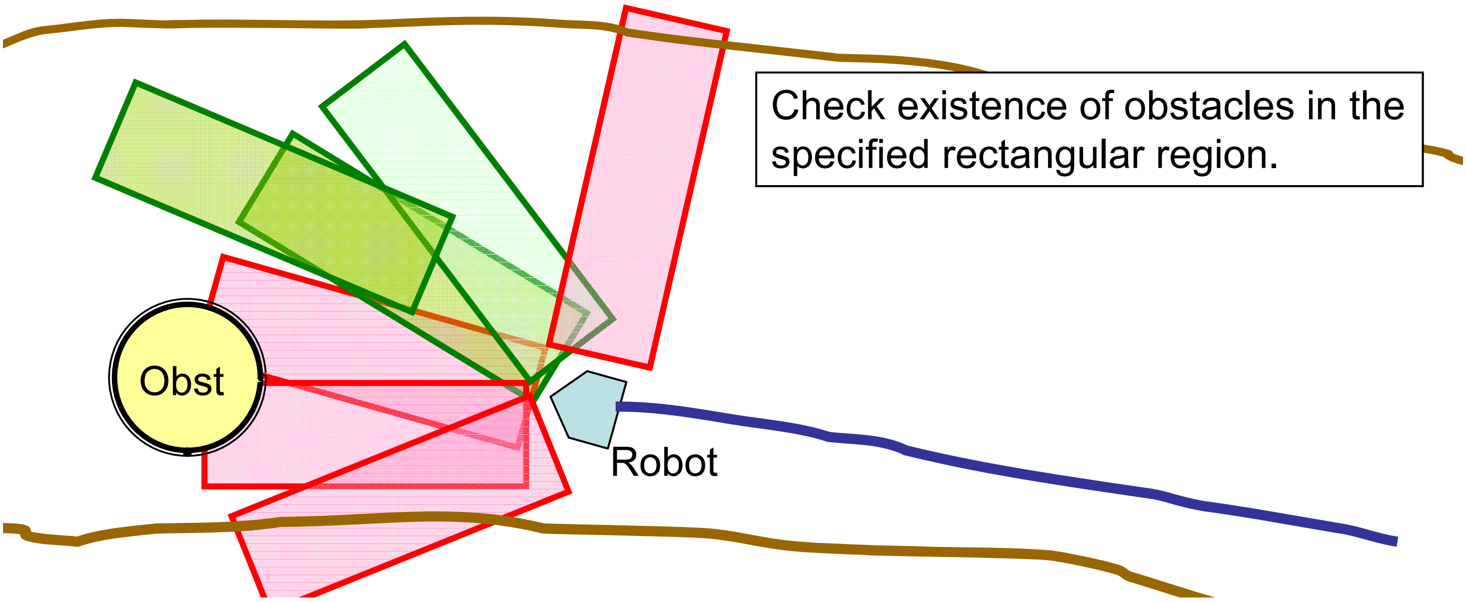


An example of environment on the course of the Tsukuba Challenge in spring

Obstacle Detection using URG

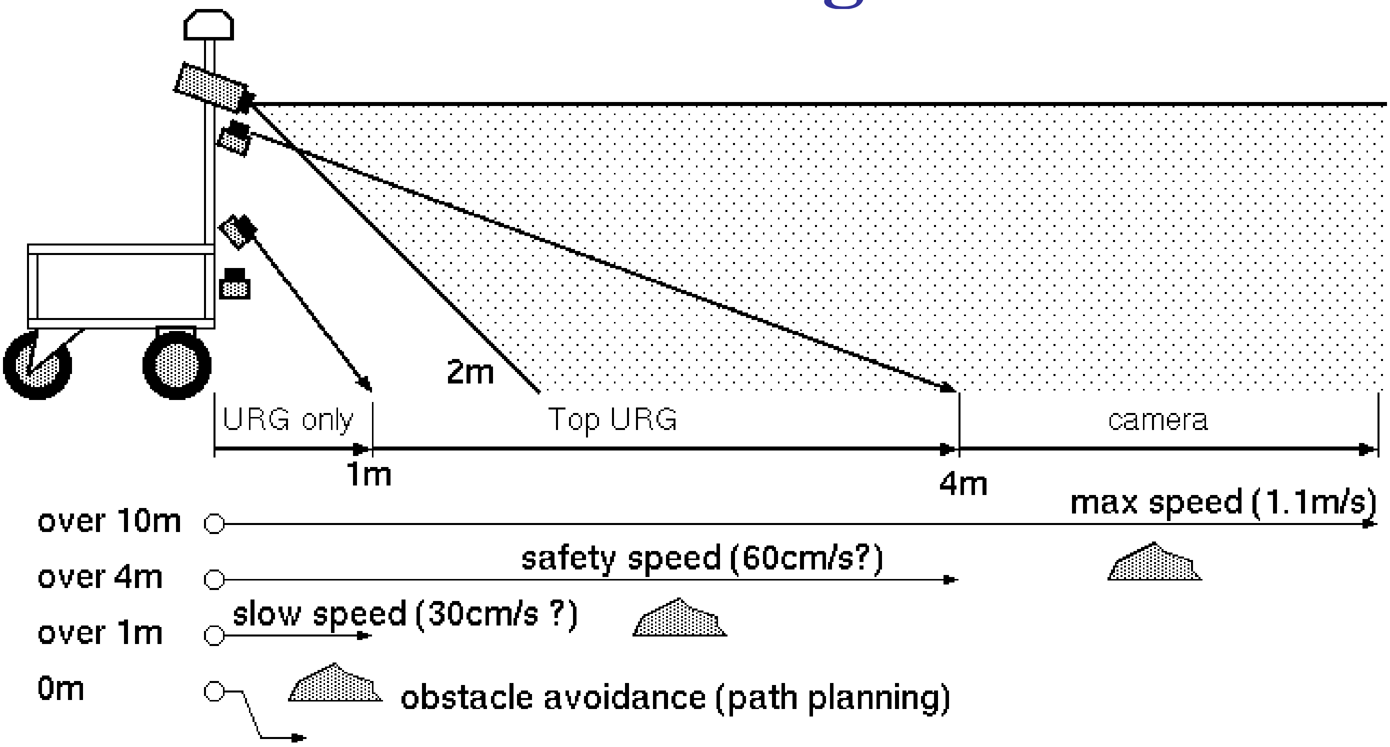


- Transform coordinates of the point cloud data from URG and Top-URG into 3D space.



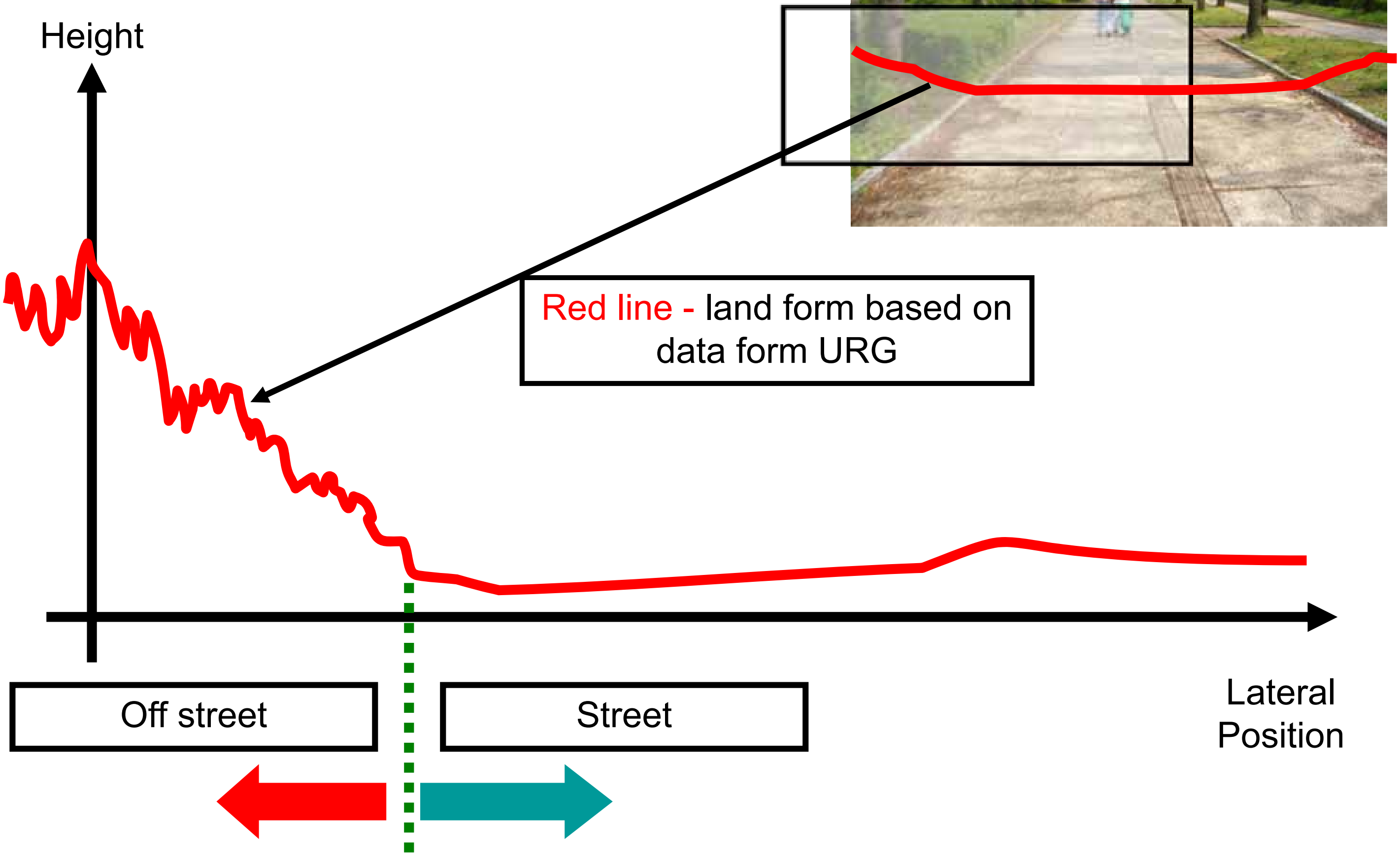
Check existence of obstacles in the specified rectangular region.

Sensor arrangement



Chose velocity according to the obstacle reporting sensors.
Take avoidance motion if the obstacle is too close

Obstacle Detection



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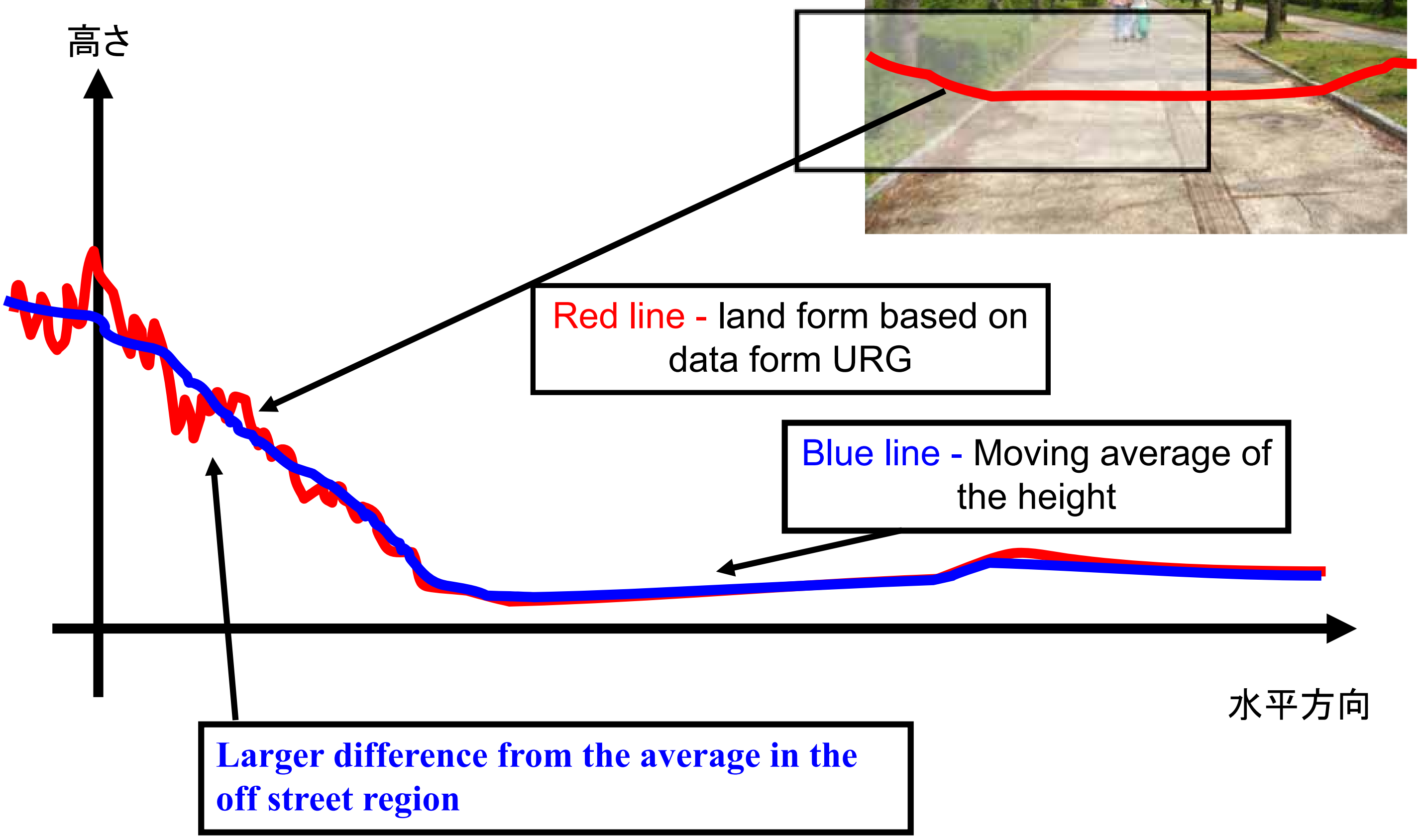
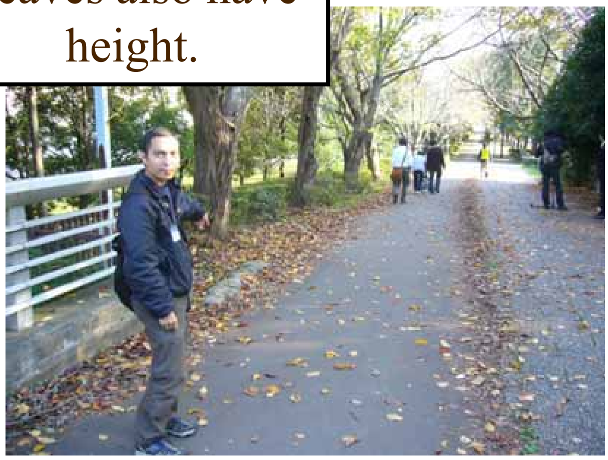
Obstacle Detection



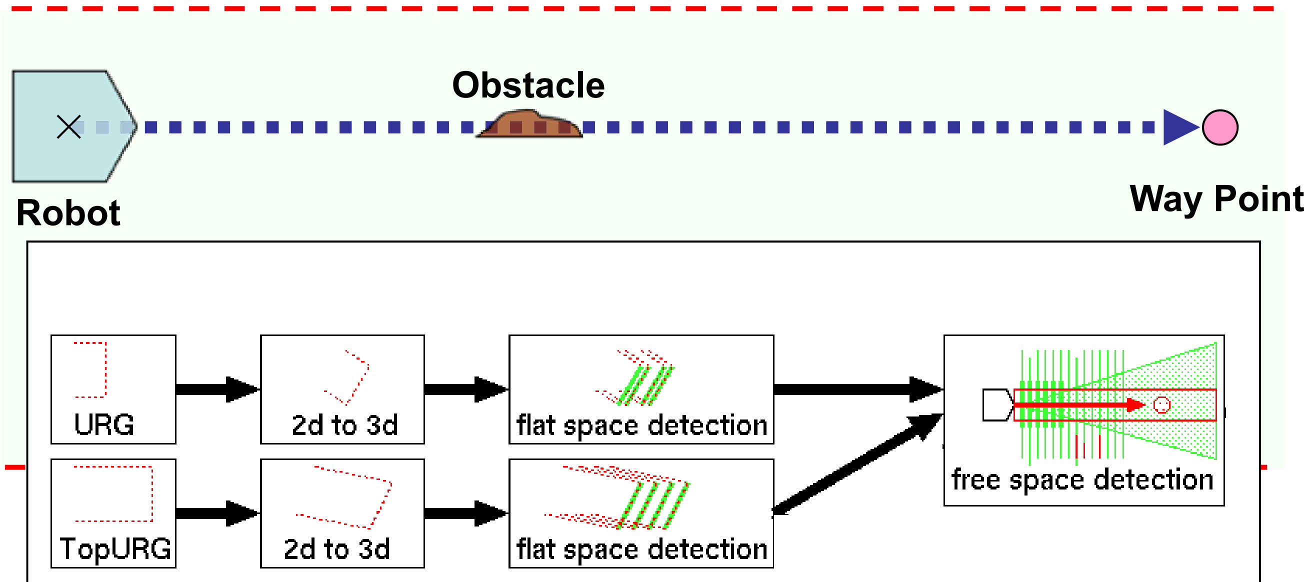
So Many Fallen Leaves in Autumn

Leaves also have height.



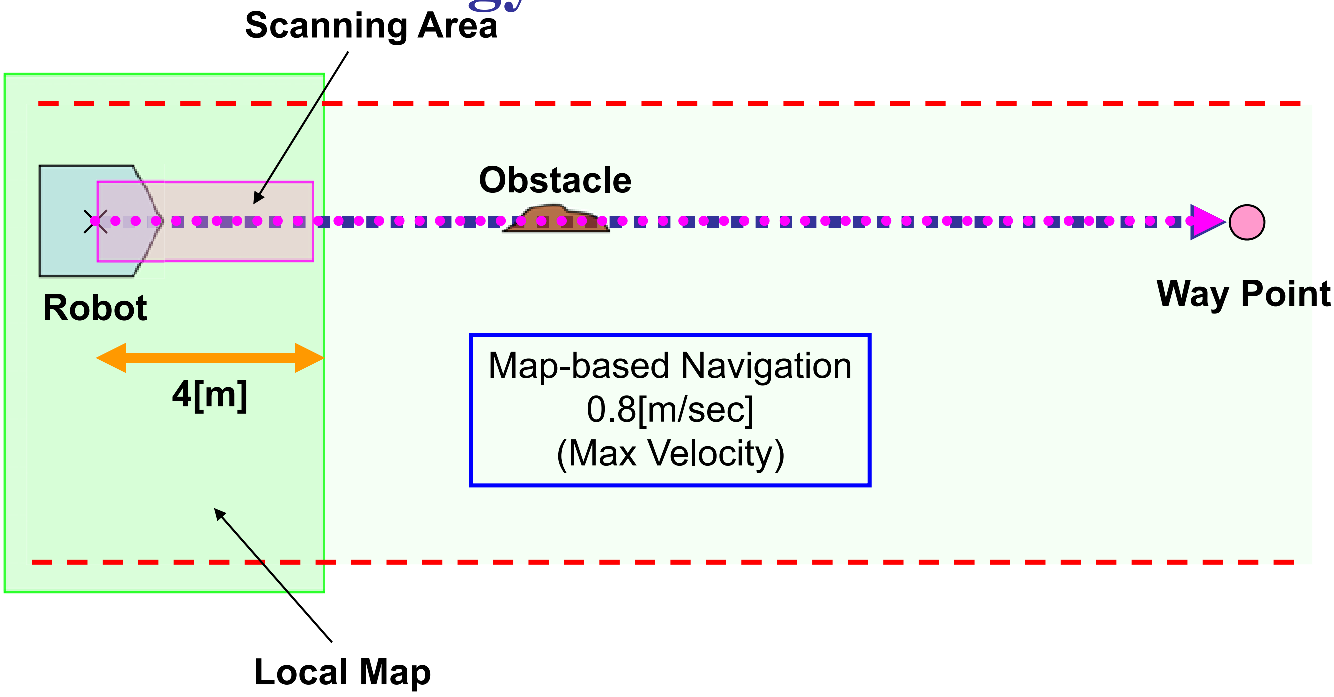
The leaves must be considered to avoid detection of avoidance in error.

Basic Strategy of Obstacle Avoidance



Map of obstacles in the vicinity of the robot renewed continually
Judge existence of obstacles within the specified rectangular region

Basic Strategy of Obstacle Avoidance



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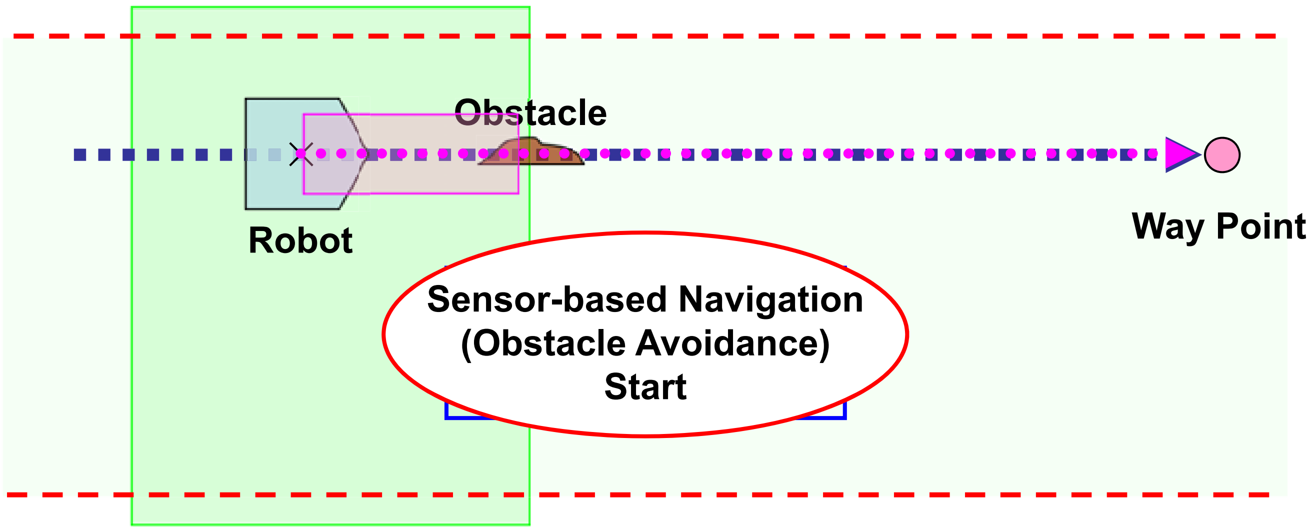
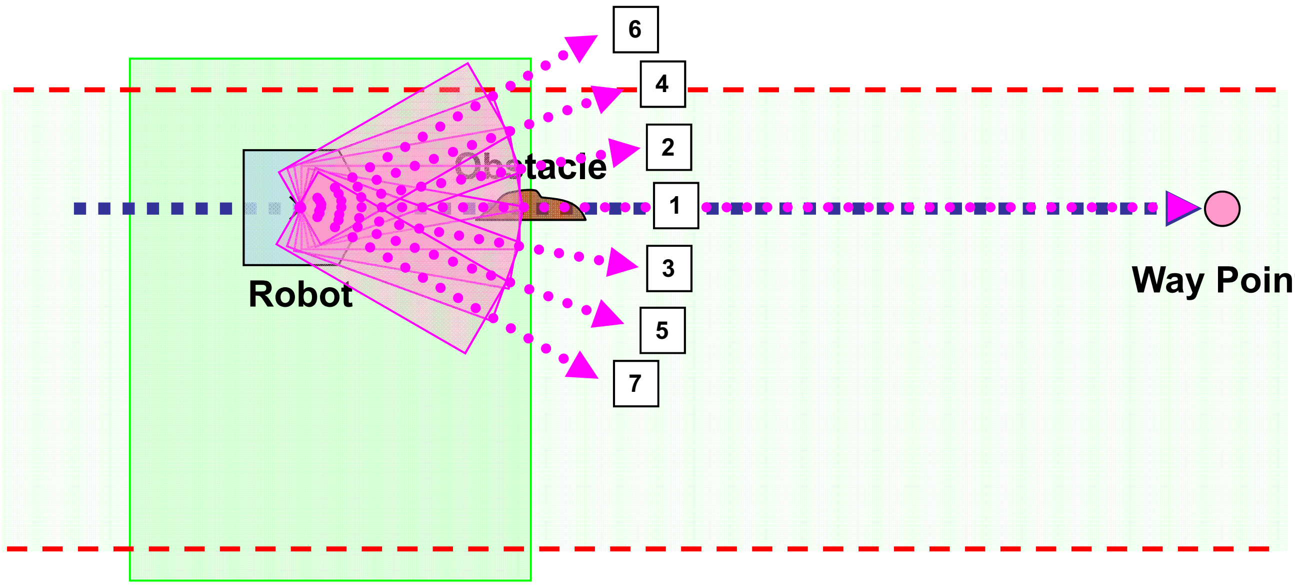
Basic Strategy of Obstacle Avoidance



Basic Strategy of Obstacle Avoidance



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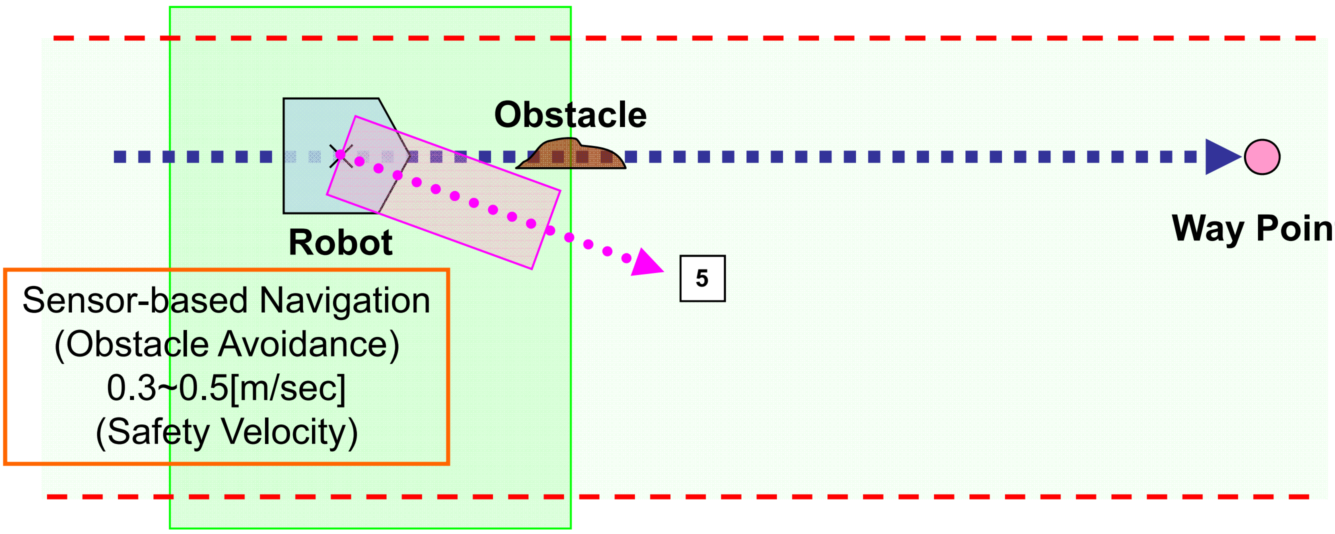
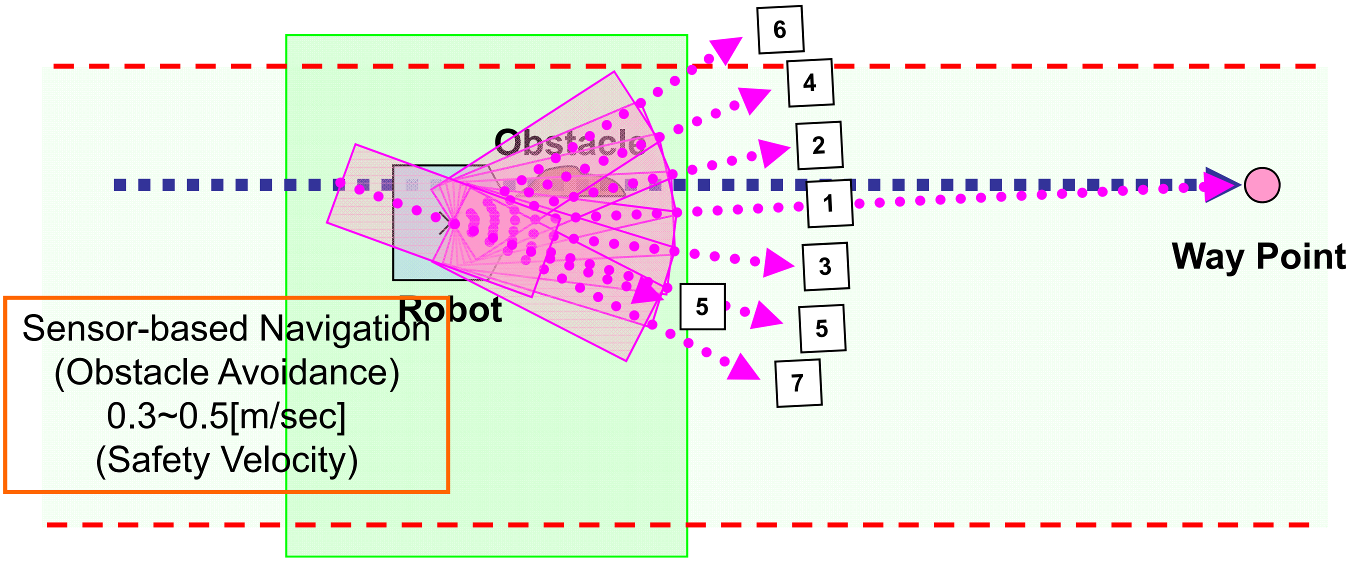


Basic Strategy of Obstacle Avoidance



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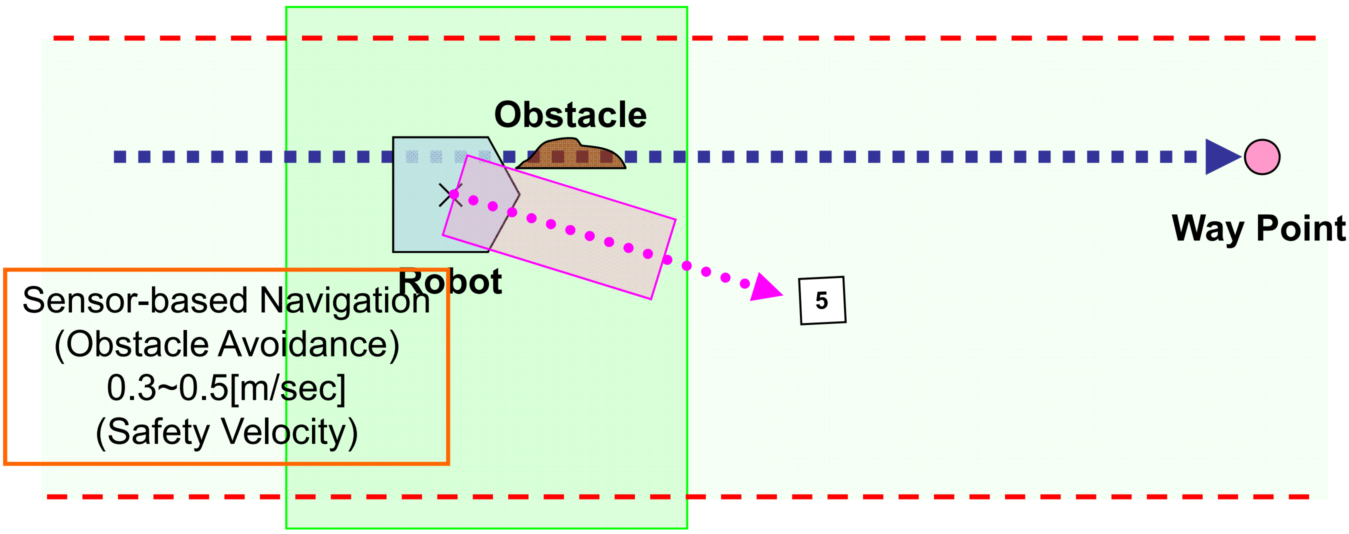
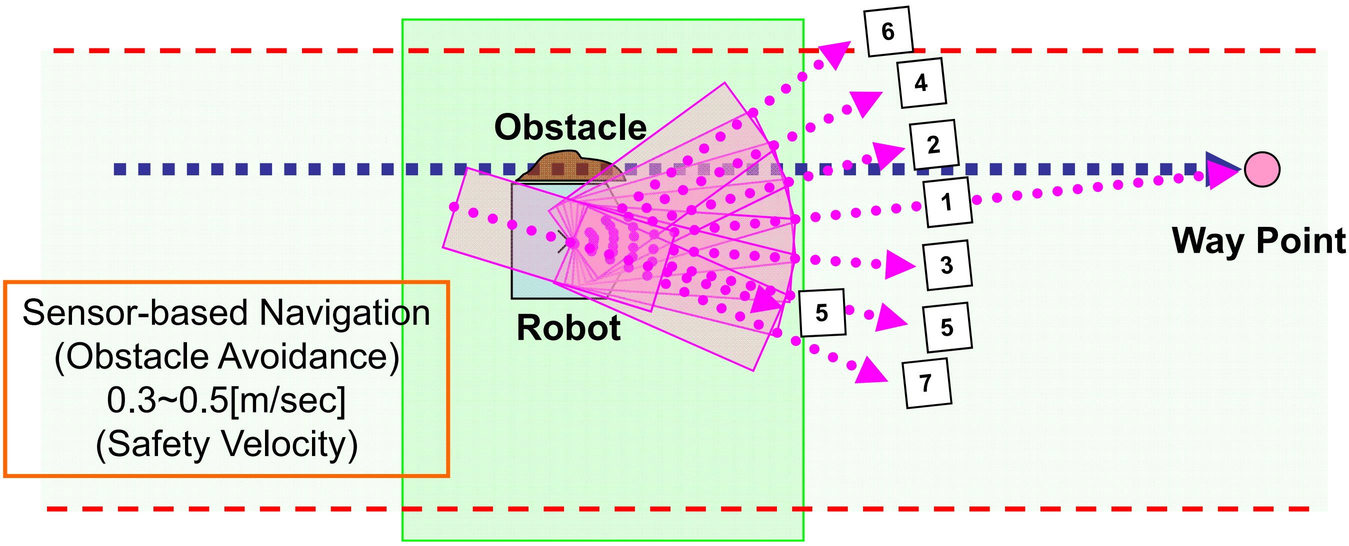
Basic Strategy of Obstacle Avoidance



Basic Strategy of Obstacle Avoidance



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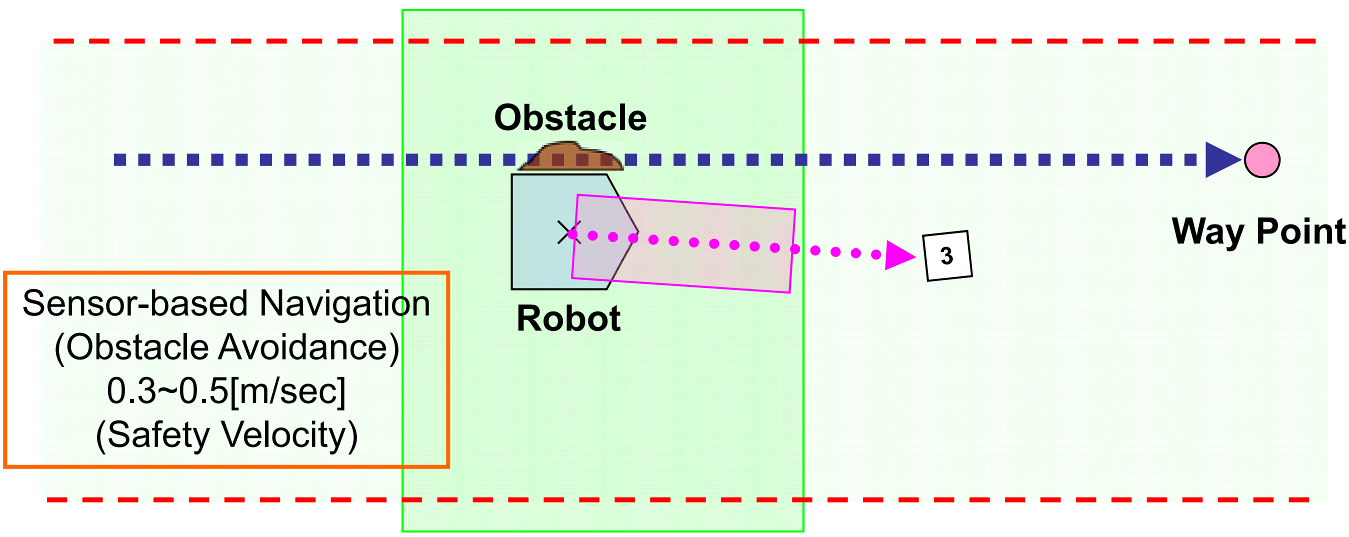
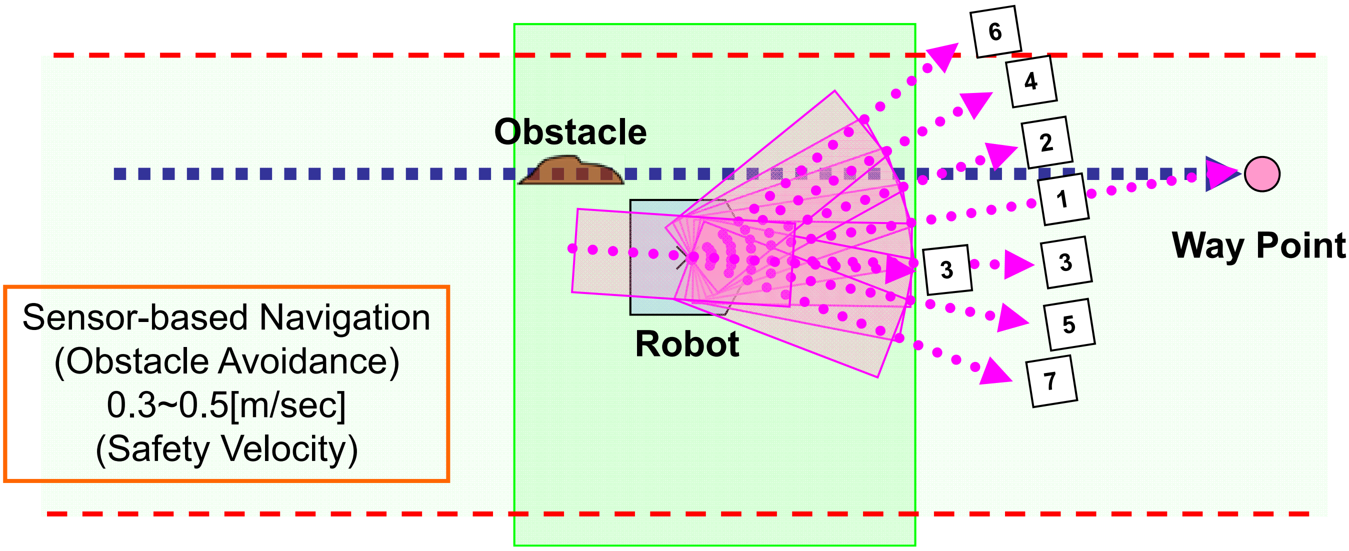
Basic Strategy of Obstacle Avoidance



Basic Strategy of Obstacle Avoidance



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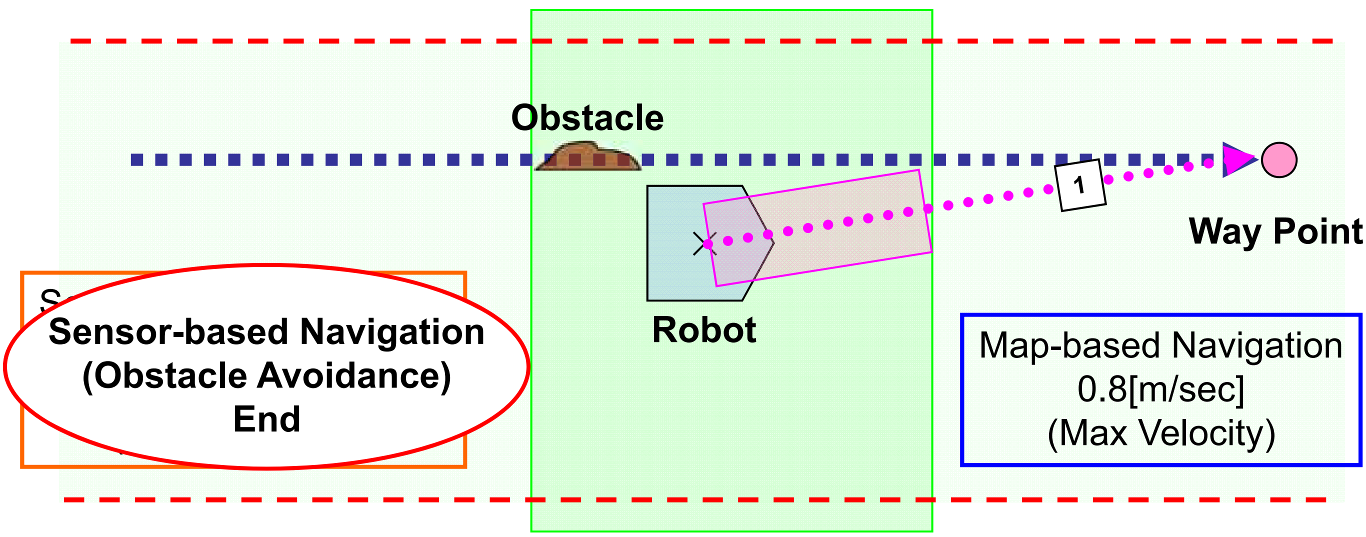
Basic Strategy of Obstacle Avoidance



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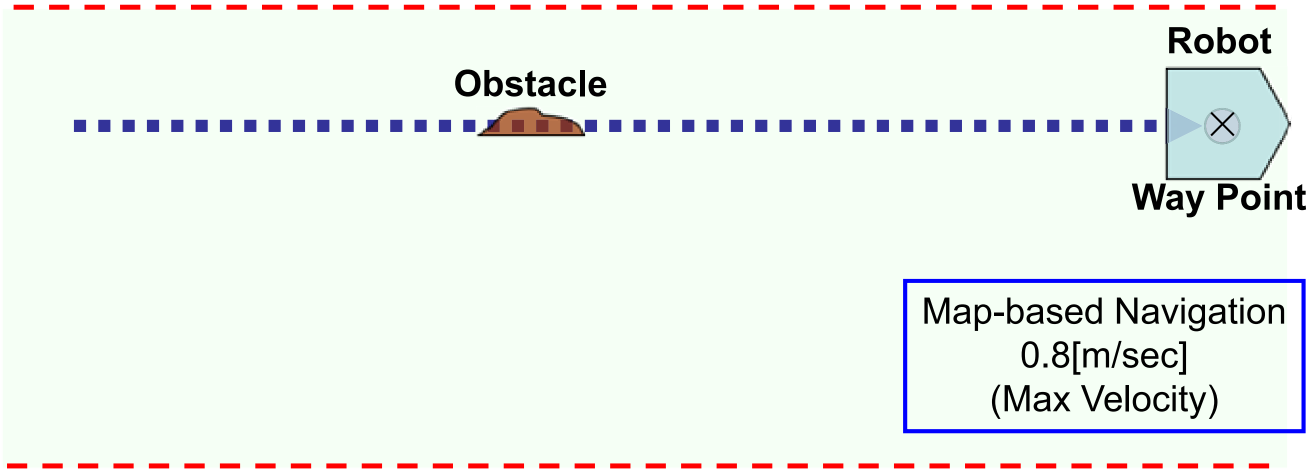
Basic Strategy of Obstacle Avoidance



At the Tsukuba Challenge, this avoidance strategy

- could avoid collision and course off and continue the motion until localization succeeded,
- could take a roundabout course not to collide with stationally obstacles, and
- could let moving obstacles go past.

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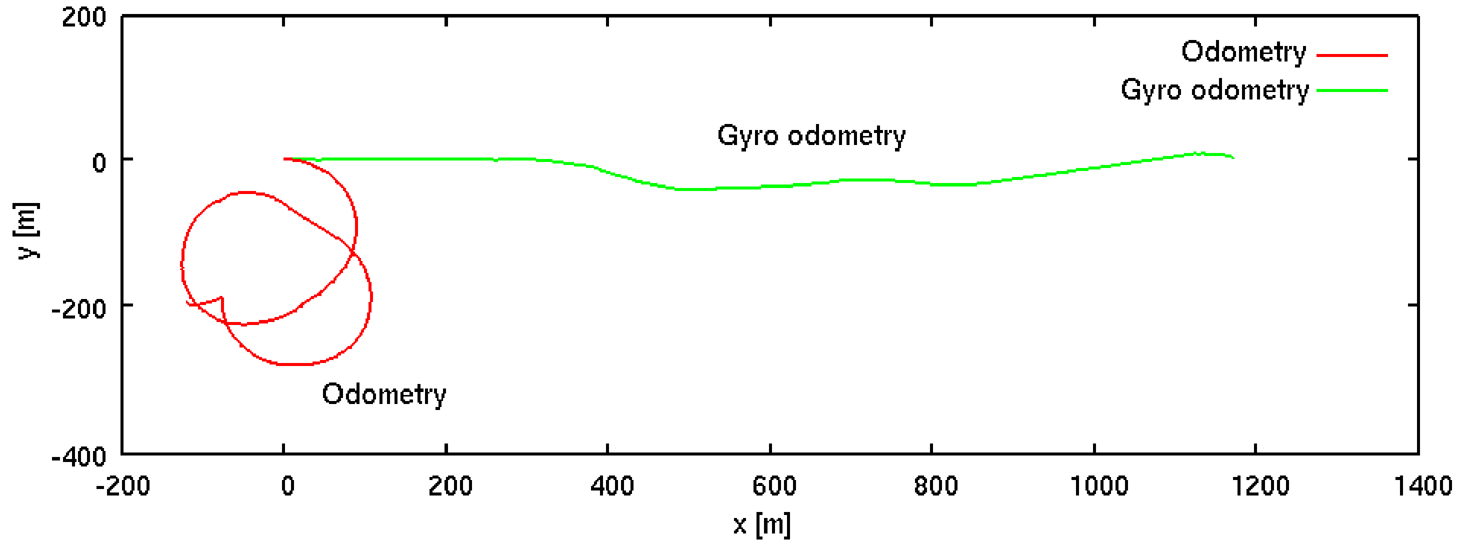
FYI: Dead Reckoning

- **Odometry and Gyrodometry**



Remote controlled test run on September 2.

FYI: GPS Moving Measurements

(Seamless Dual Mode by NAVCOM SF-2050M)

NAVCOM SF-2050M
Three modes GPS receiver

- RTK-GPS mode
- StarFire DGPS mode
- Standard DGPS mode

Automatically selectable dual modes:
- Standard and StarFire DGPS Dual
- RTK-GPS and StarFire DGPS Dual

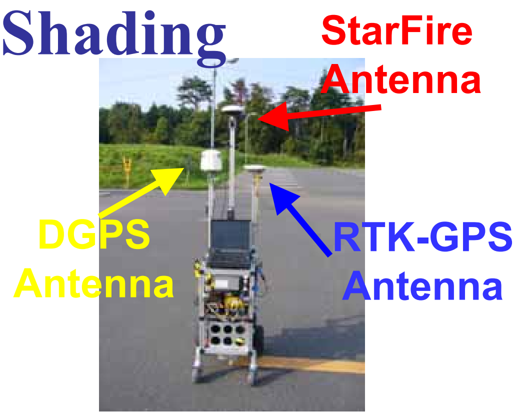
Evaluation as previous experiments:

Environments: Open Sky, Under Tree

Performance: Precision, Continuity

Moving Measurements
Passing Under Tree Shading

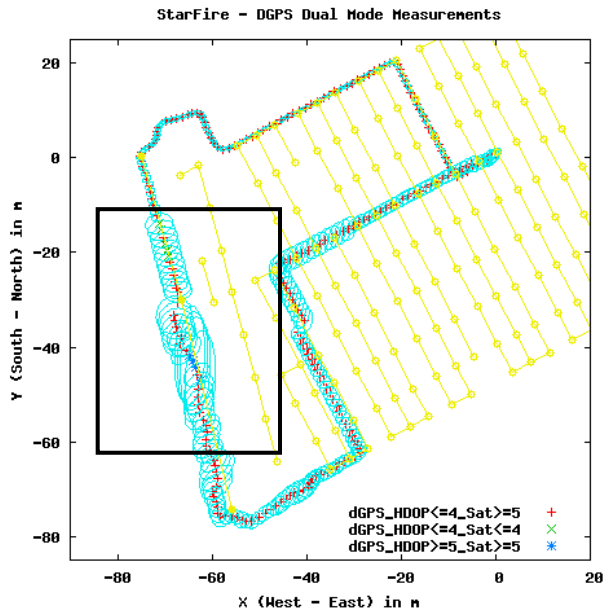
Under Tree Shading Path :
Segment → BC (77m)



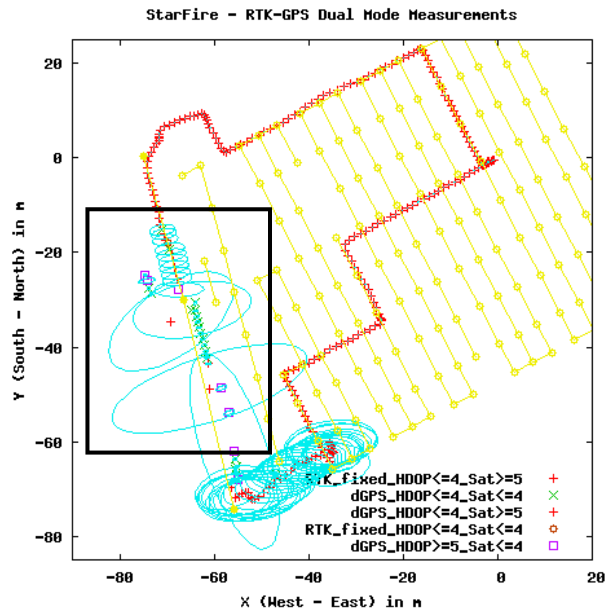
- Robot was pushed by hand
- Traveled path: A→B→C→A
- Total path: 350m (77m under tree shading)
- Real Time Positioning
- NMEA Sentences:
  - GGA: Positioning
  - GST: Position Covariance
- Weather Conditions: Clear

Moving Measurements (Dual Mode)

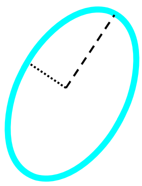
Measurement Covariance Ellipses



DGPS - StarFire



RTK-GPS - StarFire



-Covariance Ellipse of each position information

Covariance Ellipses using NMEA Sentence GST

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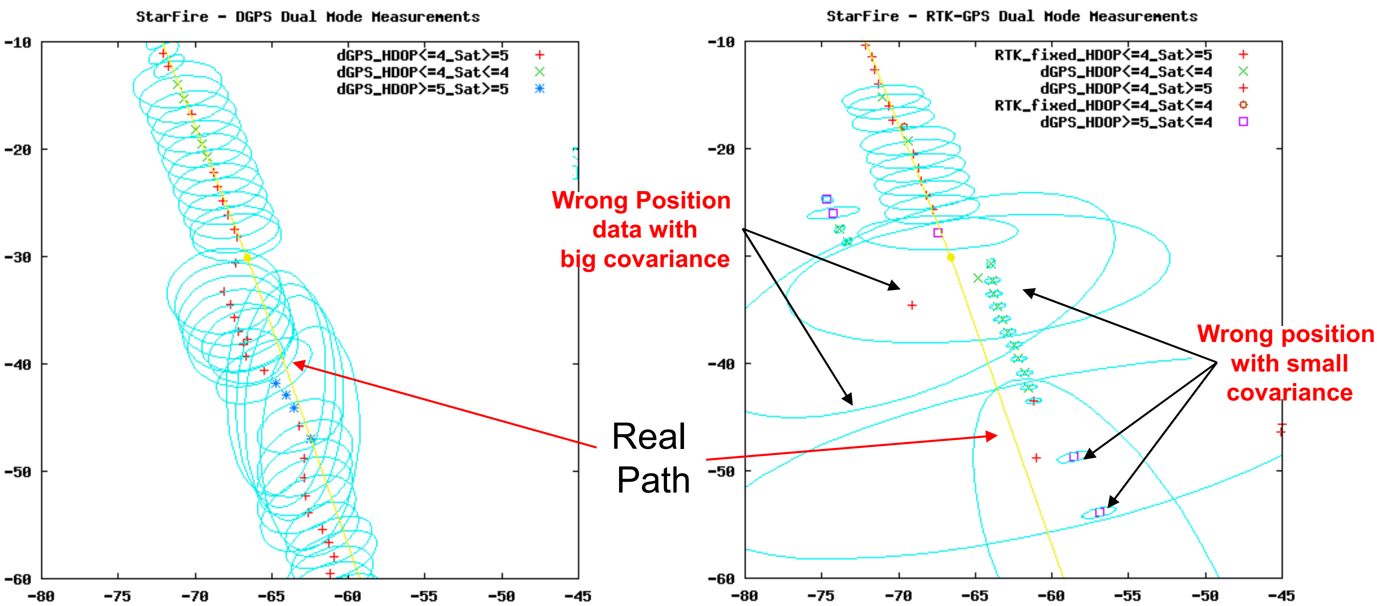
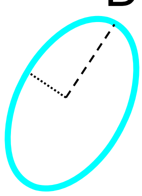
Moving Measurements (Dual Mode)

Measurement Covariance Ellipses



DGPS - StarFire

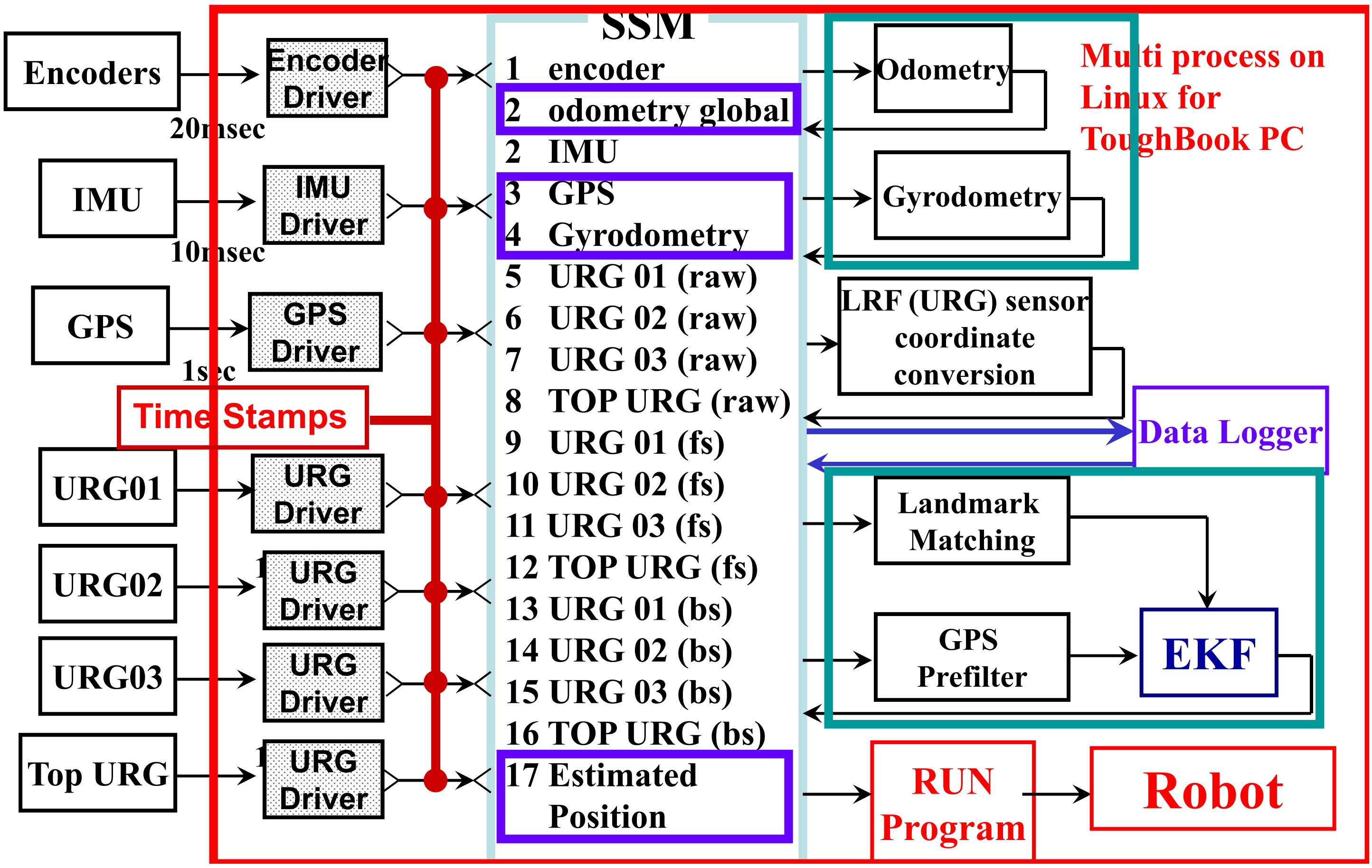
RTK-GPS - StarFire



-Covariance Ellipse of each position information

Covariance Ellipses using NMEA Sentence GST

Implementation



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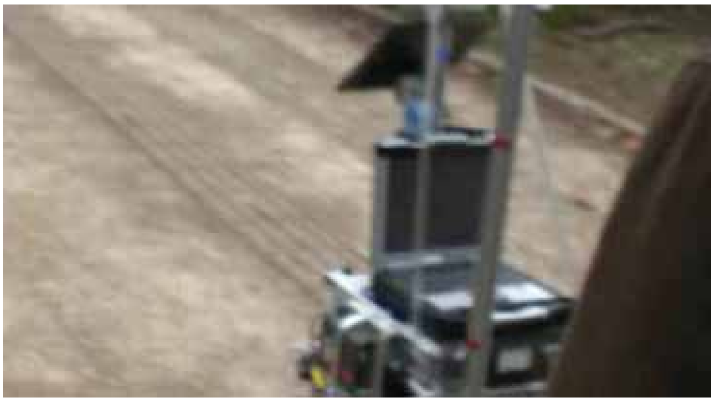
Map Data Display

Map after Kalman Smoothing

Tsukuba Challenge Final ("Hototsubo" run)



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Logged data view

Logged data display

Summary and Lessons

- Official Record ⇒Mission Completed in 23min.
- Actually, the robot stopped before 80cm to the goal. (Stopping 7m over the goal was intended)
- At the final, GPS condition was worse. Position error collection based on GPS was not so much used.
- Landmark based position error collection was frequent.
- Sensor interactive motion appeared almost half of the mission.
- More reliable sensing abilities are desired.

Summary and Lessons

- Complementary combination of the navigation strategy went well.
- Cooperation of the students was fine.
  - All students were part timer for this project
  - Only 4 months preparation with 9 students and me
- We need much more opportunities facing everyday situation in the environment

つくばチャレンジ
FINISH
Real World Robot Challenge
Kanazawa Institute of Technology

Functional Services WG

2007. 12. 11

Functional Services WG Report 1

- Candidate title for HRI RFP
  - User recognition service interface (URSI)
- Mandatory Requirements
  - 1. Architecture of URSI should be defined (diagram or description for overview)
  - 2. Classify the process of URS
  - 3. Define the function of each stage
  - 4. Define each API
    - Description of function
    - Name of API
    - Data structure (option)
    - Basic error handling (option)
  - 5. Define PIM using UML

Functional Services WG Report 2

- Optional Requirements
  - 1. Identify additional information of user (such as gender or age)
  - 2. choice of input date type or data format (including multi-modal)
  - 3. consideration of additional sensors (RFID, Bio sensors)
  - 4. Implementation example for each APIs
  - 5, Device profile may be included.

Functional Services WG schedule

- (unofficial)1ST RFP draft – 18/Jan/2008
- (unofficial) 2nd RFP draft – 8/Feb/2008 (4 week before the next OMG meeting)
- Official 1st RFP draft and discussion on March OMG meeting (Washington DC) – Make effort to call more active members (Japan, Canada, US, New Zealand, Korea etc.)
- Official 2nd RFP draft and review on June OMG meeting (Ottawa)
- If RFP approved, initial submission on December OMG meeting in Santa Clara.

Robotic Localization Service WG Status Report Burlingame Meeting

2007.12.11

Co-Chairs: Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio

Schedule

- Monday
  - 09:45-12:00 Initial Submission presentation (ETRI+Samsung, JARA)
  - 13:00-17:00 discussion
- Tuesday
  - 9:00-11:30 discussion
- Wednesday
  - 09:00-17:00 discussion
- Thursday
  - 09:00-17:00 discussion

TOPICS IN THIS MEETING

- Two presentations for initial submission
  - ETRI+Samsung, JARA
- Discussion toward revised submission
  - Sensor Module / Localization Module separation
    - relation with Profile WG
  - Naming issue
  - Data abstract structure / data format issue
  - Necessity for the meat-level information (RLML)

ROADMAP

- Washington D.C. Revised Submission discussion

  (Submit first version of the revised submission to OMG server)
- 26/May/08 Revised Submission due
- 23/Jun/08 Revised Submission presentations

robotics/2007-12-13

OMG Robotic Technology Component Specification and OpenRTM-aist

National Institute of Advanced Industrial Science and Technology
Intelligence Systems Research Institute
Task-Intelligence Research Group
Noriaki Ando, Ph.D.

About AIST

- National Institute of Advanced Industrial Science and Technology (独立行政法人産業技術総合研究所)
  - About 2000 researchers
- Intelligent Systems Research Institute (知能システム研究部門)
  - About 80 researchers

Outline

- RT-Middleware and OpenRTM-aist
- Demonstration
- RTC standardization in OMG
- Features of OpenRTM-aist
- OMG RTC specification
- Conclusion

What is RT?

- RT = Robot Technology cf. IT
  - not only standalone robots, but also robotic elements (sensors, actuators, etc….)

OpenRTM-aist

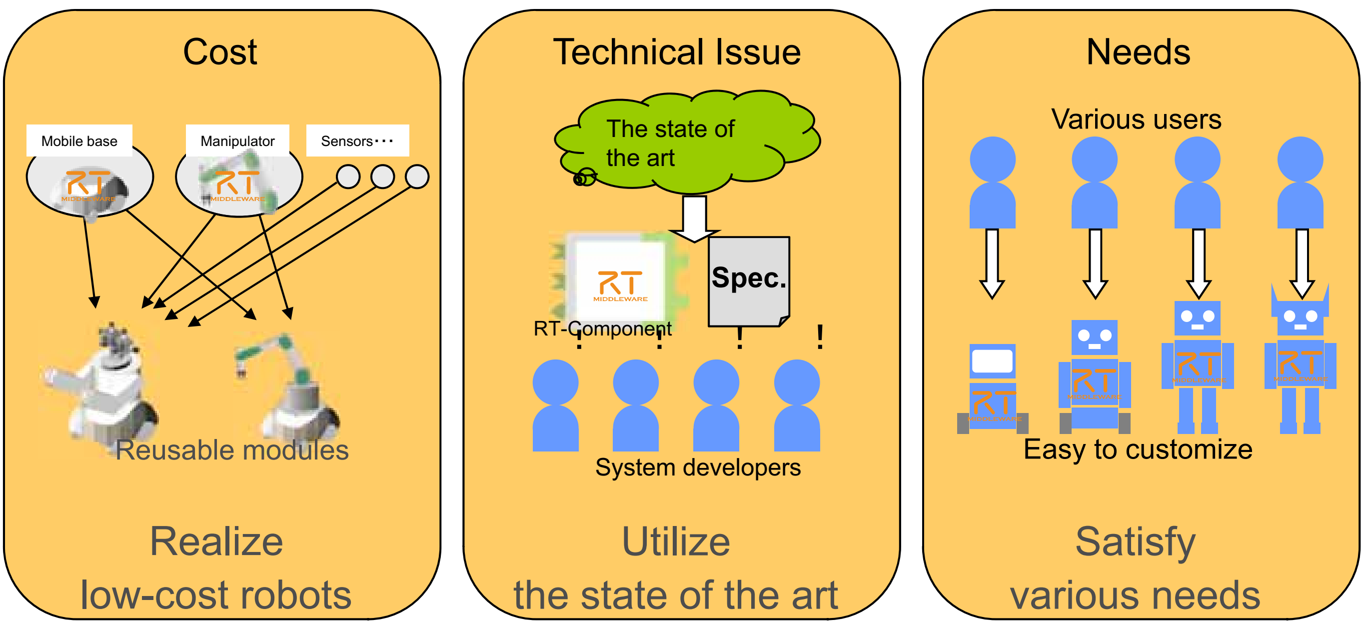
- RT-Middleware
  - middleware and platform for RT-element integration
- RT-Component
  - basic software unit in RT-Middleware

OpenRTM-aist

- Component frameworks + middleware library
- Component interface:
  - OMG Robotic Technology Component Specification
- OS
  - FreeBSD, Linux (Fedora Core, Debuan, Ubuntu, VineLinux), Windows
- Language:
  - C++, Python, Java
  - .NET (implemented by SEC)
- CPU architecture:
  - i386, ARM9, PPC
- Tools (Eclipse plugins)
  - Template source code generator: rtc-template
  - System integration tool: RtcLink
  - Pattern weaver for RT-Middleware

The aim of RT-Middleware

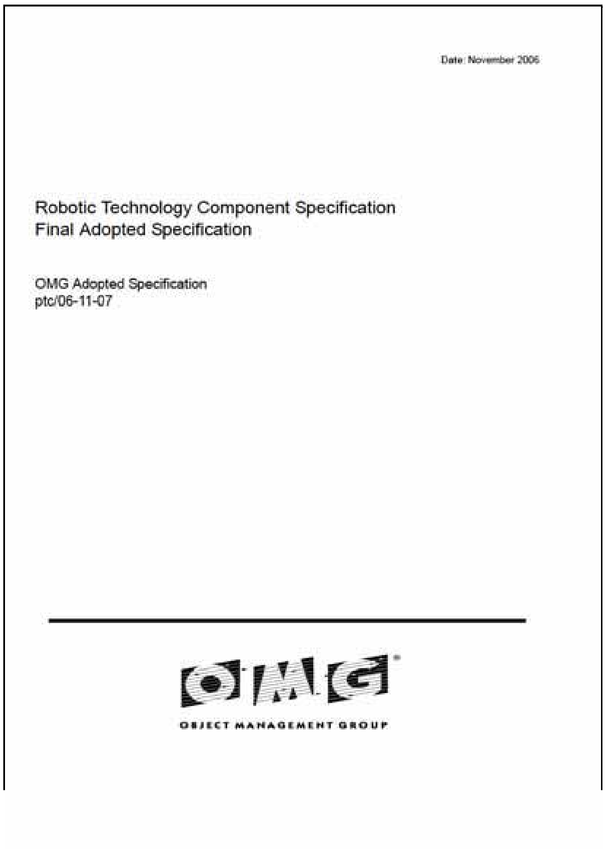
Problem Solving by Modularization



Innovation by Robot System Integration

Standardization Process in OMG

- Atlanta meeting (2005.9)
  - RFP (Request For Proposal) : Robot Technology Components (RTCs) issued
- Burlingame meeting (2005.12)
  - Robotics DTF started
- Tampa meeting (2006.2)
  - Response : PIM and PSM for RT-Component submitted
  - Submitter: AIST、RTI
- Sent Louis meeting (2006.4)
  - Proposals were merged and re-submitted
- Boston meeting (2006.6)
  - RTC Spec. was submitted to AB (rejected).
- Anaheim meeting (2006.9)
  - RTC Spec. was submitted to AB (approved).
  - FTF organized
- Jacksonville meeting (2007.9)
  - FTF report was approved
- OMG RTC Specification will be released officially from OMG until Feb. 2008.

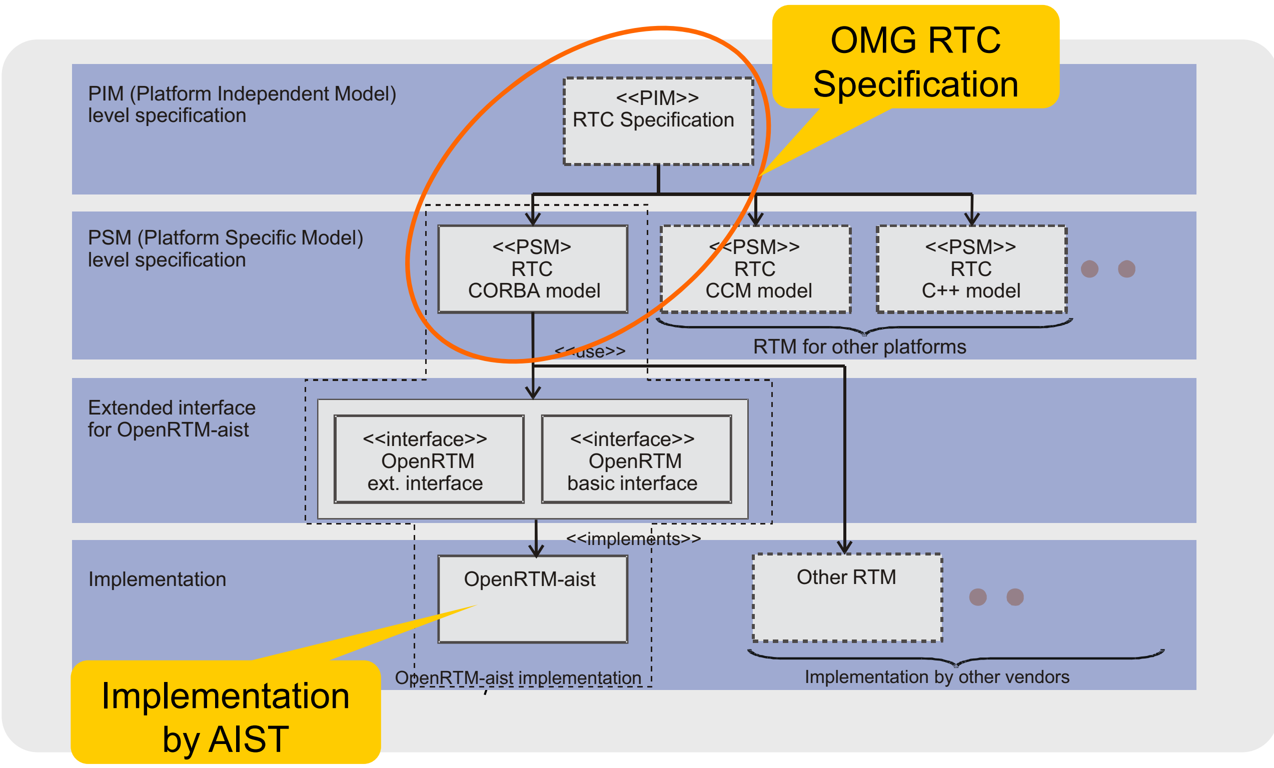

Date: November 2006

Robotic Technology Component Specification
Final Adopted Specification

OMG Adopted Specification
ptc/06-11-07

OBJECT MANAGEMENT GROUP

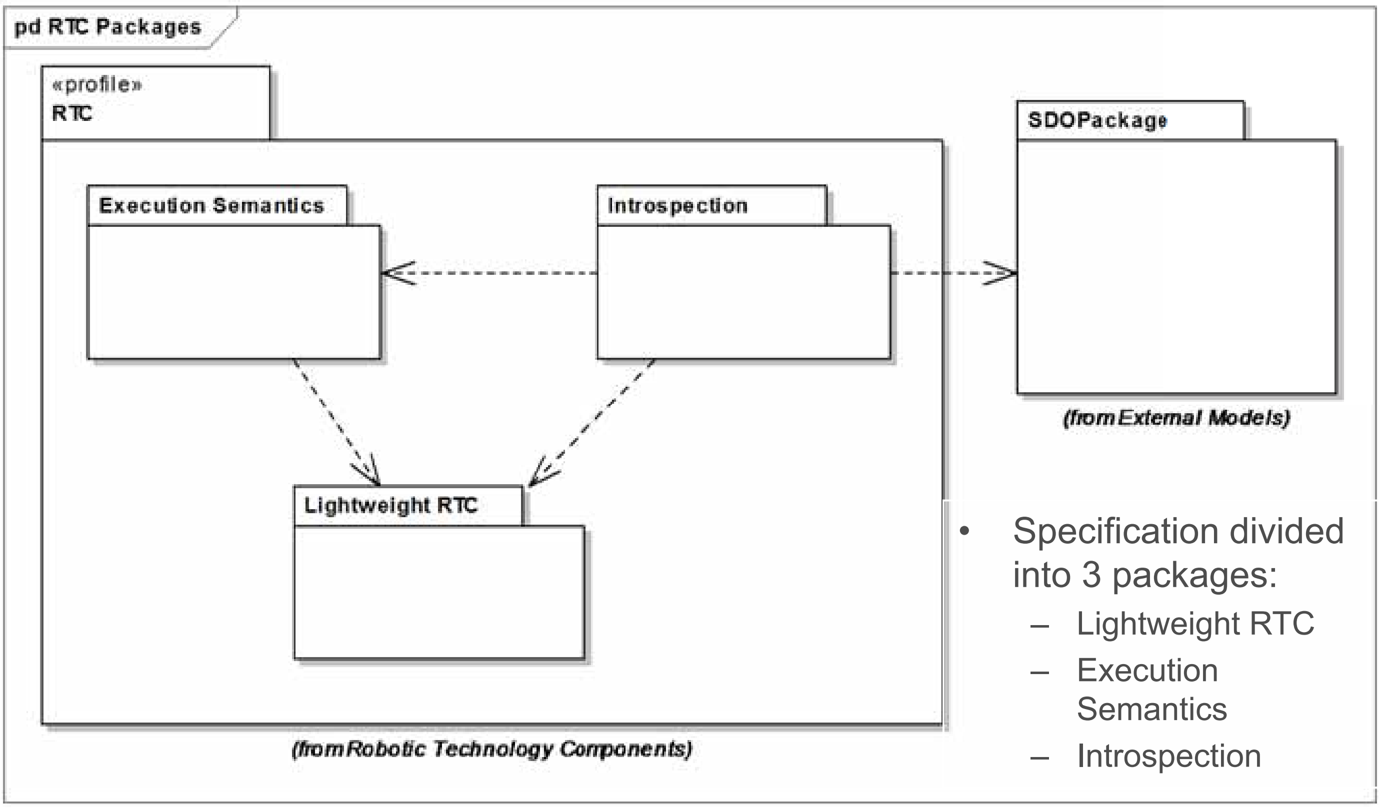
OMG RTC Spec. and OpenRTM-aist



Features of RTC

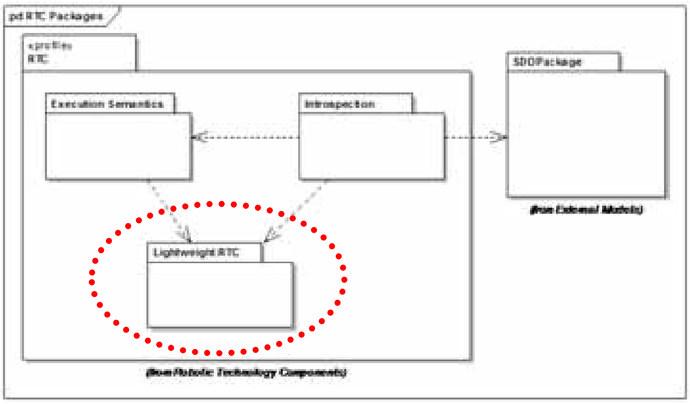
- Provides rich component lifecycle to enforce state coherency among components
- Defines data structures for describing components and other elements
- Supports fundamental design patterns
  - Collaboration of fine-grained components tightly coupled in time (*e.g.* Simulink)
  - Stimulus response with finite state machines
  - Dynamic composition of components collaborating synchronously or asynchronously

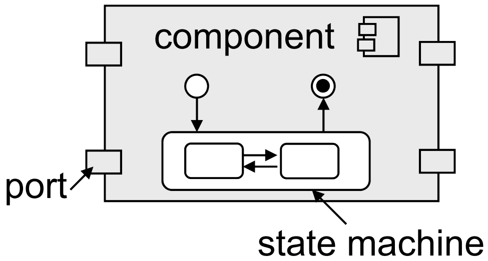
PIM Overview



- Specification divided into 3 packages:
  - Lightweight RTC
  - Execution Semantics
  - Introspection

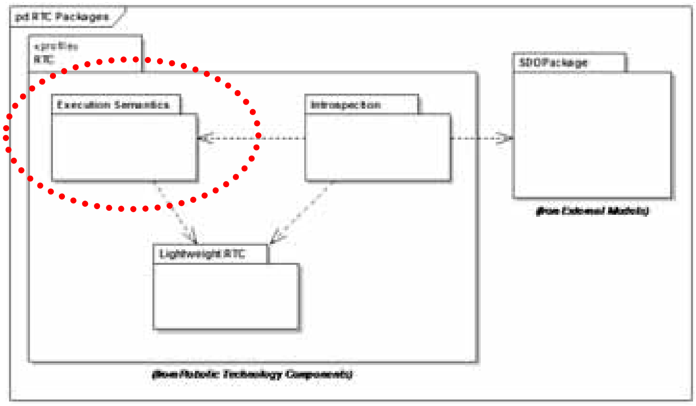
PIM Overview: Lightweight RTC

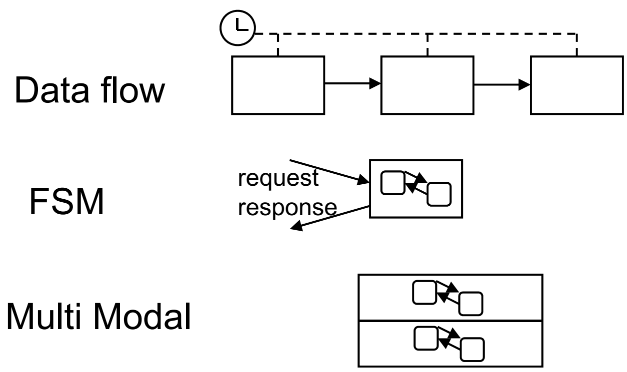




- Lightweight RTC
  - Stereotypes and constraints for components, ports, and connectors
  - Component lifecycle
  - Baseline support for component execution
  - No reflection or introspection for dynamic system construction
  - Mainly used for static component

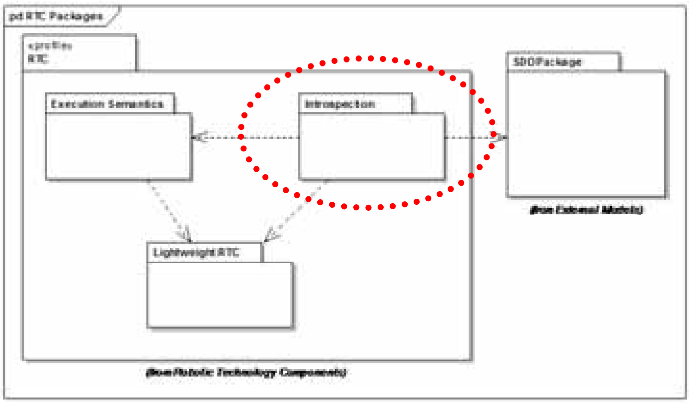
PIM Overview: Execution

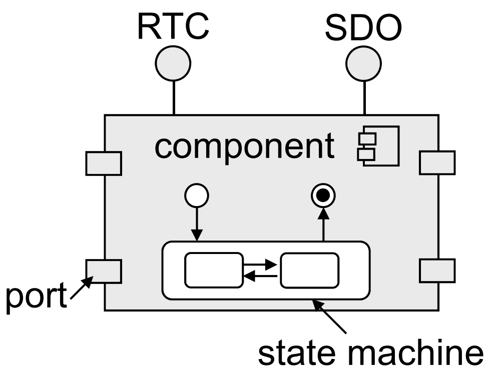




- Execution Semantics
  - Provides behavioral design patterns commonly used in robotic systems
  1. Periodic synchronous execution (“data flow”)
  2. Stimulus response/event-driven execution (FSMs)
  3. Multi-modal behavior

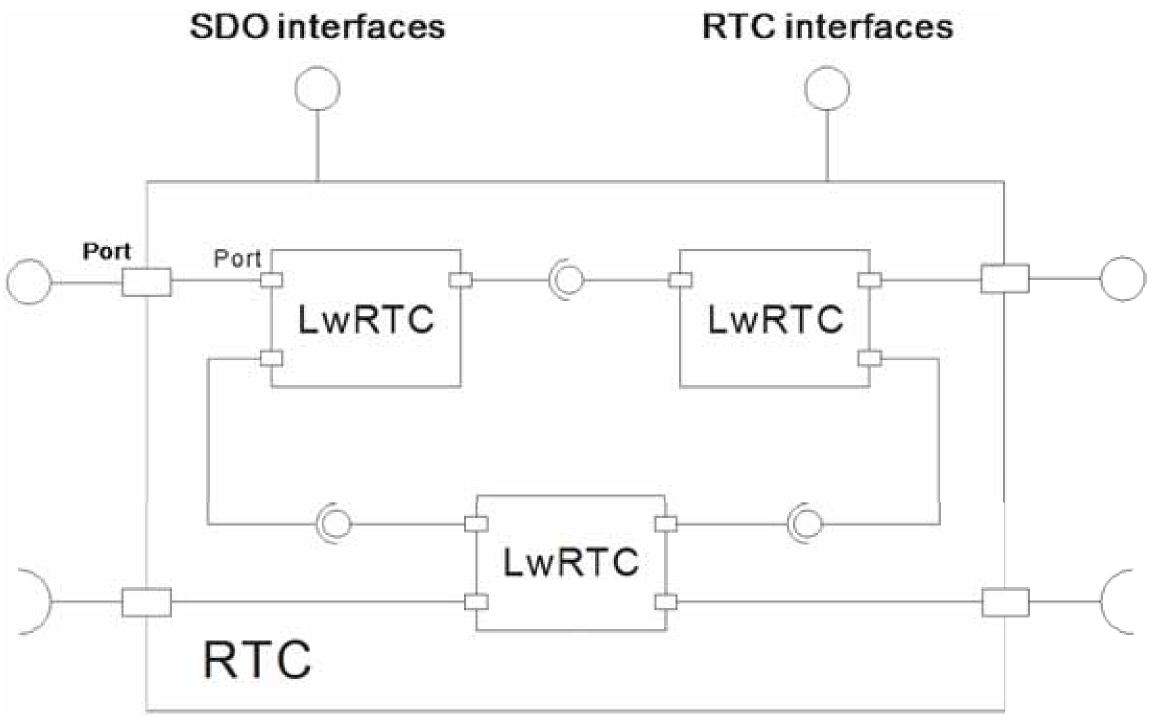
PIM Overview: Introspection





- Introspection
  - Query and modify component properties and connections at runtime
  - Based on Super-Distributed Objects (SDO)
  - Mainly used for dynamic component system integration

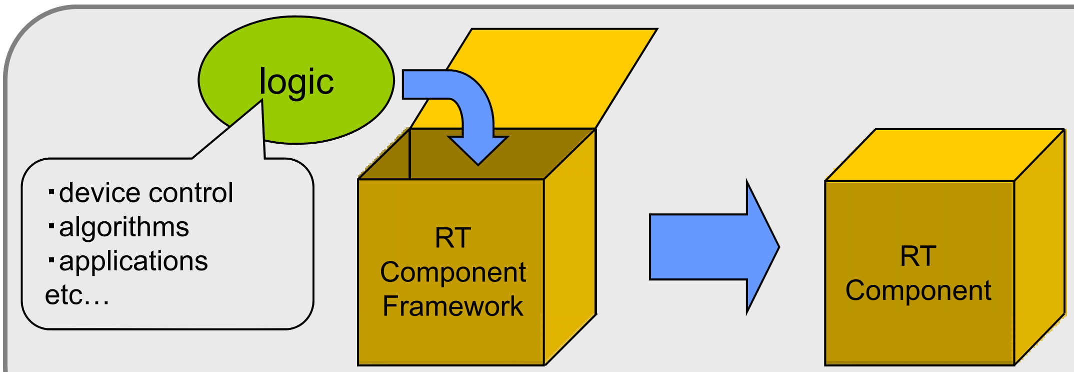
RT Component Example



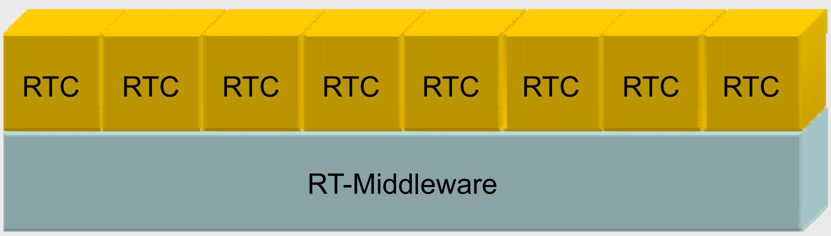
PSM (Platform-Specific Models)

- CORBA IDL
  - CORBA 2.x compliant IDL is provided.
- Lightweight CORBA Component Model
  - A.k.a Lightweight CCM
  - Distributed CORBA-based components.
- Local components
  - Low-overhead communication in a single process.
  - C++ mapping is provided.

RT-Middleware & RT-Component



Logic/algorithm with common interfaces = RT-Component（RTC）



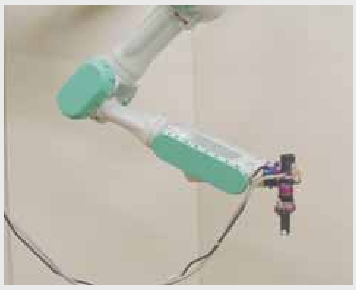
Execution environment for RTC＝RT-Middleware（RTM）
※RTCs can be distributed on network

Conventional System Integration

Joystick

Joystick software

Robot Arm Control software



Robot Arm

Arm and joystick which have compatible interface can be connected

Conventional System Integration

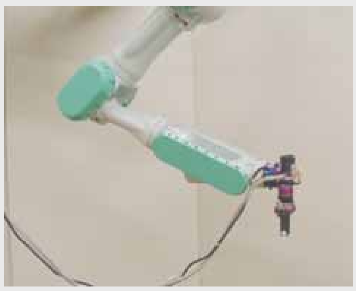
Humanoid's Arm Control software

Humanoid's Arm

Joystick

Joystick software

Robot Arm Control software

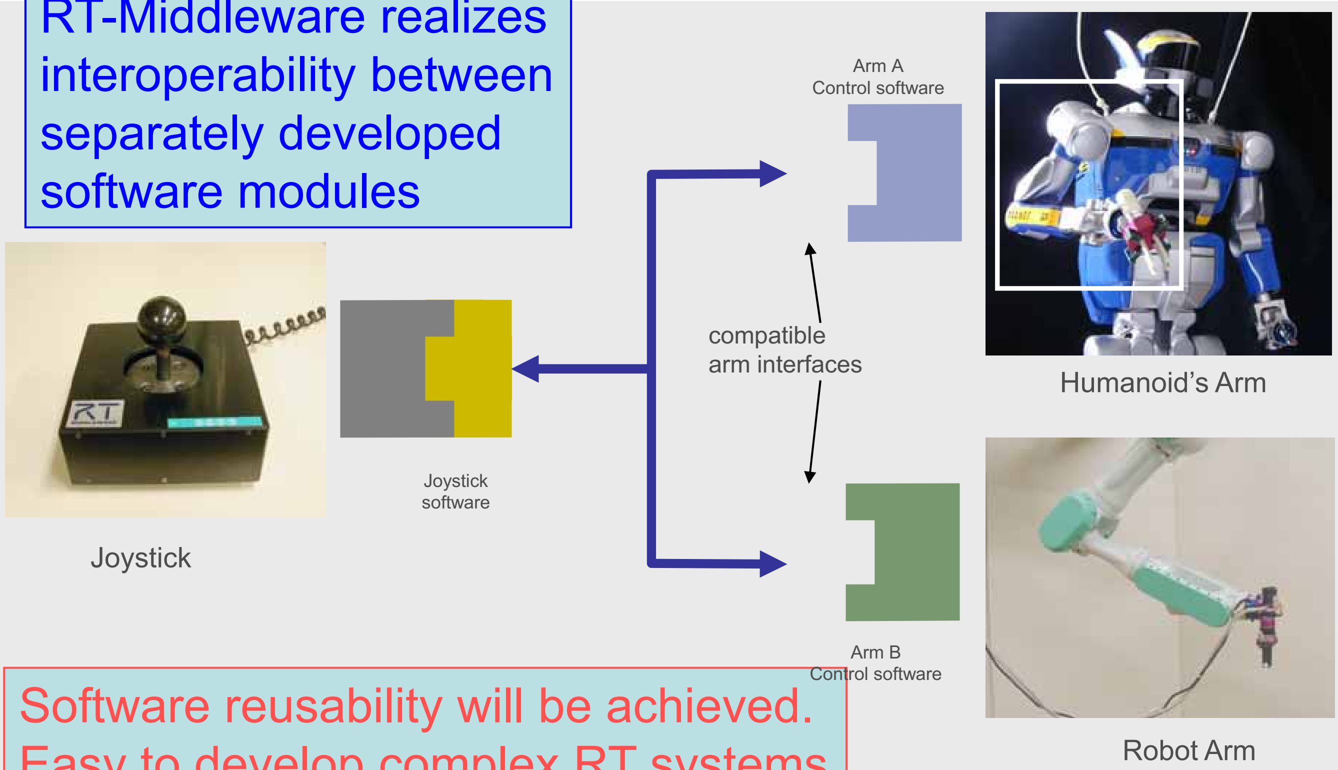


Robot Arm

Modules which has incompatible interfaces cannot be connected

RT-Middleware

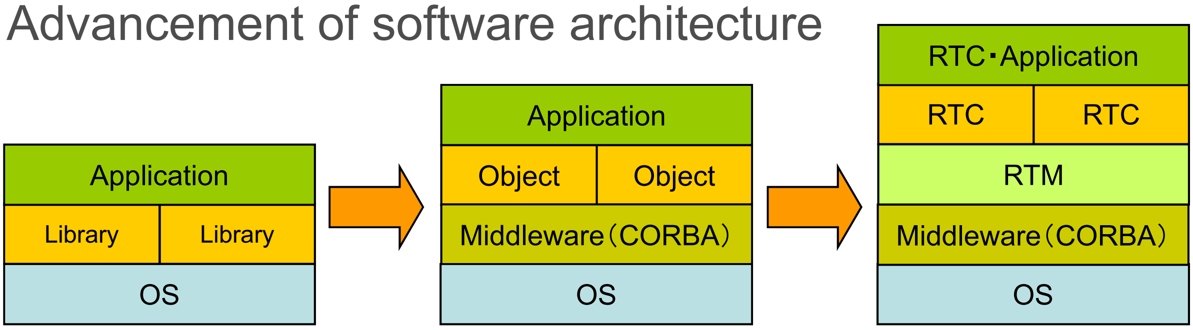
RT-Middleware realizes interoperability between separately developed software modules



Software reusability will be achieved.
Easy to develop complex RT systems

RT-Component

Advancement of software architecture



Conventional software to distributed objects

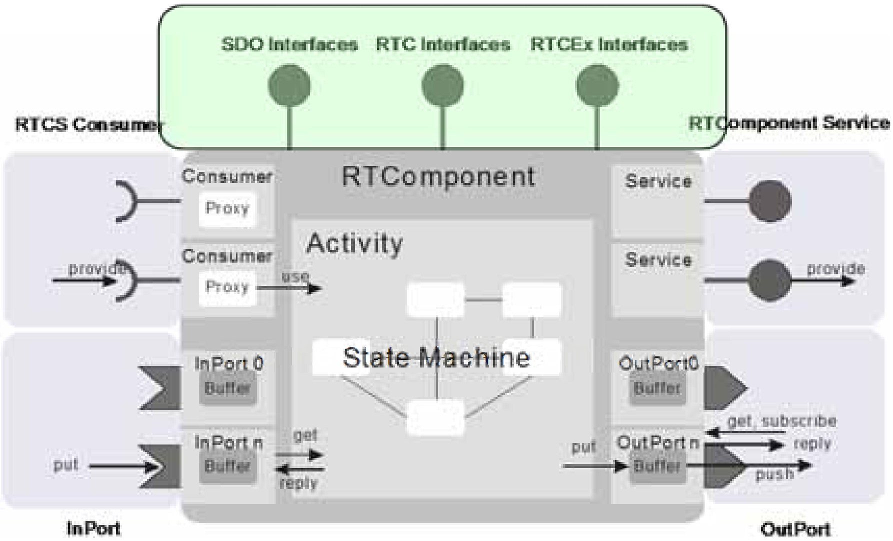
- Object oriented development
- Overcome difference among languages･OS
  - Interface definition by IDL
  - Well defined mapping to various languages
  - Independent from OS, architecture
- Network transparent
  - Easy development distributed systems

Distributed objects to RTC

- Well defined interfaces
  - Standard interfaces defined by IDL
  - Standard behavior defined by OMG RTC standard
  - Utilize as common unit
- Introspection
  - Meta-data available from I/F
  - Dynamic changes of connection/structure
- RTC provides robot specific functions

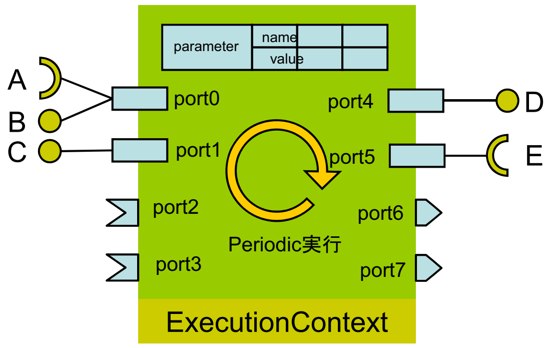
RT-Component Architecture

- Meta-data
  - Profile
  - What kind of component?



RT-Component's Meta-data

- Meta-data
  - RTC's specification
- Introspection
  - Name, type
  - Port (number, kind)
  - Interface information
  - Properties
  - Parameter
  - Execution context
- For dynamic reconfiguration of systems

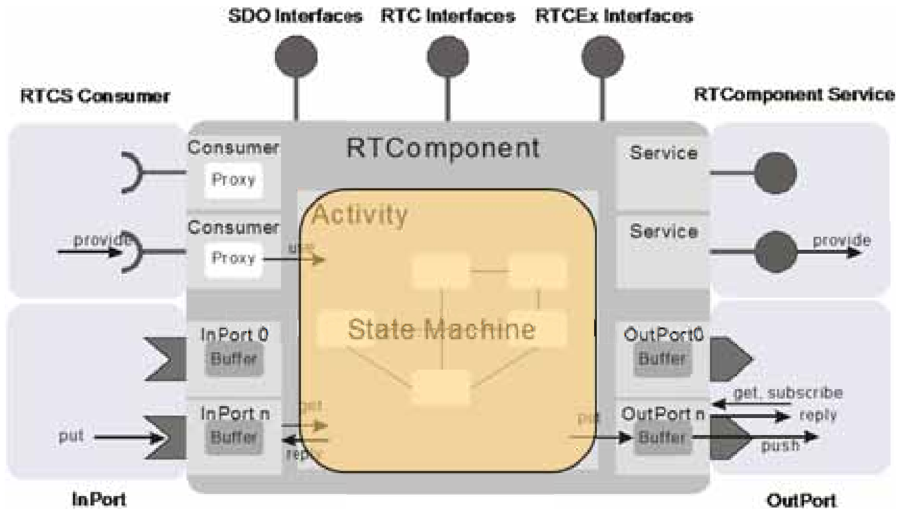


RTC's meta-data example

Name	MyManipulator0
Type	Periodic execution type
port0	Provide: A, Required: B
port1	Provide: C
Port2	DataPort: InPort, velocity, float x6
Port3	DataPort: InPort, position, float x6
Port4	Provide: D
Port5	Required: E
Port6	DataPort: OutPort, status int x1
Port7	DataPort: OutPort, velocity, float x6
ExecutionContext	Period: 10ms
Parameter	gain0(float x6), flag(int x1), dev_file(string)

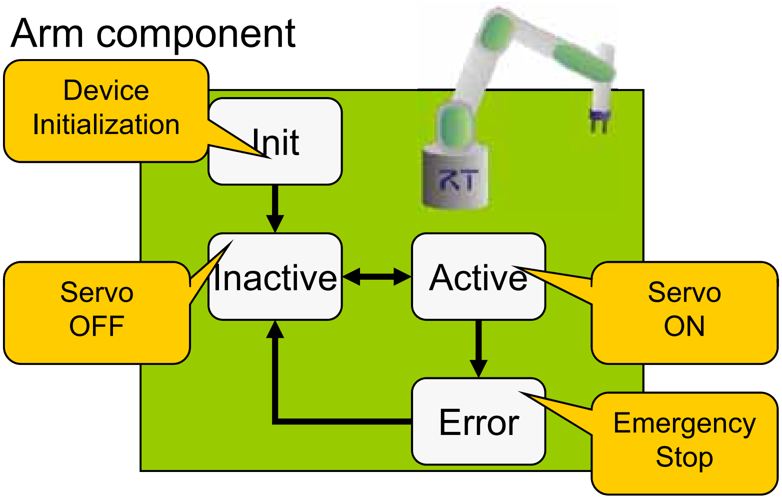
RT-Component Architecture

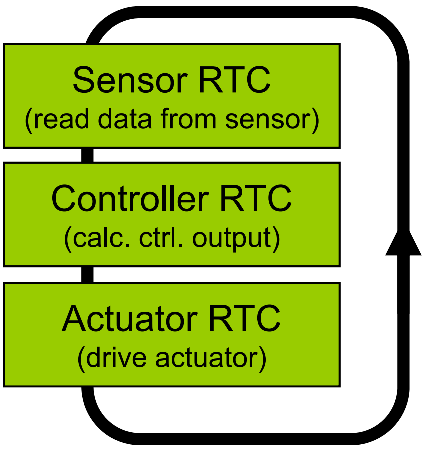
- Meta-data
  - Profile
  - What kind of component?
- Activity
  - Execution of user defined logic



Activity

- Logic Execution
- Common State Machine
  - Initialize
  - Inactive（OFF）
  - Active（ON）
  - Error

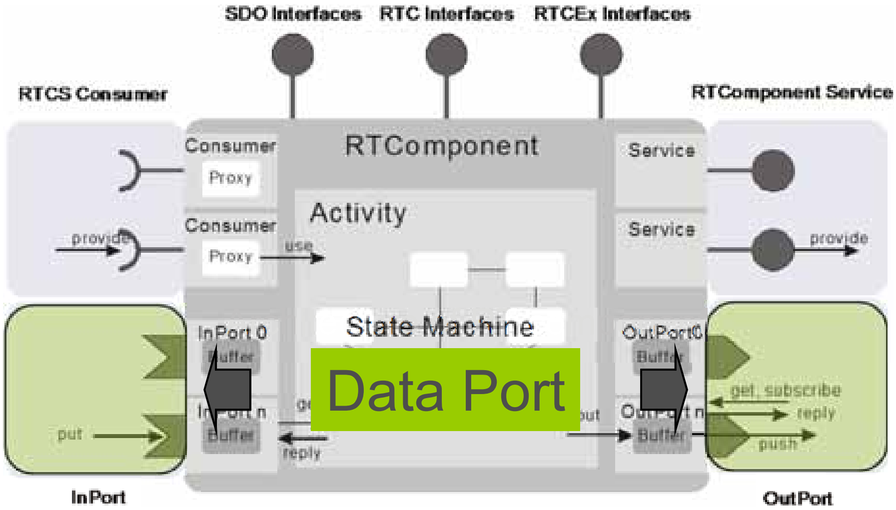




Execute independent components sequentially in real-time thread
→Composite Component

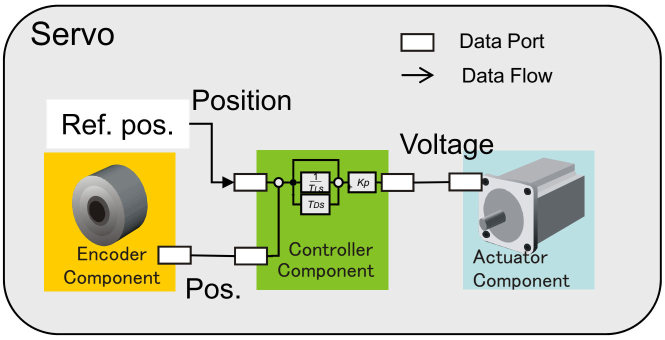
RT-Component Architecture

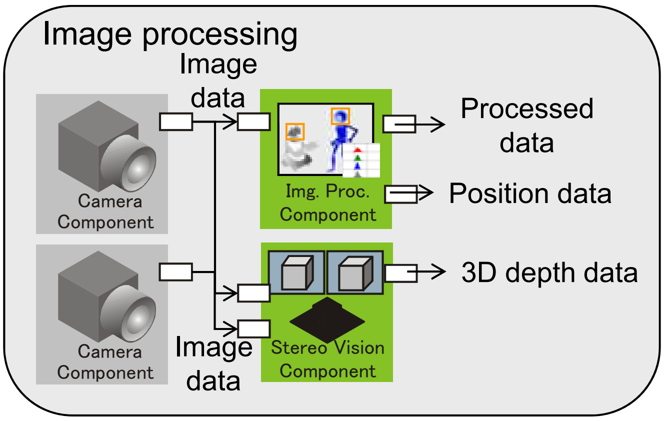
- Meta-data
  - Profile
  - What kind of component?
- Activity
  - Execution of user defined logic
- Data Port
  - Data-centric interaction btw. RTCs

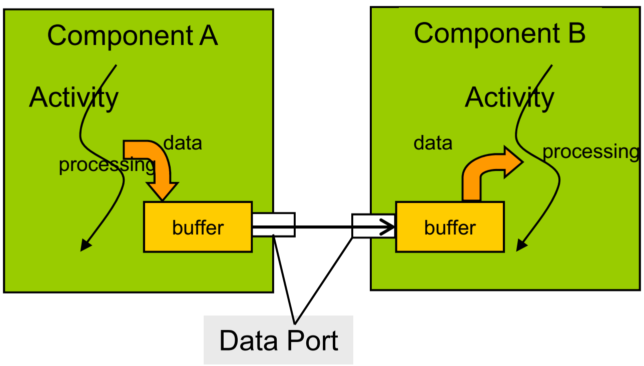


Data Port

- Port for data centric interaction
- Data stream
  - Position control
    - Ex. position, voltage
  - Image processing
    - Ex. image data
- For lower level processing for robot systems
- Same data-typed ports are connectable
- Dynamic connection/disconnection



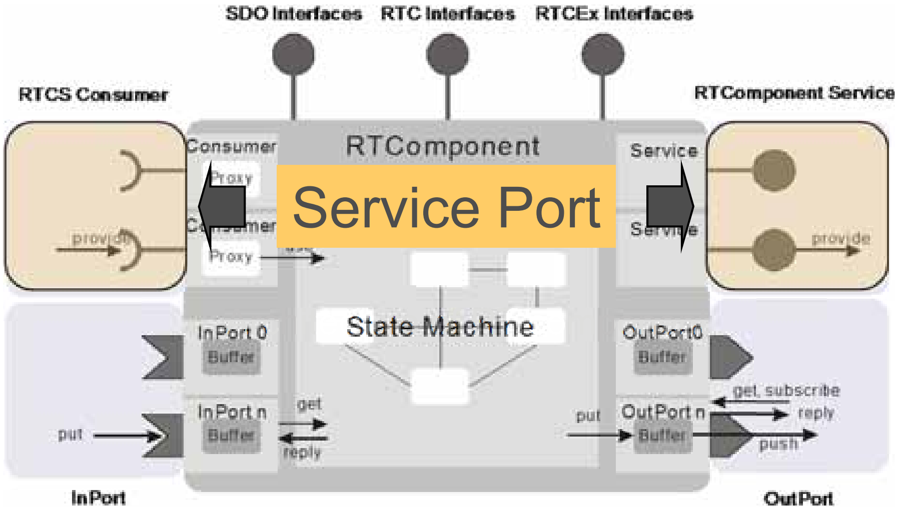




Data are sent automatically

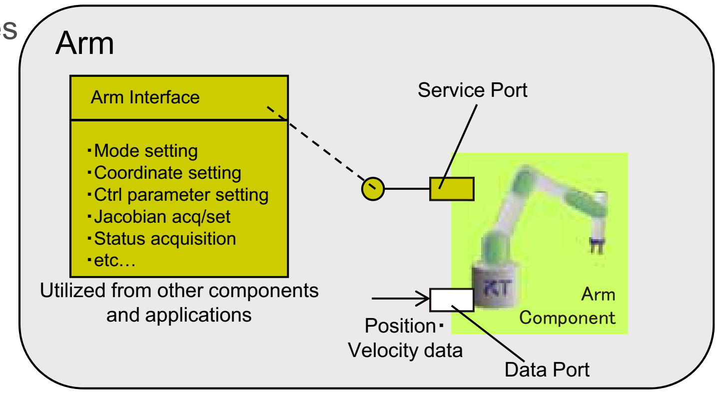
RT-Component Architecture

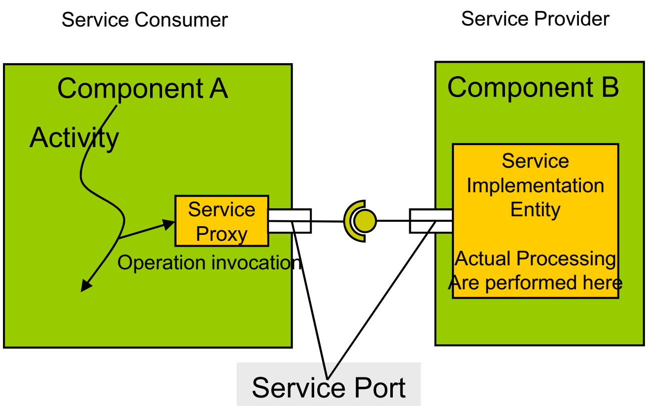
- Meta-data
  - Profile
  - What kind of component?
- Activity
  - Execution of user defined logic
- Data Port
  - Data-centric interaction btw. RTCs
- Service Port
  - request/response type interaction

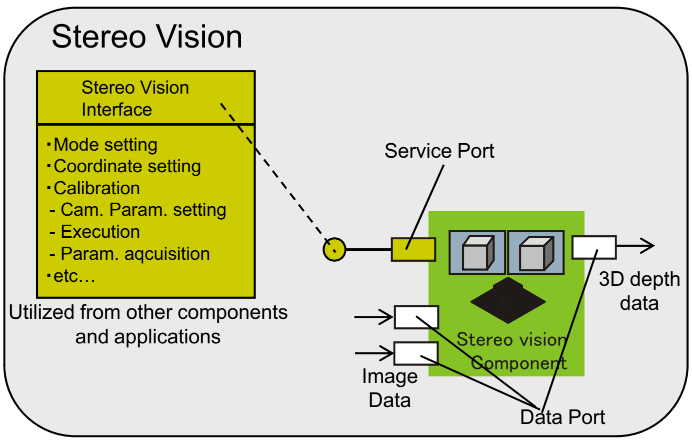


Service Port

- The Port which has any kind of interfaces
  - Developer defined interface
  - Provider Interface
    - Provides services to other components
  - Consumer Interface
    - Consume services of other components
- Service to provide accessibility to
  - Parameter setting,
  - Mode change,
  - Service request and response
  - etc…

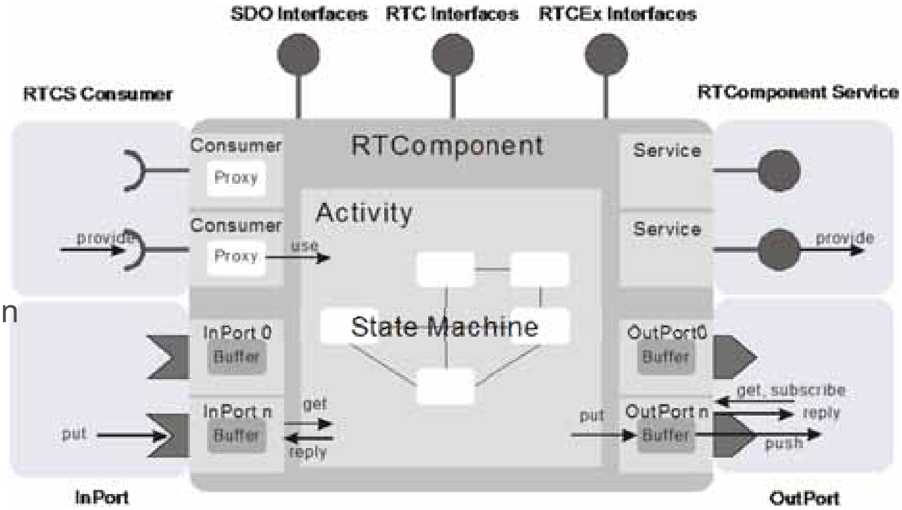






RT-Component Architecture

- Meta-data
  - Profile
  - What kind of component?
- Activity
  - Execution of user defined logic
- Data Port
  - Data-centric interaction btw. RTCs
- Service Port
  - request/response type interaction
- Configuration
  - User defined configuration parameter

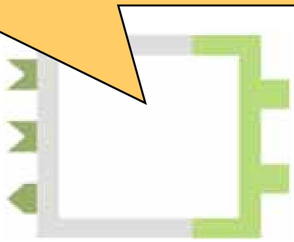


Configuration

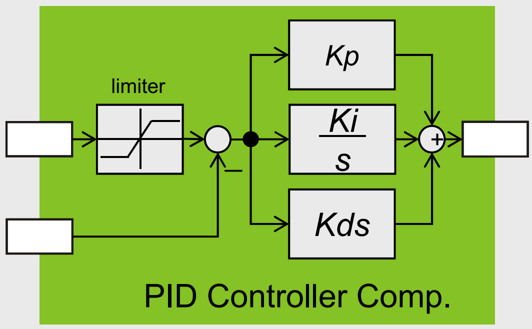
- Configuration
  - Parameter management
  - Configuration Set
    - Set's name、list of name value
    - Two or more sets
    - Sets can be switched

Configuration sets are changeable in run-time

Set A	name					
	value					
Set B	name					
	value					



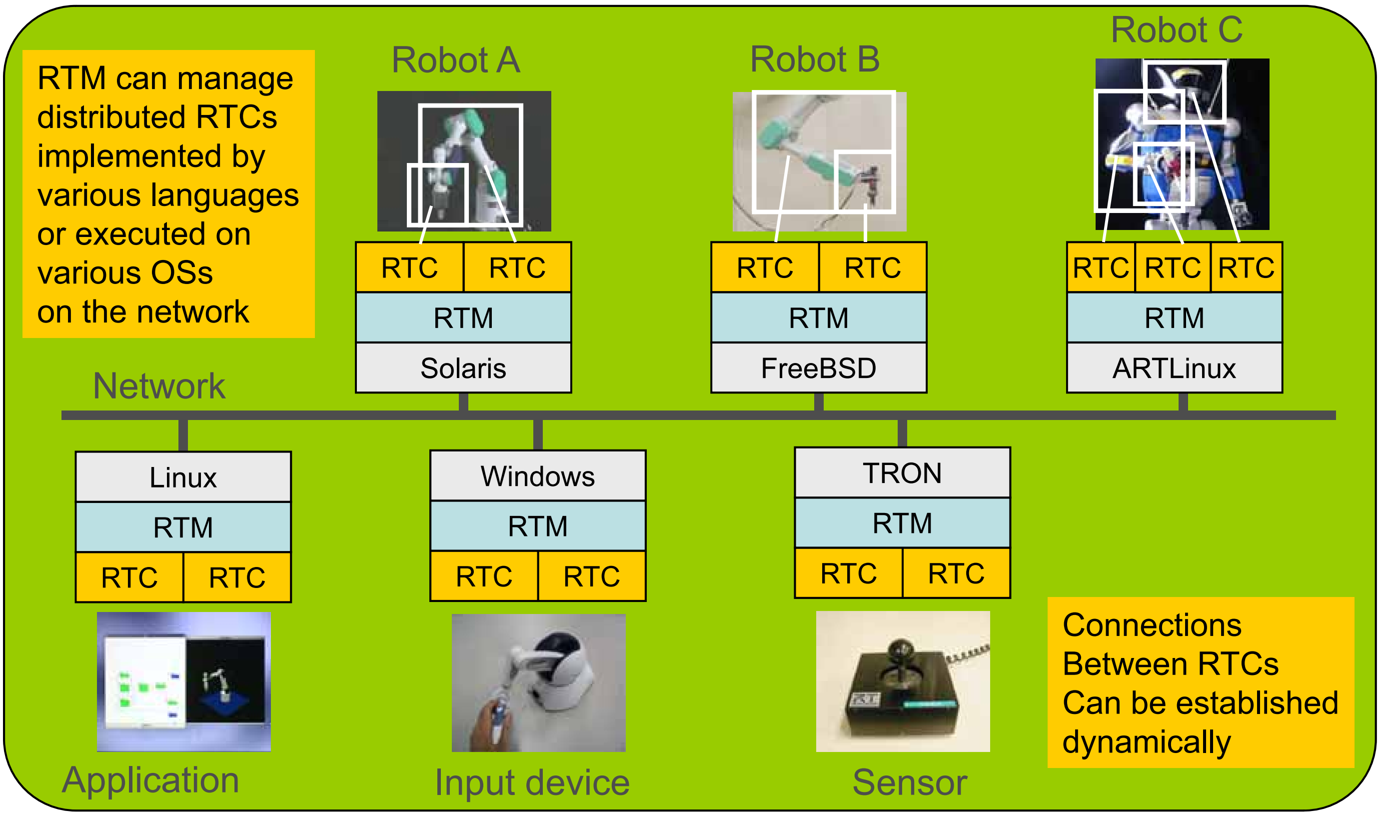
PID Controller



		Kp	Ki	Kd	In_{max}	In_{min}
modeA	value	0.6	0.01	0.4	5.0	-5.0
modeB	value	0.8	0.0	0.01	10.0	-10.0
modeC	value	0.3	0.1	0.31	1.0	-1.0

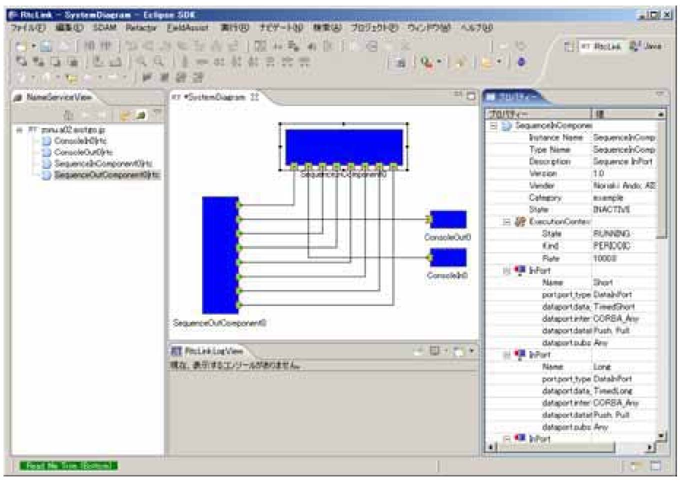
PID gains and limiter parameter can be switched according to controlled plants or modes.
Parameter can be switched any time.

RT-M based Distributed Systems



Development Environment

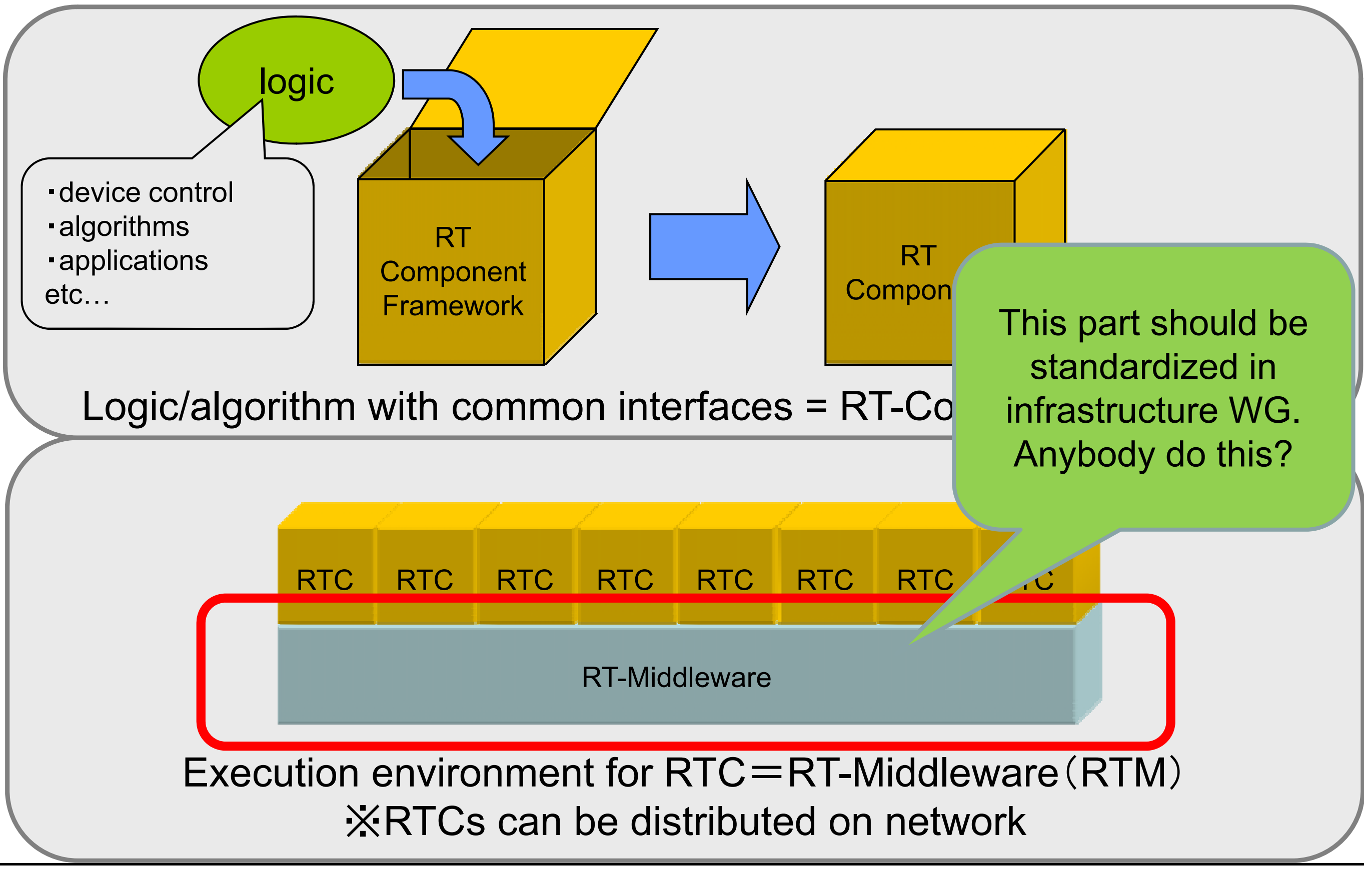
- rtc-template
  - RTC code generator
  - RTC's template codes can be generated according to given RTC's specifications
- RtcLink
  - System developer can construct RTC based systems by using the tool



Integrated Development Environment for RTC・RTM

for RTC design, implementation and debugging, RTCs integration on RTM
Are developed on Eclipse environment

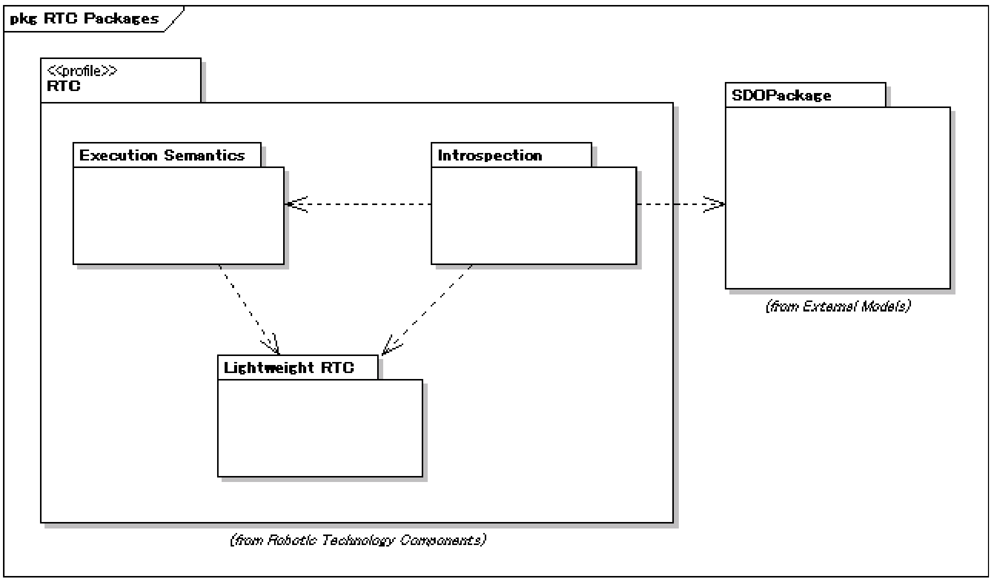
RT-Middleware & RT-Component



Introduction to
Robotic Technology Component

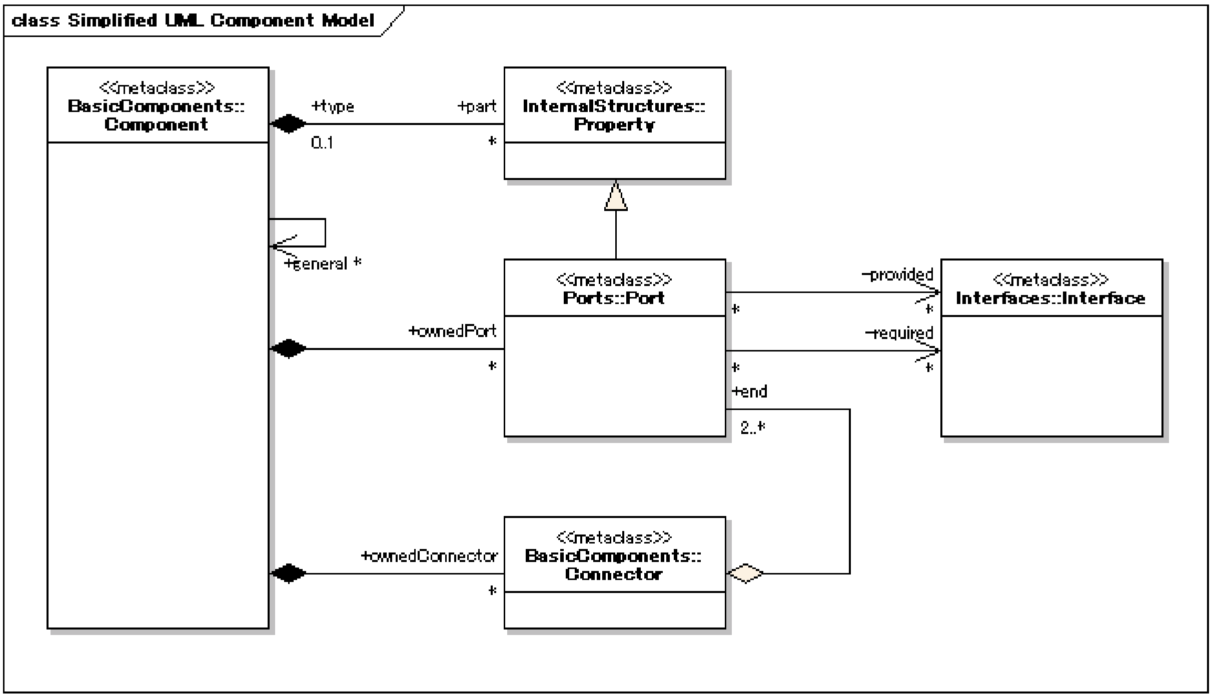
Takeshi Sakamoto
Robot Business Promotion Group
TECHNOLOGIC ARTS INCORPORATED

RTC packages



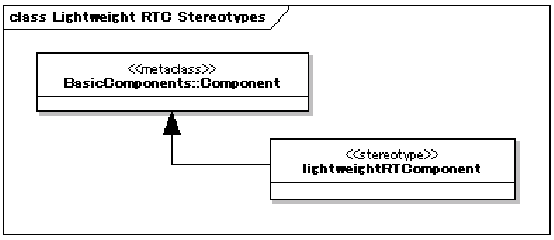
- Lightweight RTC
  - A simple model containing definitions of concepts.
- Execution semantics
  - Extensions to Lightweight RTC to directly support critical design patterns used in robotics applications.
- Introspection
  - An API allowing for the examination of components, ports, etc. at runtime.

Simplified depiction of components and their constituents from [UML]

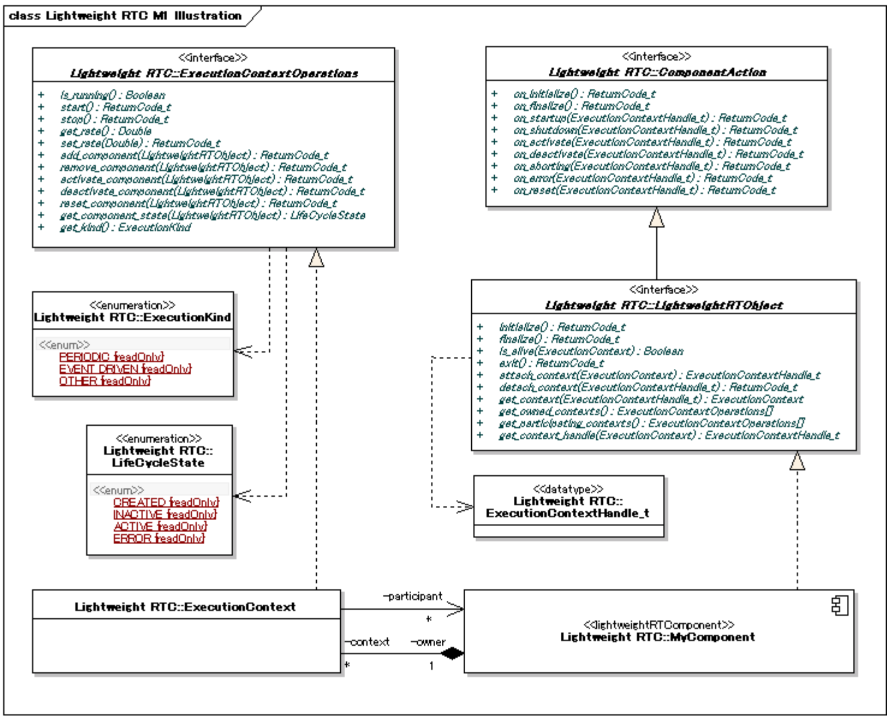


- A component of UML2 is the basis of lightweight RT Component.

Lightweight RTC Structure

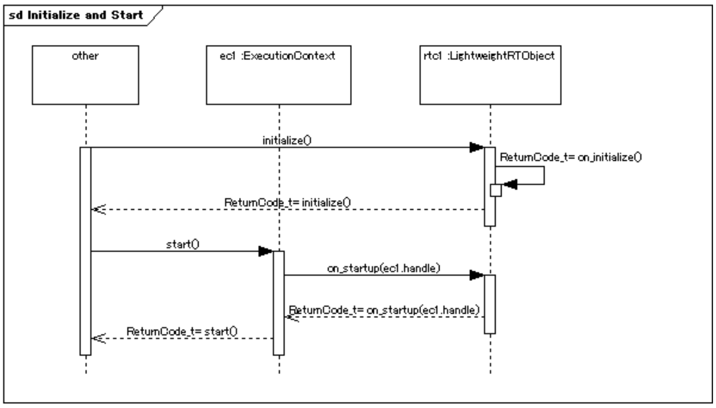


Lightweight RTC Stereotypes

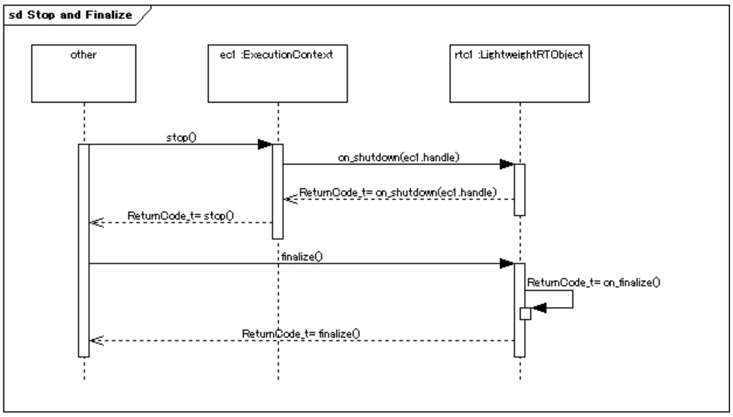


Lightweight RTC M1 Illustration

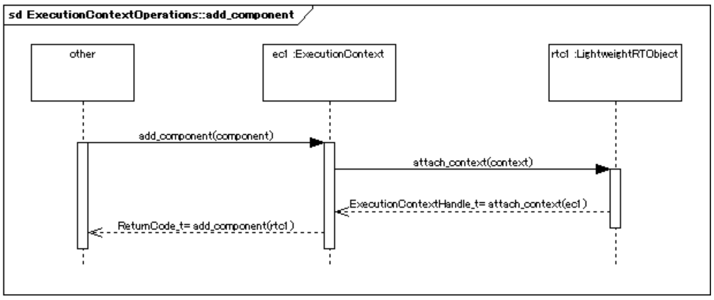
Basic behavior (sequence diagram)



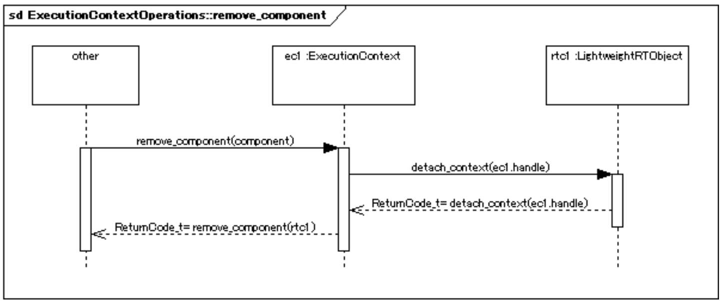
Initialize and Start



Stop and Finalize

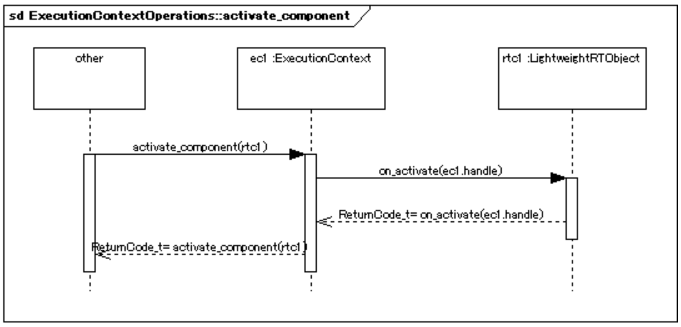


add_component

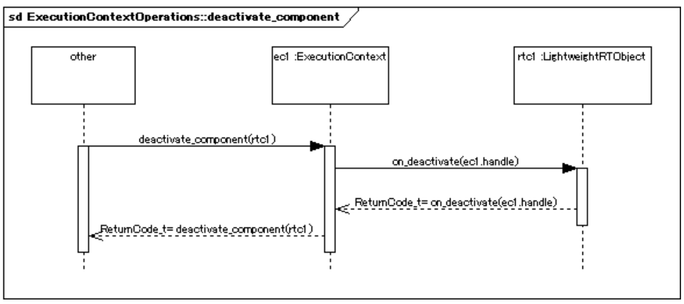


remove_component

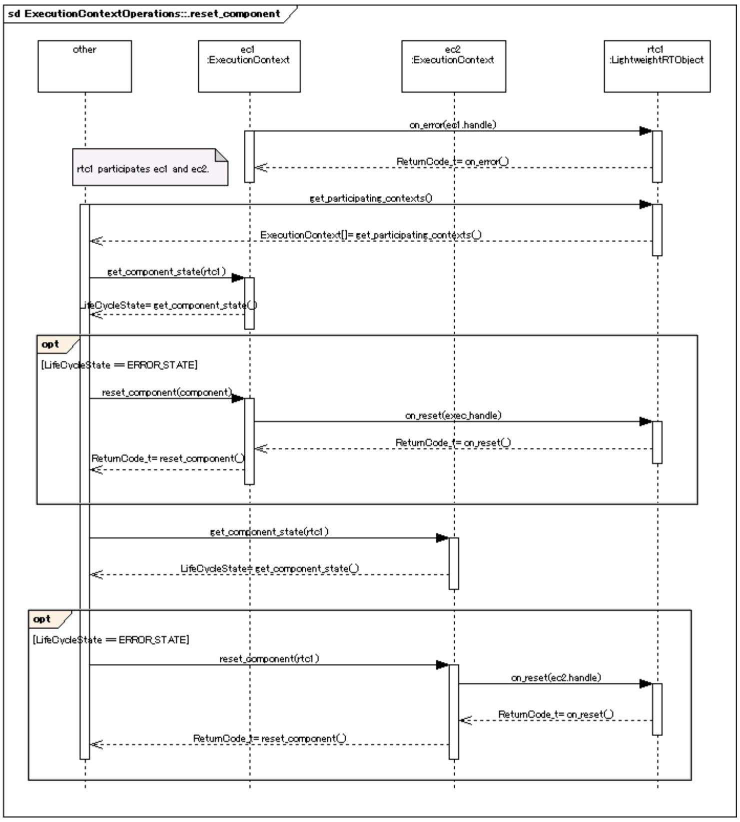
Basic behavior (sequence diagram)



activate_component

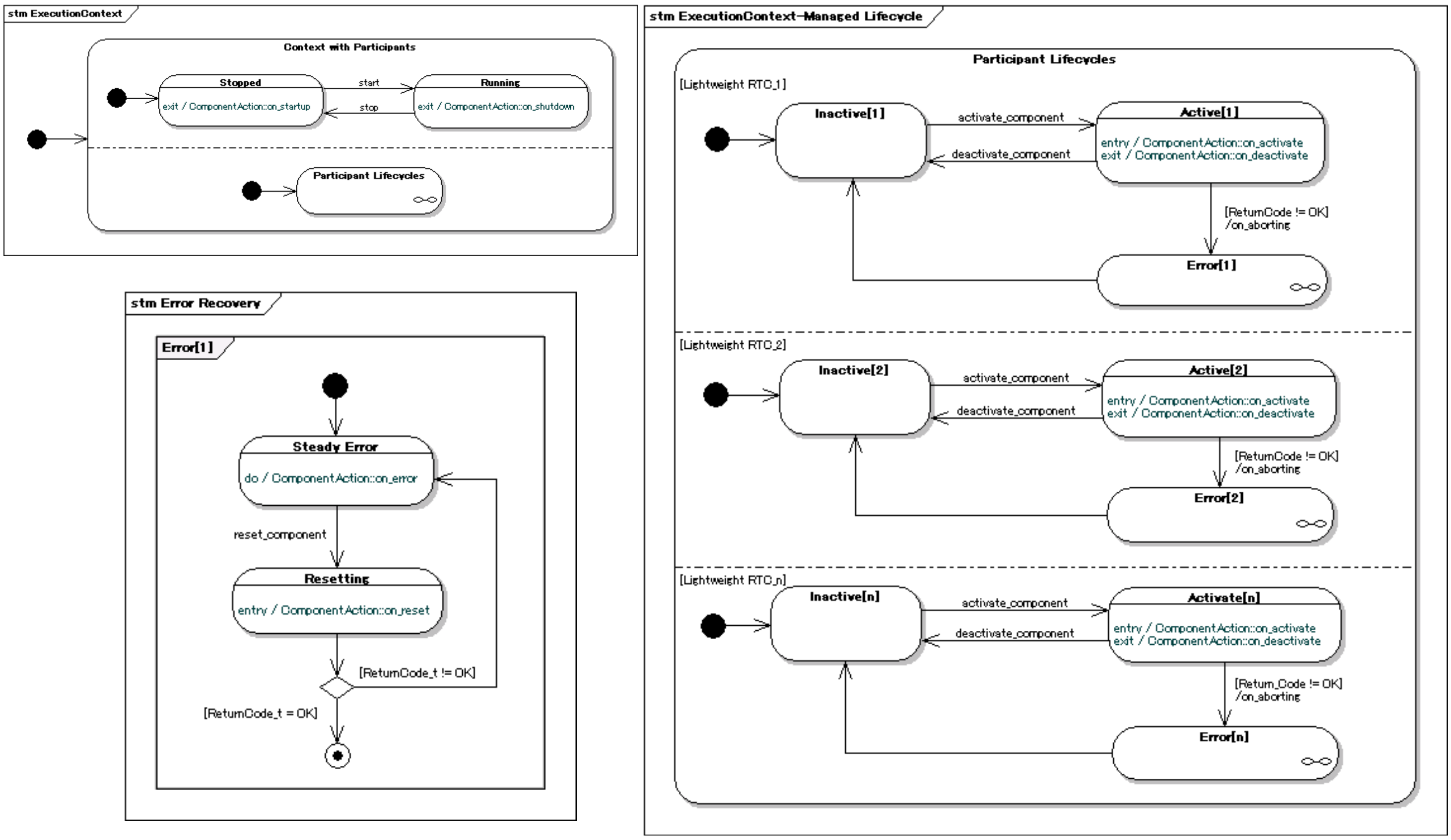


deactivate_component



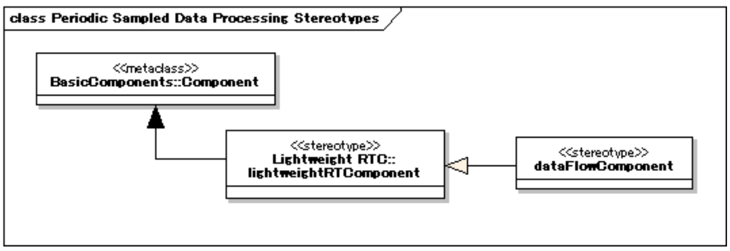
reset_component

StateMachine of ExecutionContext

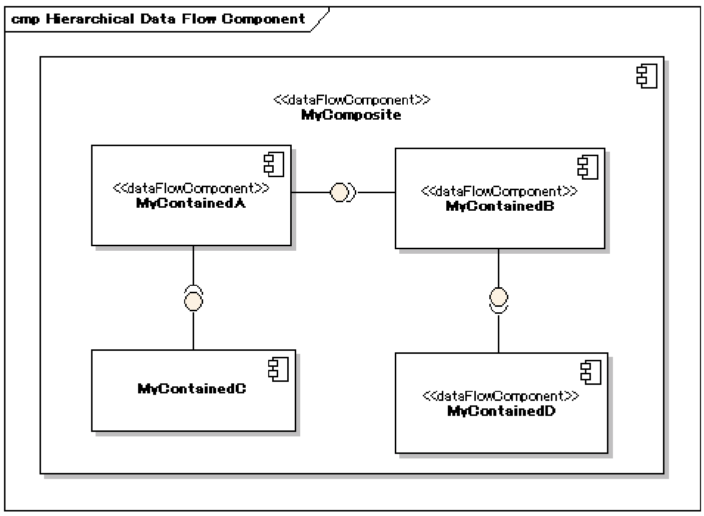


- ExecutionContext manages the states of RT-Component

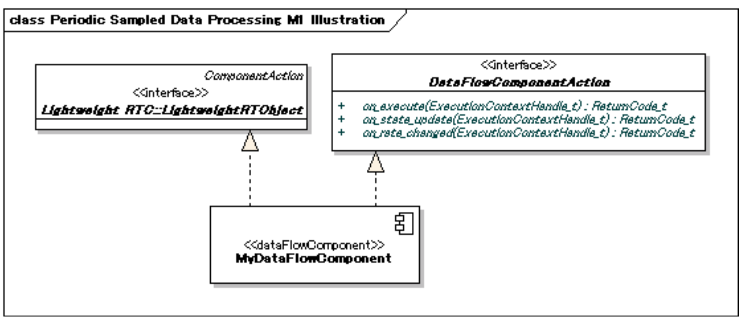
Periodic Sampled Data Processing Structure and Sample



Periodic Sampled Data Processing Stereotypes

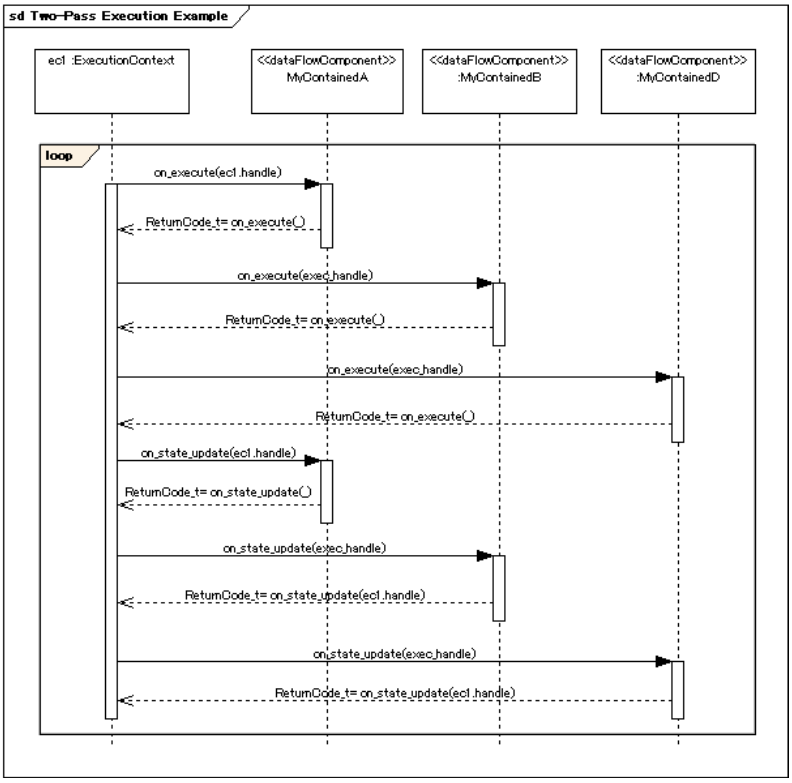


Hierarchical Data flow Component



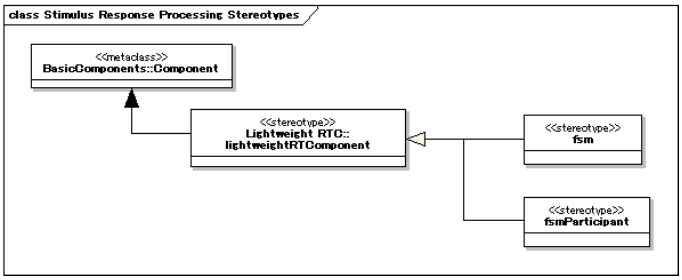
Periodic Sampled Data Processing M1 Illustration

Two-Pass Execution

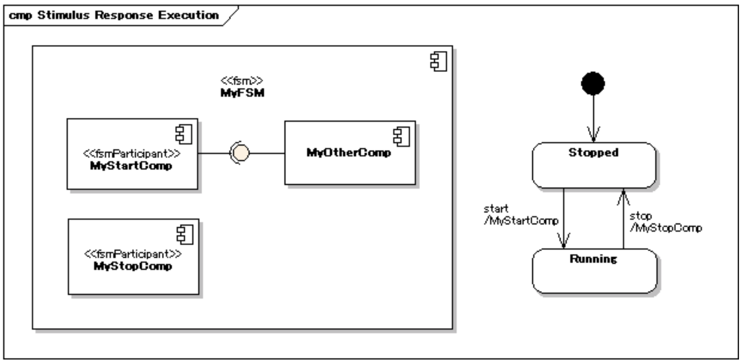


- Primary business logic in on_execute operation.
- Delay any expensive operations or changes to shared state in on_state_update operation.

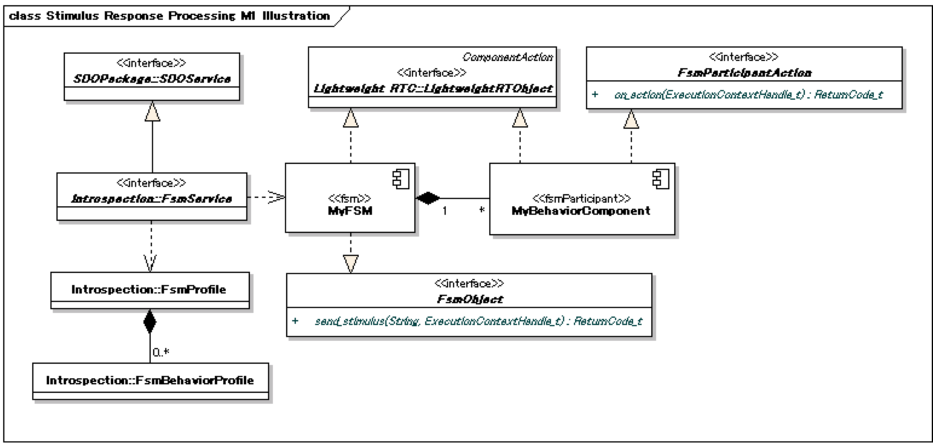
Stimulus Response Processing



Stimulus Response Processing Stereotypes

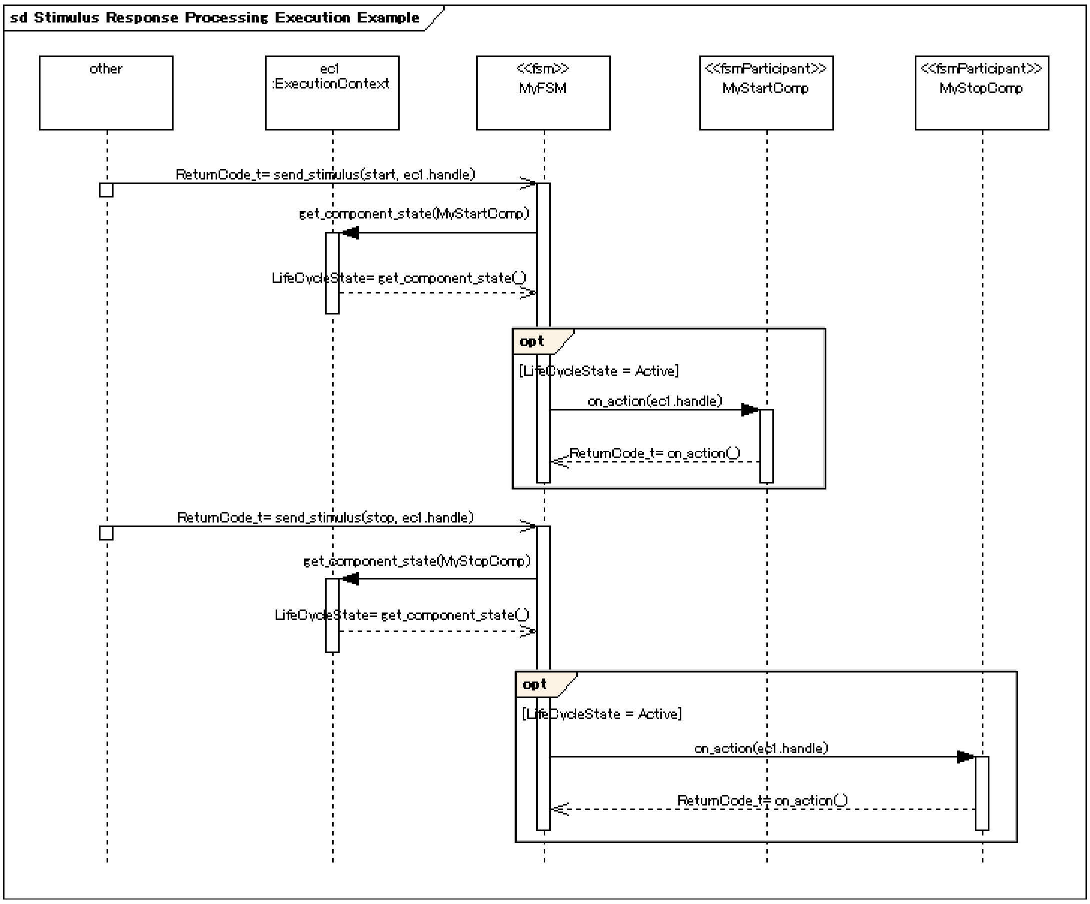


FSM Participant Defines State Transition Behavior

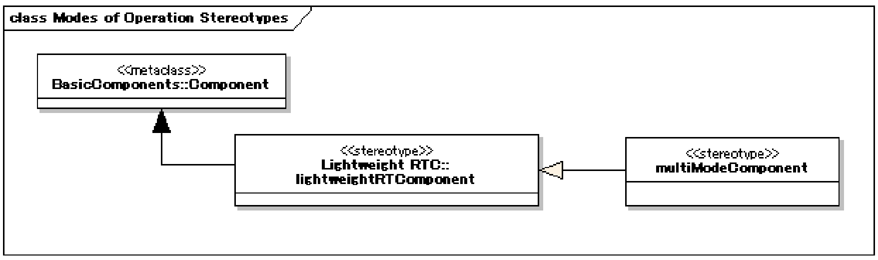


Stimulus Response Processing M1 Illustration

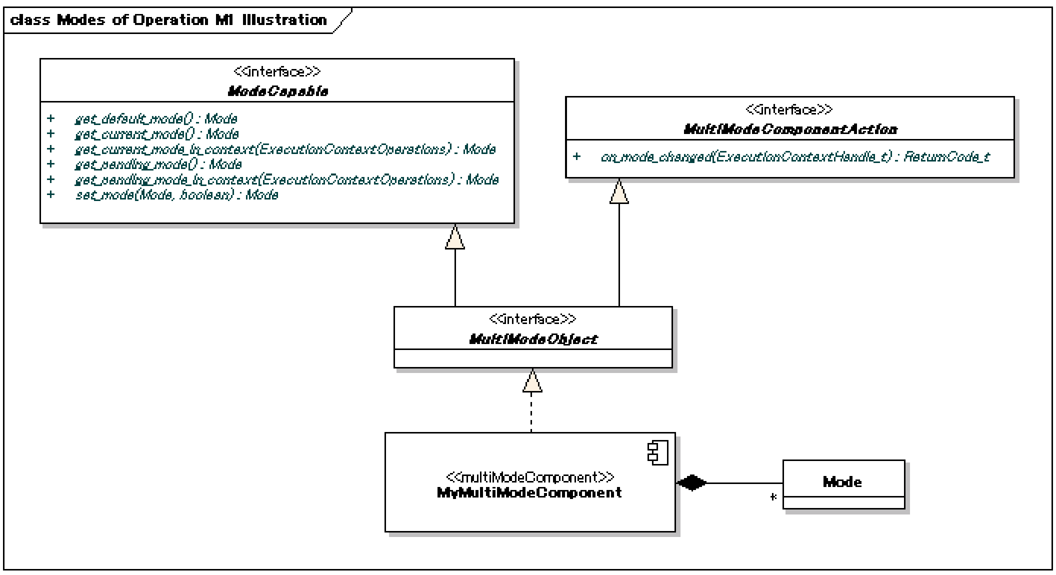
Stimulus Responding Processing Execution Example



Modes of Operation

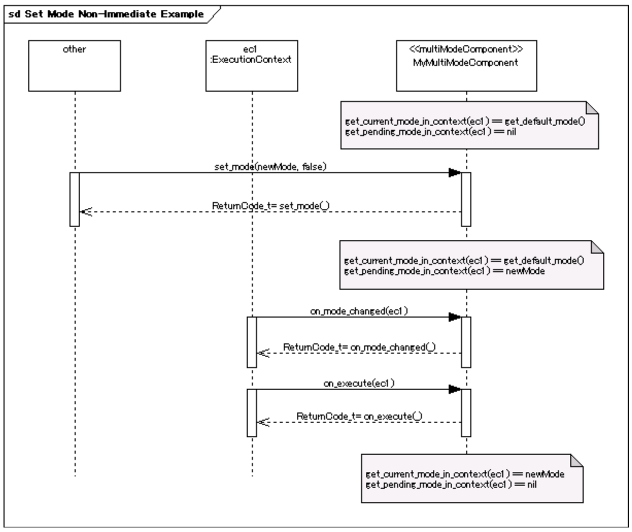


Modes of Operation Stereotypes

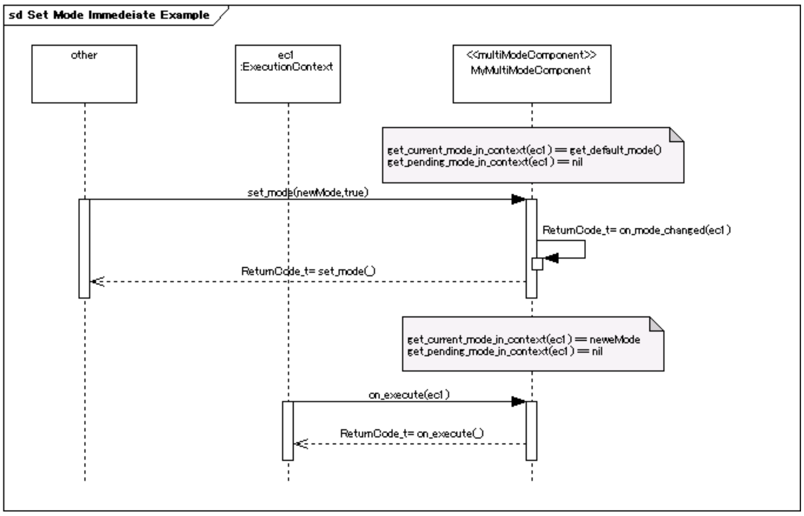


Modes of Operation M1 Illustration

Set Mode Examples

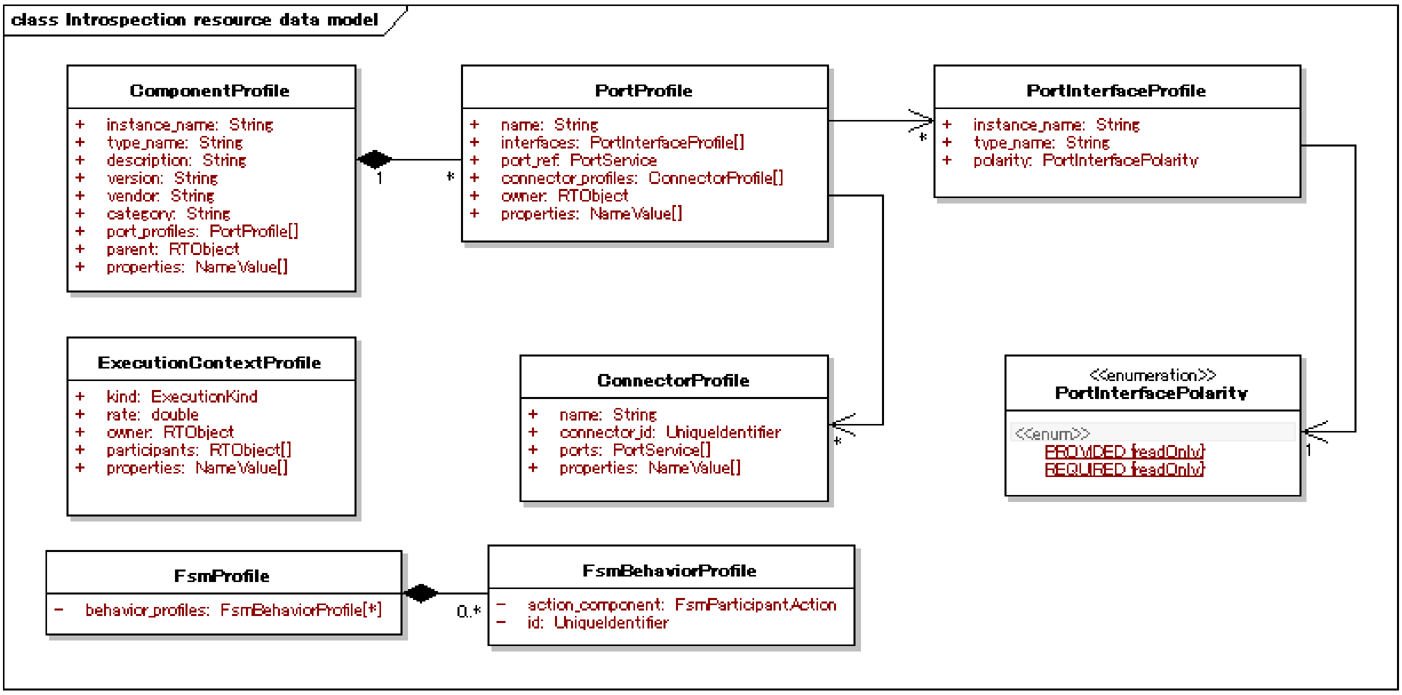


Non-Immediate Example

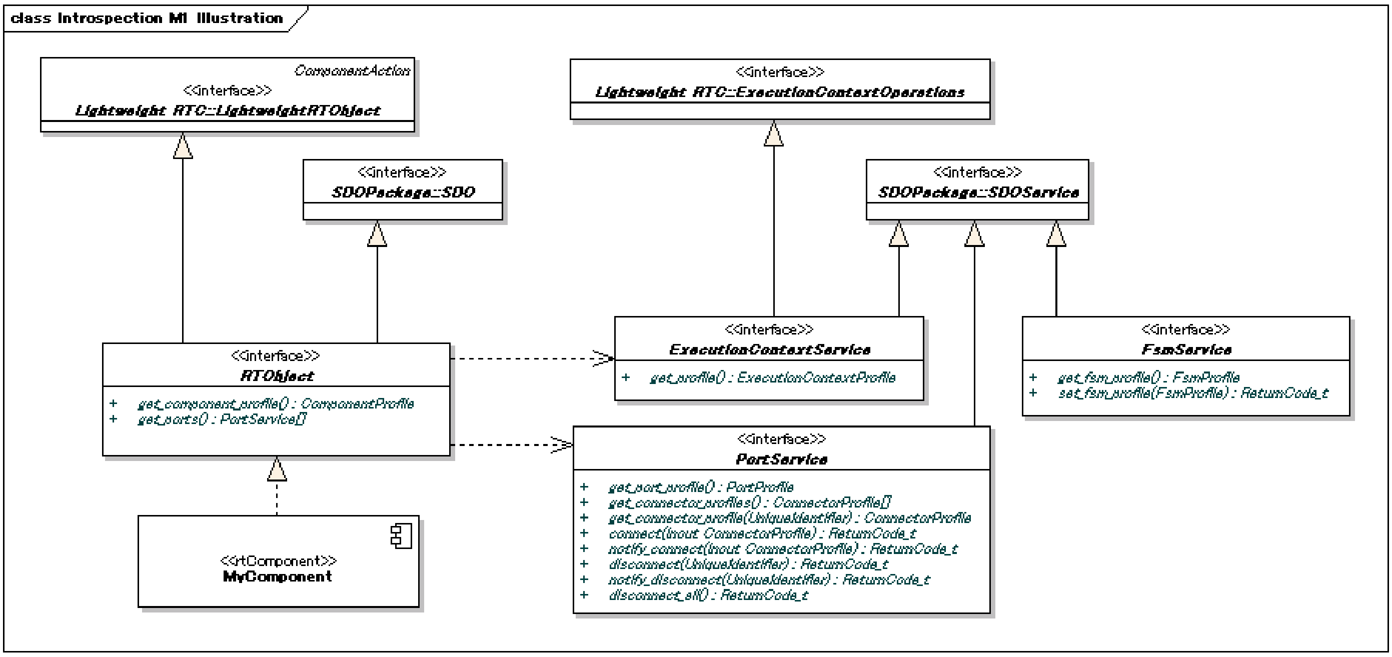


Immediate Example

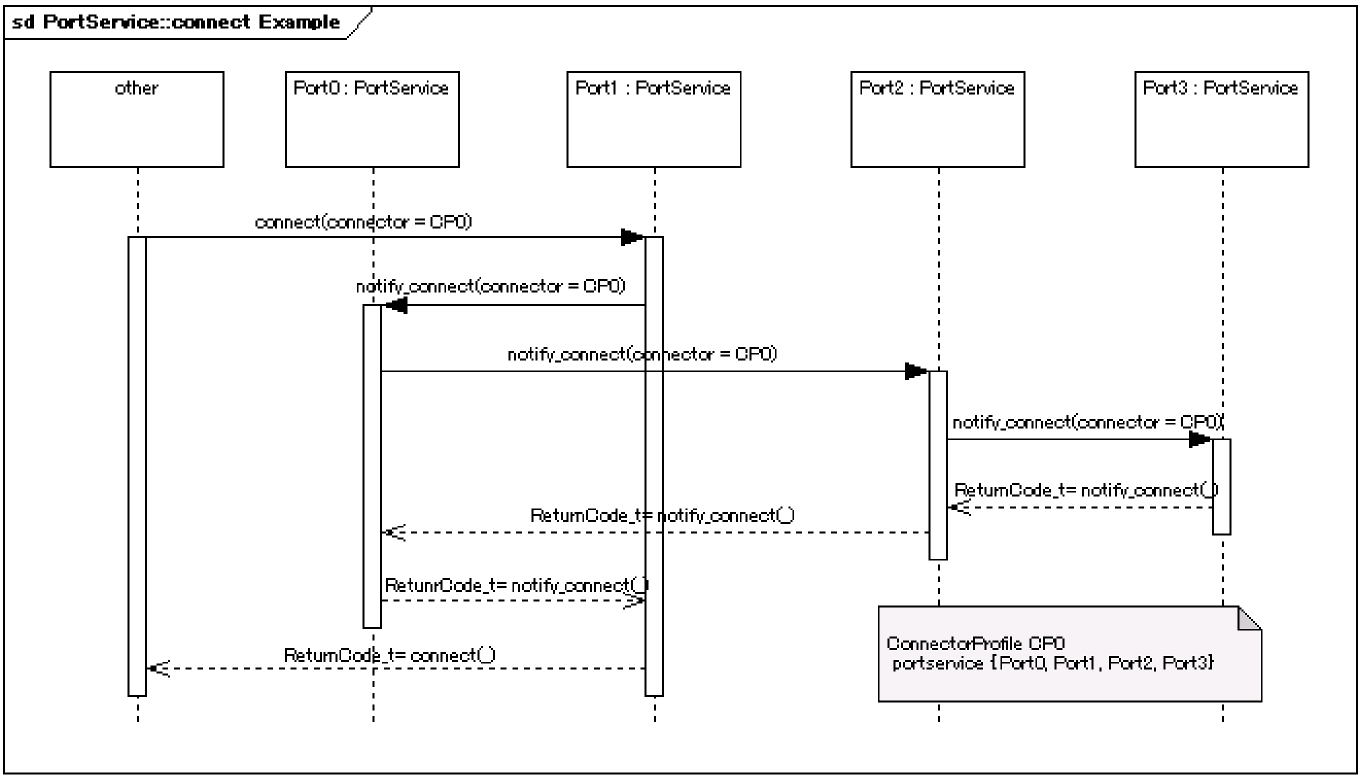
Introspection Resource Data Model



Introspection Interface definition



connect example



Conclusion

- The RTC specification consists of three parts.

- Lightweight RTC
  - LightweightRTComponent
    - basic component that has Lifecycle and realizes real functions or business logic.
  - ExecutionContext
    - a logical thread of control
  - One lightweightRTComponent can have many ExecutionContexts.
  - Many lightweightRTComponents can participate one ExecutionContext.
  - ExecutionContext manages the states of lightweightRTComponent.

Conclusion

- Execution semantics – three kinds
  - Sampled Data Processing
    - Execution sorting
      - Execution order of data flow components is decided by interface direction.
    - Two-pass execution
      - Primary business logic in on_execute operation.
      - Delay any expensive operations or changes to shared state in on_state_update operation.
  - Stimulus Response Processing
    - FSM component decides FSM participant from FsmBehavior Profile.
    - FSM participant defines a Behavior.
  - Modes of Operation
    - Switching between different implementations of a given functionality.
    - Non-immediate type, Immediate type.
- Introspection
  - RTC resource data model and Interfaces.
  - Query and modify component properties and connections at runtime.
  - Based on Super-Distributed Objects (SDO)

Eric Berger

December, 2007

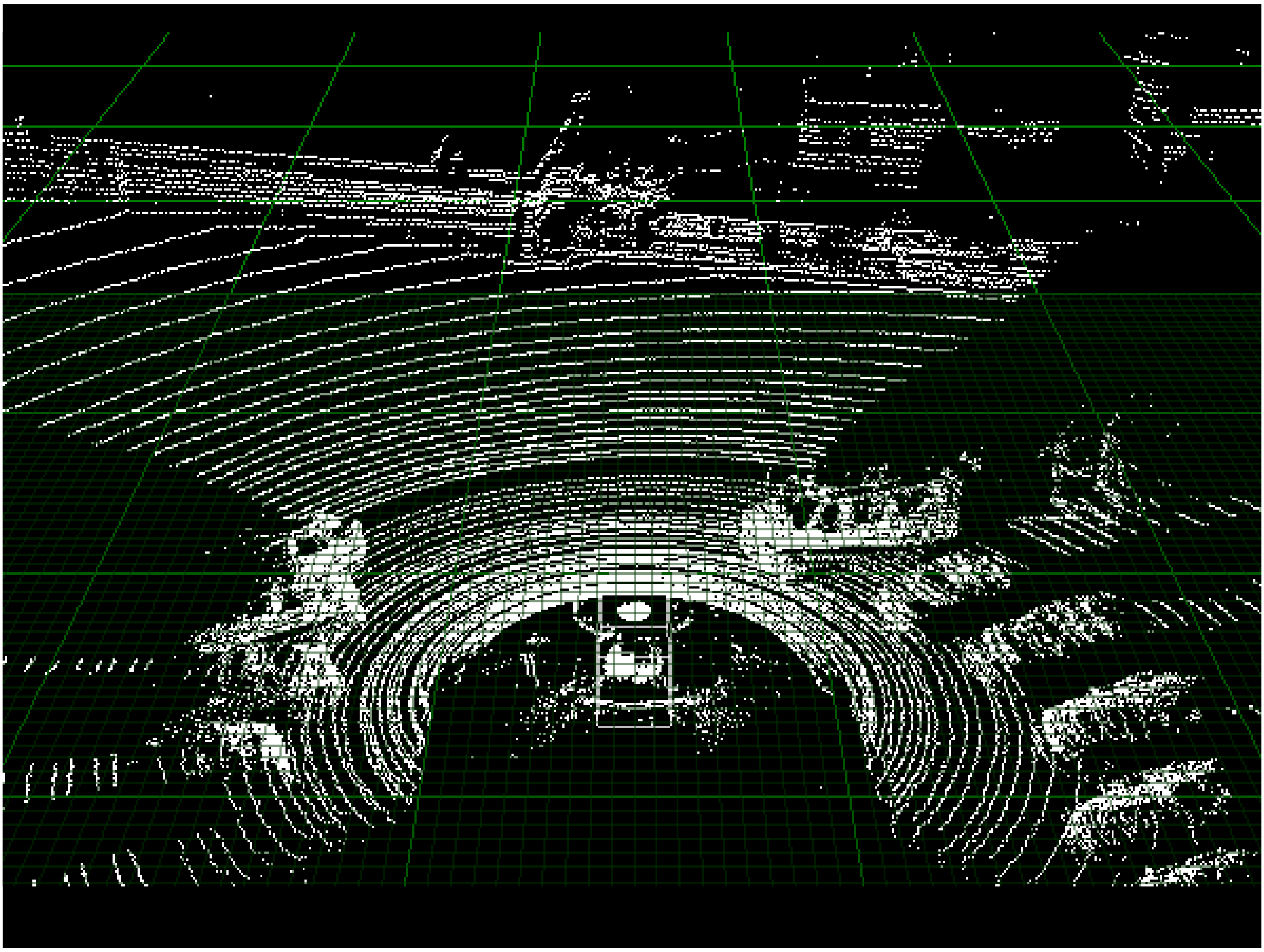
Willow Garage

Goal: Have a positive impact through robotics

- Non-military
- Autonomous devices
- Open source approach
- Tool-building and platform development

The Car

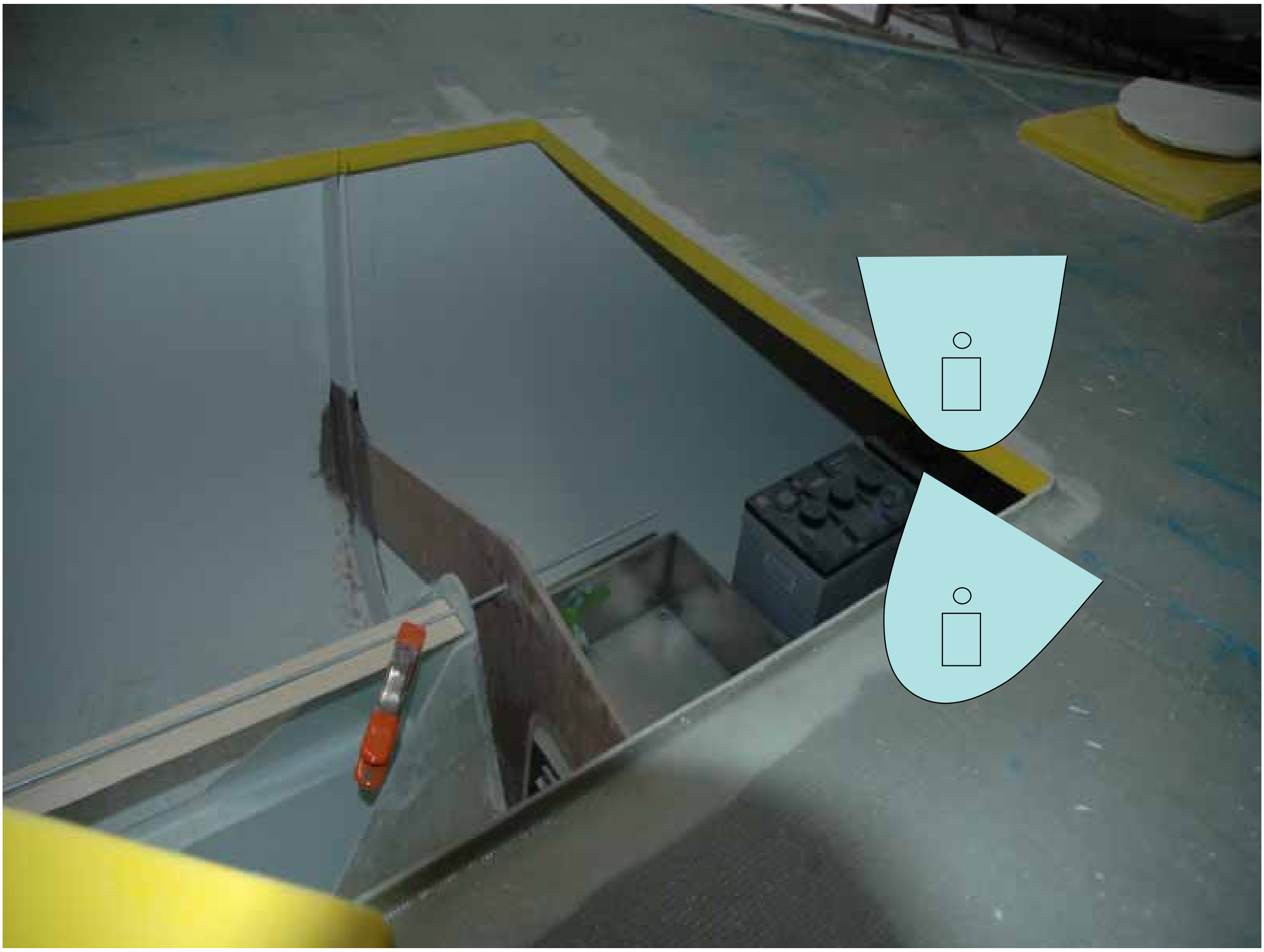
- Build a car that can drive itself for
  - Safety
  - Efficiency of roads
  - Efficiency of people's time
- Near-term applications
  - Self-parking
  - Stop-and-go traffic
  - Safety-assist



The Boat

- Goal: Autonomous Platform for Ocean-based Science
  - Unattended operation for up to a year
  - Low cost


The Hull
8/20/07



Personal Robotics Program

Hardware and Software Development Platform for Personal Robotics

Software Goals

Make it easy to do robotics research

Develop open-source robotics tools

Barriers to robotics research

Integration is really really hard, but necessary

“Magic grad student” effect

Lack of reproducible results

PR-1

Stanford Personal Robotics Program

Prof. Ken Salisbury
Eric Berger
Keenan Wyrobek

STAIR

Stanford AI Robot

Prof. Andrew Ng
Morgan Quigley
Stephen Gould
Ashutosh Saxena
Many Others

Personal Robotics Program

Develop, distribute and maintain PR-2 Hardware and Software system

Release 10 robots by December 2008

Barriers to research adoption

Researchers are not software developers

Researchers will not adapt to framework

Researchers are very quick to reject systems

Linux as a model

Ecosystem of users and contributors

Useful things come from many places

Support for flexible and conflicting standards

Deeply customizable

ROS

(Robot Operating System)

Modular architecture
Distributed computation

Open Source
Flexible tool choice

ROS

Infrastructure
Communications architecture
Development Tools
Robotics libraries (modules)
Robot-specific functionality

Running demos and example code

Key Points

Separation between components
Support for different development patterns
Large, actively maintained and open tool-set
Major commitment to basic content

Many documented examples and running demos

Contact Report

Prof. Makoto Mizukawa
mizukawa@sic.shibaura-it.ac.jp
Shibaura Institute of Technology
Tokyo, Japan

Conferences

- 2007 IEEE/RSJ International Conference on Intelligent Robots and Systems (**2007 IROS**) **http://www.iros2007.org/**
- Sheraton Hotel, San Diego, CA, USA
- Oct 29-Nov 2 2007

Conferences: IROS2007

- October 29 (Mon)
  - Workshops
    - MW-2 Network Robot Systems: Ubiquitous, Cooperative, Interactive Robots for Human Robot Symbiosis
      Norihiro Hagita et.al
    - MW-5 Measures and Procedures for the Evaluation of Robot Architectures and middleware, Erwin Prassler et.al
    - MW-8 Robot Semantic Web Tom Henderson, R. Dillmann et.al
  - Tutorial
    - MT-2 Building Ubiquitous Robot Systems: A Hands-On Tutorial Alessandro Saffiotti, Mathias Broxvall
- November 2(Fri)
  - Workshop
    - FW-2 Ubiquitous Robotic Space Design and Applications
      Wonpil Yu

Conferences cont'd

- 2007 International Conference on Control, Automation and Systems (**ICCAS 2007**)
  www.iccas.org
- the COEX in Seoul, Korea, October 17 - 20, 2007
  - Organized by ICROS(The Institute of Control, Robotics and Systems)
  - Technically Co-sponsored by IEEE IES, RAS and CSS
  - FP02 OS003 RT (Robot Technology) System Integration
  - Chairs
    - Prof. Chung Yun Koo ETRI
    - Prof. Ahn Hyo-Sung Gwangju Institute of Science and Technology
  - 6papers

Conferences cont'd

- **ICCAS 2007**
- FP02 OS003 RT (Robot Technology) System Integration
  - FP02-1 Navigation of the Autonomous Mobile Robot Using Laser Range Finder Based on the Non Quantity Map
    S. Kubota, Y. Ando, M. Mizukawa (S.I.T.)
  - FP02-2 Research on the "Task Localization" for Distributed Intelligence Japan H. Minamino, M. Mizukawa, Y. Ando (S.I.T.)
  - FP02-3 Testing and Certification Framework for URC Korea Sangguk Jung (TTA)
  - FP02-4 Software Testing for Intelligent Robot Korea
    Yun Koo Chung (ETRI)
  - FP02-5 Indoor Mobile Robot and Pedestrian Localization Techniques Korea Hyo-Sung Ahn (Gwangju Institute of Science and Technology), Won Pil Yu(ETRI)
  - FP02-6 Localization of Ubiquitous Environment Based Mobile Robot Japan Yong-Shik Kim, et.al (AIST)

RWRC (Real World Robot Challenge) Tsukuba Challenge, Nov 16-17, 2007

- 1km Navigation in Natural environment on the pedestrian road in Tsukuba City
- No traffic control to pedestrians and bicycles

- 33 entries->11 qualified->3 mission completion

http://www.robomedia.org/challenge/index.html

The Robot Award 2007 by METI

- To promote R&D and application of RT(robot technology)
- 13 robots were selected as First Prize winners from 82 entries
- Software Division
  - RT middleware:OpenRTM-aist-0.4.0 (AIST, JARA, NEDO)
  - ORiN 2.0 (Denso Wave, Co. LTD)

http://www.robotaward.jp/

Coming conferences

- 2008 IEEE International Conference on Robotics and Automation (**ICRA 2008**)
  http://www.icra2008.org/
- Pasadena, California, May 19-23, 2008

- 2008 IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS 2008**)
  http://www.iros2008.org/
- Nice, France, Sep 22-26 2008

KIRSF – Contact Report

Robotics DTF (Burlingame Meeting)
Date: December 11, 2007
Reporter: Yun Koo Chung

1. KIRSF Standardization

- KIRSF adopted 27 standards in 2007.
- Most hot issues:
  - Performance Testing & Certification testing
  - Safety guide of robots
  - Communication protocols for URC

2. TTA Standardization

- 8 standards will be adopted in Dec. 2007.

3. RUPI (Robot Unified Platform Initiative) ver 2.0

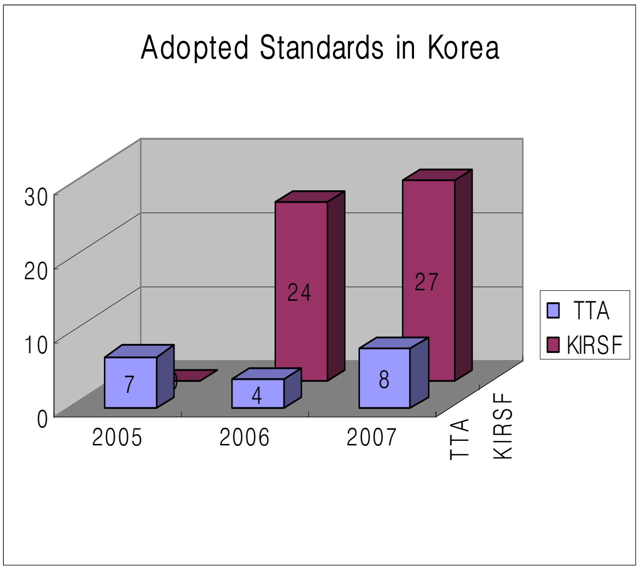
- The second stage of the national project for URC will start from 2008 for 3 years.
- Standards for URC will be developed as RUPI v 2.0, which is a set of standards selected from URC standards.

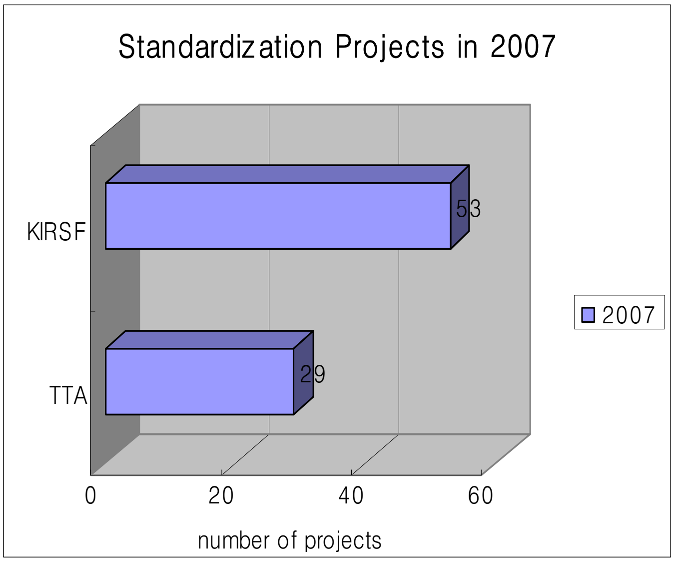
Robotics/2007-12-XX

KIRSF – Contact Report

Robotics DTF (Burlingame Meeting)
Date: December 11, 2007
Reporter: Yun Koo Chung

Statistics of Robot Standards in Korea





Accumulated Total number of standards, 2007 – TTA : 19, KIRSF: 51

KIRSF – Contact Report

Robotics DTF (Burlingame Meeting)
Date: December 11, 2007
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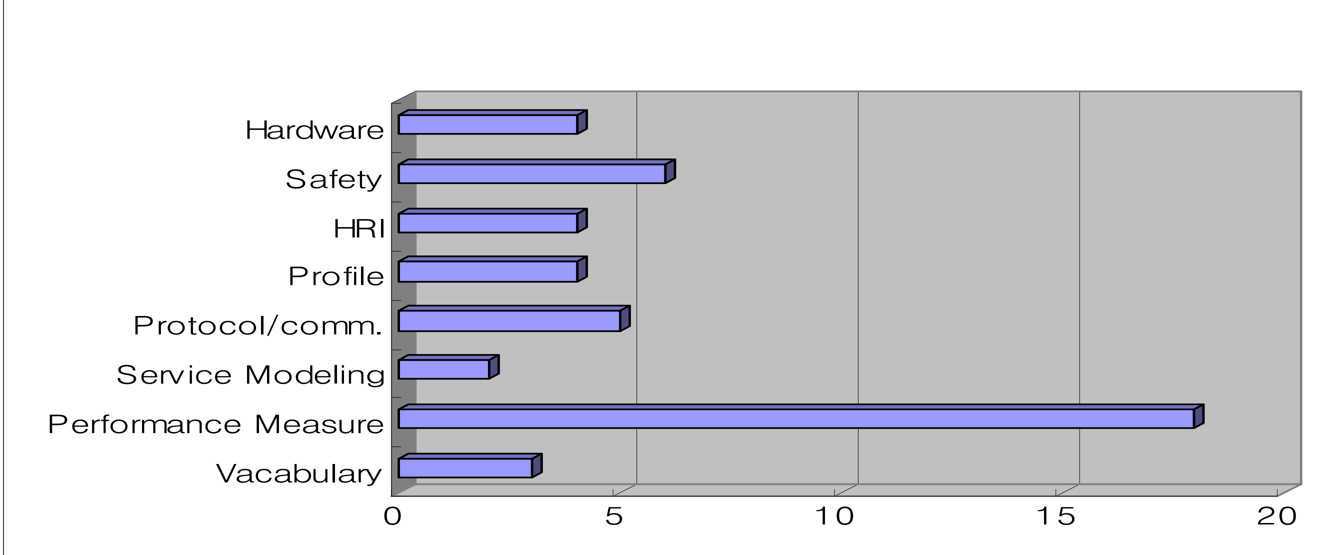
Statistics of Robot Standards in Korea



Robotics/2007-12-XX

KIRSF – Contact Report

Robotics DTF (Burlingame Meeting)
Date: December 11, 2007
Reporter: Yun Koo Chung

4. Standardization feasibility study for networked robot with ITU

- Cooperated work will start with ITU for feasibility study of standardization of networked robots from December 2007.
- Scope of the work will be network area of networked robots.
- International standardization workshop of the networked robots will be held in April 2007.

The following organizations are already involved

ADA Software
AIST
ETRI
Fujitsu
Hitachi
IHI, Japan
Japan Robot Association
John Deere & Co
KAIRA
Kangwon National University
NEDO
NIST
Objective Interface Systems
PrismTech
Raytheon
Real Time Innovations
Schlumberger
SEC
Seoul National University
Shibaura Institute of Technology
Systronix Inc.
Technologic Arts Inc.
Thales
Toshiba
UEC, Japan
Universidad Politecnica, Madrid
Zeligsoft Inc.

Join Us

OMG's Robotics Domain Task Force has already started laying the groundwork for a common platform-independent model of robotics software development. The first step was to issue a Request for Information (RFI) on available products, projects, theories, models and requirements to support development of Service Robotic Systems based on distributed objects.

The Robotics DTF received a number of responses to the RFI and currently has several RFIs and RFPs in the works, so now is the ideal time to get involved! The Robotics DTF will meets at each OMG Technical Meeting.

For more information, or to join us visit,
http://robotics.omg.org
or
http://www.omg.org

OBJECT MANAGEMENT GROUP
140 Kendrick Street
Building A, Suite 300
Needham, MA 02026
Tel. 781-444 0404

ROBOTICS
Domain Task Force

Building Standards That Work

Object Management Group

About Object Management Group the Robotics DTF

The Object Management Group™ (OMG™) is an international, open membership, not-for-profit computer industry standards consortium. OMG Task Forces develop enterprise integration standards for a wide range of technologies and an even wider range of industries. OMG's modeling standards enable powerful visual design, execute and maintenance of software and other processes.

OMG's Robotics Domain Task Force (DTF) is actively working to develop standards for robotics software design and development through OMG's inclusive, open process. In the past, most robotics software initiatives have been developed independently. The Robotics DTF is talking to leading vendors, end users, researchers, robotics organizations and other interested parties to lay the groundwork for a common platform-independent model of robotics software development.

Focus and Targets

Robot Technology is a complicated mix of various domain technologies — a challenge for forming a common standard. To make things even more challenging, key industry players develop their own unique standards that act against interoperability.

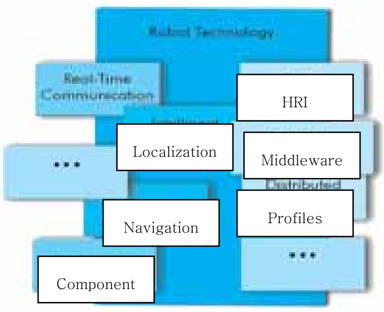
The Robotics DTF is working to address these issues by:

- Adoption of existing OMG standards to the domain,
- Extending OMG technologies to robotic applications,
- Forming a bridge between OMG and Robotic communities,
- Collaborating with other similar organizations like ISO, IEEE, OASIS to encourage interoperability,
- Coordinating with other task forces in OMG to develop common standards across domains.

The Robotics DTF currently has three working groups in addition to Steering, Publicity and Contacts sub-committees:

- Infrastructure
- Robotic Functional Services
- Robotic Devices and Data Profile

Meeting picture



The need for Standards

The difference between a robotic vacuum cleaner and a Mars rover may seem vast, but they have a lot in common. For example, both require a method of sensing their environment and relaying information to the servos that control their movement. This commonality of design and function has created both an opportunity and a need for standards. The goal of robotics standards is to increase interoperability, compatibility and reusability. This ultimately will lead to an increase in both the availability and usage of robotic systems. The OMG's Robotics DTF is spearheading the effort to develop these standards.

Contact Report:

ISO TC184/SC2/AG1 Meeting Report

December 11th, 2007

Burlingame, CA, USA

Hyatt Regency San Francisco Airport

AG1 Meeting in Tokyo (Nov.26, 2007)

Attendee:

- Experts(7 persons): S. Moon(Korea), G. Virk, O. Tokhi(UK), Y. Yamada, Y.Ota(Japan), R. Gelin(France), S. Dryselius(Sweden)
- Observers(8 persons) : Young Sook Jeong, SK Jung, YD Kim(Korea), C. Harper(UK), T. Miura, Morihiro Taba, T. Kotoku, S. Hamada(Japan)

Agenda:

- Aims of the Advisory Group
- Review of resolutions from the previous meeting
- Report from the working groups.
- Proposal for scopes and definitions for PT1 and PT2
- Dates of next meetings

AG1 Meeting in Tokyo (Nov.26, 2007)

Topics:

- AG: Definition and scope of PT1 and PT2
- WG2: Performance/Safety Standards for Intelligent Robots in Korea
- WG4: Robot and Animals (include pet caring robots)
- OMG: OMG Activity Report

Next Meetings:

- Feb. 19(Tuesday afternoon half-day session), 2008 in Wellington, New Zealand.
- During June 23(Mon)-26(Thu), 2008 in Paris.
- During Oct. 13(Mon) – 15(Wed) in COEX, Seoul, Korea 2008, before Plenary Meeting, to be held on Thursday and Friday.

AIST

TC184/SC2 Organization

- AG1 *(Advisory Group)*
  - *WG1 (Vocabulary): => PT3*
  - *WG2 (Software):*
  - *WG3 (Performance):*
  - *WG4 (Other topics):*
- PT1 (*Revision of ISO 10218-Robots for industrial environments - Safety requirements)*
- PT2 (*Robots in personal care - Safety requirements)*
- PT3 *(Vocabularies)*
  definitions - robot, industrial robot, robotic device, and service robot, in order to define the scopes of PT1 and PT2.

NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

Robotics-DTF Plenary Meeting Closing Session

December 11th, 2007

Burlingame, CA, USA

Hyatt Regency San Francisco Airport

Document Number

- robotics/2007-12-01 Final Agenda (Tetsuo Kotoku)
- robotics/2007-12-02 Jacksonville Meeting Minutes [approved] (Su-Young Chi and Shuichi Nishio)
- robotics/2007-12-03 Steering Committee Presentation (Tetsuo Kotoku)
- robotics/2007-12-04 Roadmap for Robotics Activities (Tetsuo Kotoku)
- robotics/2007-12-05 Opening Presentation (Tetsuo Kotoku)
- robotics/2007-12-06 Robotic Localization Service - OMG Initial Submission (Kyuseo Han)
- robotics/2007-12-07 JARA Initial Submission to Robotic Localization Service RFP (Shuichi Nishio)
- robotics/2007-12-08 Robotic Localization Service - ETRI&SAMSUNG vs. JARA (Yeon-Ho Kim)
- robotics/2007-12-09 Considerations for revised submission (Kyuseo Han)
- robotics/2007-12-10 Real World Robot Challenge in Tsukuba (RWRC2007) - Tsukuba Challenge 2007 - (Takashi Tsubouchi)
- robotics/2007-12-11 Robotic Functional Services WG Report (Hyunsoo Kim)
- robotics/2007-12-12 Robotic Localization Service WG Report (Shuichi Nishio)

Document Number

robotics/2007-12-13 OMG Robotic Technology Component Specification and OpenRTM-aist (Noriaki Ando)

robotics/2007-12-14 Introduction to Robotic Technology Component (Takashi Sakamoto)

robotics/2007-12-15 Willow Garage (Eric Berger)

robotics/2007-12-16 Contact Report (Makoto Mizukawa)

robotics/2007-12-17 KIRSF - Contact Report (Yun-Koo Chung)

robotics/2007-12-18 Robotics-DTF flier - DRAFT (Yun-Koo Chung)

robotics/2007-12-19 ISO TC184/SC2/AG1 Meeting Report (Tetsuo Kotoku)

robotics/2007-12-20 Closing Presentation (Tetsuo Kotoku)

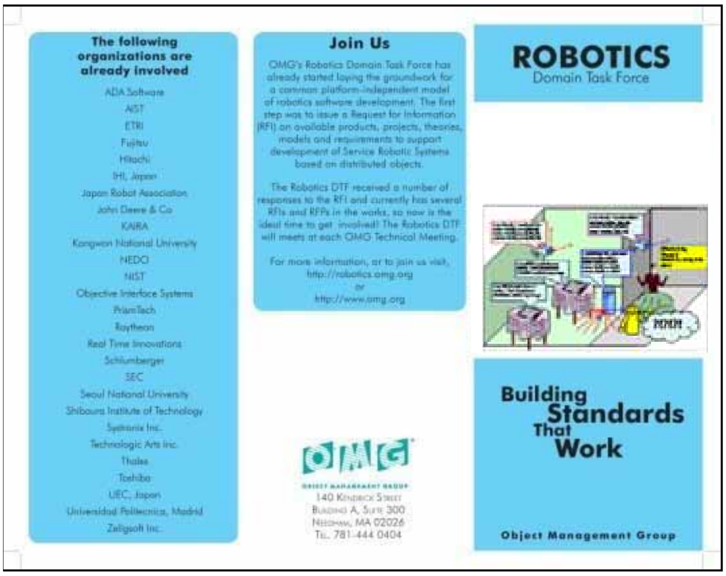
robotics/2007-12-21 Next Meeting Preliminary Agenda - DRAFT (Tetsuo Kotoku)

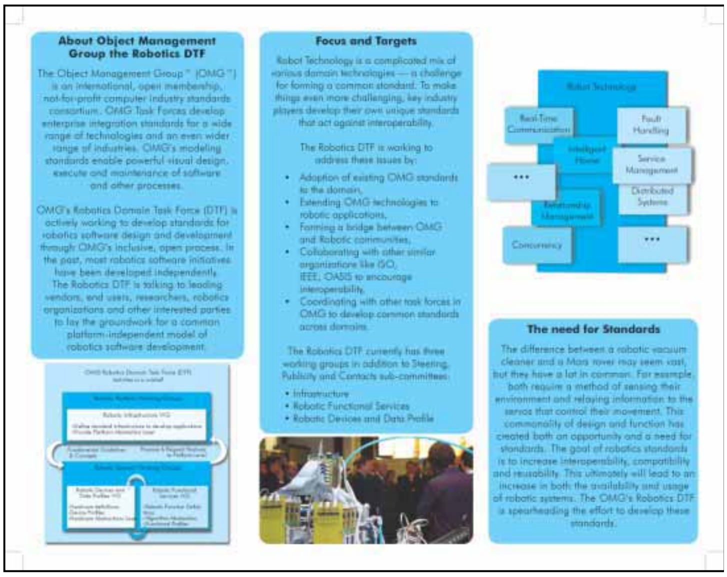
robotics/2007-12-22 Supplementary Info on Composite Robotic Coordinate Information Set (CRCS) (Shuichi Nishio)

robotics/2007-12-23 DTC Report Presentation (Tetsuo Kotoku)

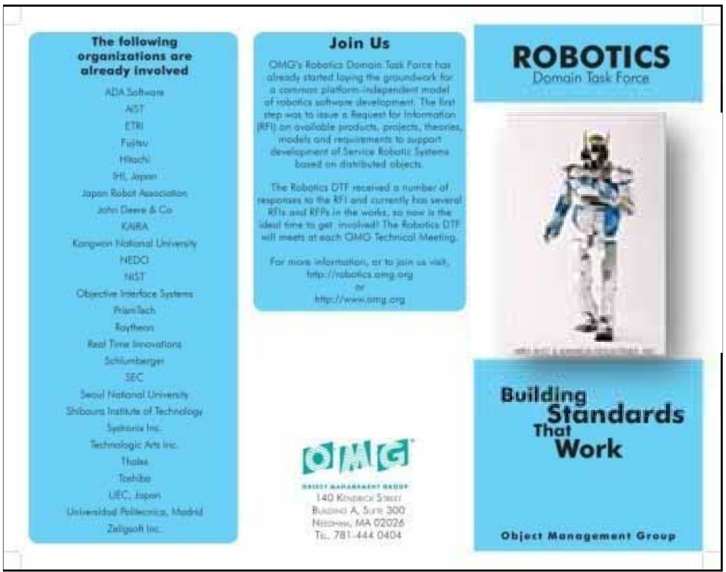
robotics/2007-12-24 Burlingame Meeting Minutes - DRAFT (Geffrey Biggs and Yun-Koo Chung)

Robotics-DTF leaflet





Robotics-DTF leaflet



The following organizations are already involved

ADA Software
AIST
ETRI
Fujitsu
Hitachi
IHI, Japan
Japan Robot Association
John Deere & Co
KAIRA
Kangwon National University
NEDO
NIST
Objective Interface Systems
PrismTech
Raytheon
Real Time Innovations
Schlumberger
SEC
Seoul National University
Shibaura Institute of Technology
Systronix Inc.
Technologic Arts Inc.
Thales
Toshiba
UEC, Japan
Universidad Politecnica, Madrid
Zeligsoft Inc.

Join Us

OMG's Robotics Domain Task Force has already started laying the groundwork for a common platform-independent model of robotics software development. The first step was to issue a Request for Information (RFI) on available products, projects, theories, models and requirements to support development of Service Robotic Systems based on distributed objects.

The Robotics DTF received a number of responses to the RFI and currently has several RFIs and RFPs in the works, so now is the ideal time to get involved! The Robotics DTF will meets at each OMG Technical Meeting.

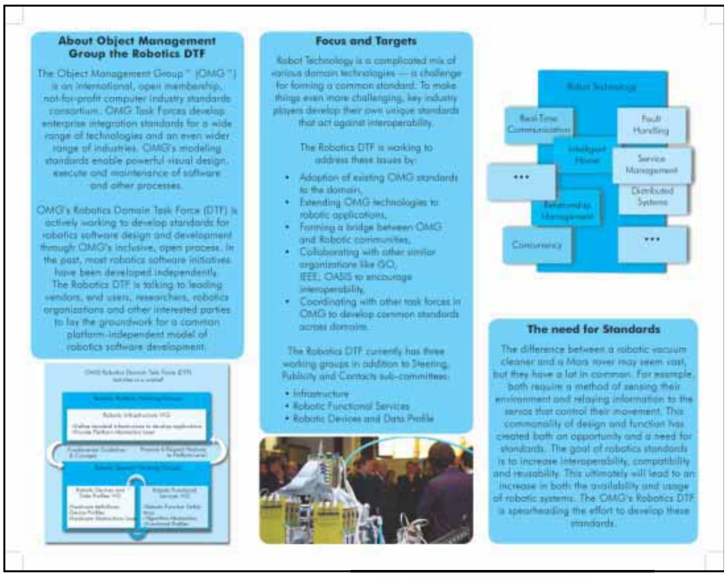
For more information, or to join us visit,
http://robotics.omg.org
or
http://www.omg.org

OBJECT MANAGEMENT GROUP
140 Kendrick Street
Building A, Suite 300
Needham, MA 02026
Tel. 781-444-0404

ROBOTICS
Domain Task Force

Building Standards That Work

Object Management Group



About Object Management Group the Robotics DTF

The Object Management Group™ (OMG™) is an international, open membership, not-for-profit computer industry standards consortium. OMG Task Forces develop enterprise integration standards for a wide range of technologies and an even wider range of industries. OMG's modeling standards enable powerful visual design, execute and maintenance of software and other processes.

OMG's Robotics Domain Task Force (DTF) is actively working to develop standards for robotics software design and development through OMG's inclusive, open process. In the past, most robotics software initiatives have been developed independently. The Robotics DTF is talking to leading vendors, end users, researchers, robotics organizations and other interested parties to lay the groundwork for a common platform-independent model of robotics software development.

Focus and Targets

Robot Technology is a complicated mix of various domain technologies — a challenge for forming a common standard. To make things even more challenging, key industry players develop their own unique standards that act against interoperability.

The Robotics DTF is working to address these issues by:

- Adoption of existing OMG standards to the domain,
- Extending OMG technologies to robotic applications,
- Forming a bridge between OMG and Robotic communities,
- Collaborating with other similar organizations like ISO, IEEE, OASIS to encourage interoperability,
- Coordinating with other task forces in OMG to develop common standards across domains.

The Robotics DTF currently has three working groups in addition to Steering, Publicity and Contacts sub-committees.

- Infrastructure
- Robotic Functional Services
- Robotic Devices and Data Profile

The need for Standards

The difference between a robotic vacuum cleaner and a Mars rover may seem vast, but they have a lot in common. For example, both require a method of sensing their environment and relaying information to the servos that control their movement. This commonality of design and function has created both an opportunity and a need for standards. The goal of robotics standards is to increase interoperability, compatibility and reusability. This ultimately will lead to an increase in both the availability and usage of robotic systems. The OMG's Robotics DTF is spearheading the effort to develop these standards.

Organization

- **Robotics-DTF** — Yun-Koo Chung (ETRI, Korea); Tetsuo Kotoku (AIST, Japan); Call for volunteer
  - **Steering Committee** — All volunteers
    - **Publicity Sub-Committee** — Abheek Bose (ADA Software, India); Masayoshi Yokomachi (NEDO, Japan); Yun-Koo Chung (ETRI, Korea)
    - **Contacts Sub-Committee** — Makoto Mizukawa (Shibaura-IT, Japan); Yun-Koo Chung (ETRI, Korea)
  - *Technical WGs*
    - **Infrastructure WG** — Noriaki Ando (AIST, Japan); Call for volunteers
    - **Robotic Functional Services WG** — Soo-Young Chi (ETRI, Korea); Hyunsoo Kim (Samsung, Korea); Call for volunteers
    - **Robotic Data and Profiles WG** — Bruce Boyes (Systronix, USA); Call for volunteers
    - **Robotic Localization Services WG** — Kyuseo Han (ETRI, Korea); Yeon-Ho Kim (Samsung, Korea); Shuichi Nishio (JARA/ATR, Japan)

Call for volunteer

- Robotics-DTF Co-chair
  - Not from Japan and Korea
  - Election will be held upcoming Washington DC Technical Meeting

- Robotic Infrastructure WG Co-Chair
- Robotic Functional Services WG Co-Chair
- Robotic Data and Profiles WG Co-Chair

Next Meeting Agenda

March10-14 (Washington DC, USA)

Monday:

Steering Committee (morning)
RLS 2nd Submission Presentations (am)
WG activity (pm)

Tuesday:

WG activity (am)
Robotics-DTF Plenary Meeting (pm)
- Guest and Member Presentation
- Contact reports
- Co-chair election

Wednesday-Thursday:

WG activity follow-up [if necessary]

Special Talk Candidates

- RUPI 2.0 (Tentative)
- Report of RoboDevelopment 2007 and Introduction to JCX robotics project (Tentative)
  - Bruce Boyes (Systronix)
- Someone from local area

Attendee

- Anthony Tarlano (DoCoMo)
- Eric Berger (Willow Garage)
- Geoffrey Biggs (AIST)
- Hiroyuki Fukano (TSB Information)
- Hyun-Seo Kim (Samsung)
- Itsuki Noda (AIST)
- John Rodell (OIS)
- Kwang Koog Lee (Kaungwon National Univ.)
- Kyuseo Han (ETRI)
- Makoto Mizukawa (Shibaura-IT)
- Miwako Doi (Toshiba)
- Noriaki Ando (AIST)
- Roger Burkhart (John Deere)
- Shuichi Nishio (JARA/ATR)
- Su-Young Chi (ETRI)
- Takashi Sakamoto (Technologic Arts)
- Takashi Tubouchi (Univ. of Tsukuba)
- Tetsuo Kotoku (AIST)
- Yeon-Ho Kim (Samsung)
- Yun Koo Chung(ETRI)

Start	End	TF/SIG Host	TF/SIG Joint (Invited)	Agenda Item	Purpose	Room
Robotics Domain Task Force Preliminary Agenda ver0.0.2						**robotics/2007-12-21**
OMG Technical Meeting - Washington DC, USA -- Mar. 10-14 , 2008						
				http://robotics.omg.org/		
Monday: Robotics Plenary(am) and WG activites(pm)						
9:00	9:45	Robotics		Robotics Steering Committee	Arrangement	
9:45	10:00	Robotics		Robotics-DTF Plenary Opening Session	Robotics plenary openning	
10:00	11:00			Robotic Localization Service - Revised Submission Presentation (1) - Kyuseo Han (ETRI) and Yeon Ho Kim (Samsung)	presentation and discussion	
11:00	12:00			Robotic Localization Service - Revised Submission Presentation (2) - Shuich Nishio (JARA/ATR)	presentation and discussion	
12:00	13:00	**LUNCH**				
13:00	18:00			Architecture Board Plenary		
13:00	14:00	Robotics		Robotic Data and Profiles WG (1h)	discussion	
14:00	18:00	Robotics		Robotic Localization Services WG (4h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	
				Services WG(4h): Human Robot Interaction RFP draft Meeting - Su-Young Chi and Hyunsoo Kim	discussion	
Tuesday: WG activities (am) and Robotics Plenary (pm)						
9:00	12:00	Robotics		Robotic Localization Services WG (3h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	
				Services WG(3h): Human Robot Interaction RFP draft Meeting - Su-Young Chi and Hyunsoo Kim	discussion	
12:00	13:00	**LUNCH**				
13:00	14:00	Robotics		WG Reports and Roadmap Discussion (Service WG, Profile WG, Robotic Localization Service WG)	reporting and discussion	
14:00	15:00	Robotics		**Special Talk: TBD**	presentation and discussion	
				Break (30min)		
15:30	16:30	Robotics		**Special Talk: TBD**	presentation and discussion	
16:30	17:10	Robotics		Contact Reports: - Makoto Mizukawa(Shibaura-IT), and Yun-Koo Chung(ETRI)	Information Exchange	
17:10	17:30	Robotics		**DTF Co-Chair election** and Next meeting Agenda Discussion	Robotics plenary closing	
17:30				Adjourn joint plenary meeting		
17:30	18:00	Robotics		Robotics WG Co-chairs Planning Session (Preliminary Agenda for next TM, Draft report for Friday	planning for next meeting	
Wednesday WG activity follow-up						
9:00	12:00	Robotics		Robotic Localization Services WG (3h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	
				Services WG(3h): Human Robot Interaction RFP draft Meeting - Su-Young Chi and Hyunsoo Kim	discussion	
12:00	14:00	**LUNCH and OMG Plenary**				
14:00	18:00	Robotics		Robotic Localization Services WG (3h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	
				Services WG(3h): Human Robot Interaction RFP draft Meeting - Su-Young Chi and Hyunsoo Kim	discussion	
18:00	20:00	**OMG Reception**				
Thursday WG activity follow-up						
9:00	12:00	Robotics		Robotic Localization Services WG (3h) - Kyuseo Han, Yeon-Ho Kim and Shuichi Nishio	discussion	
12:00	13:00	**LUNCH**				
13:00	18:00			Architecture Board Plenary		
Friday						
8:30	12:00			AB, DTC, PTC		
12:00	13:00	**LUNCH**				
Other Meetings of Interest						
Monday						
8:00	8:45	OMG		New Attendee Orientation		
18:00	19:00	OMG		New Attendee Reception (by invitation only)		
Please get the up-to-date version from http://staff.aist.go.jp/t.kotoku/omg/RoboticsAgenda.pdf						

Supplementary Info on Composite Robotic Coordinate Information Set (CRCS)

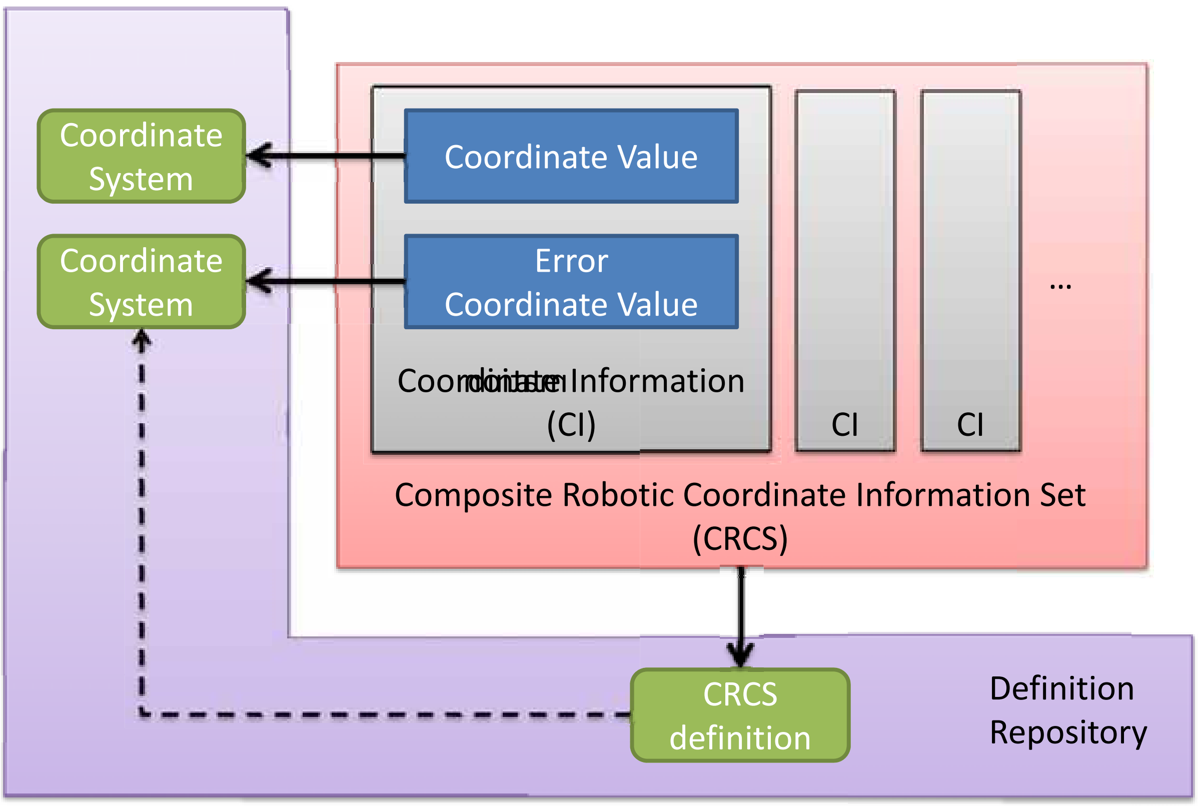
12 Dec, 2007

NISHIO Shuichi

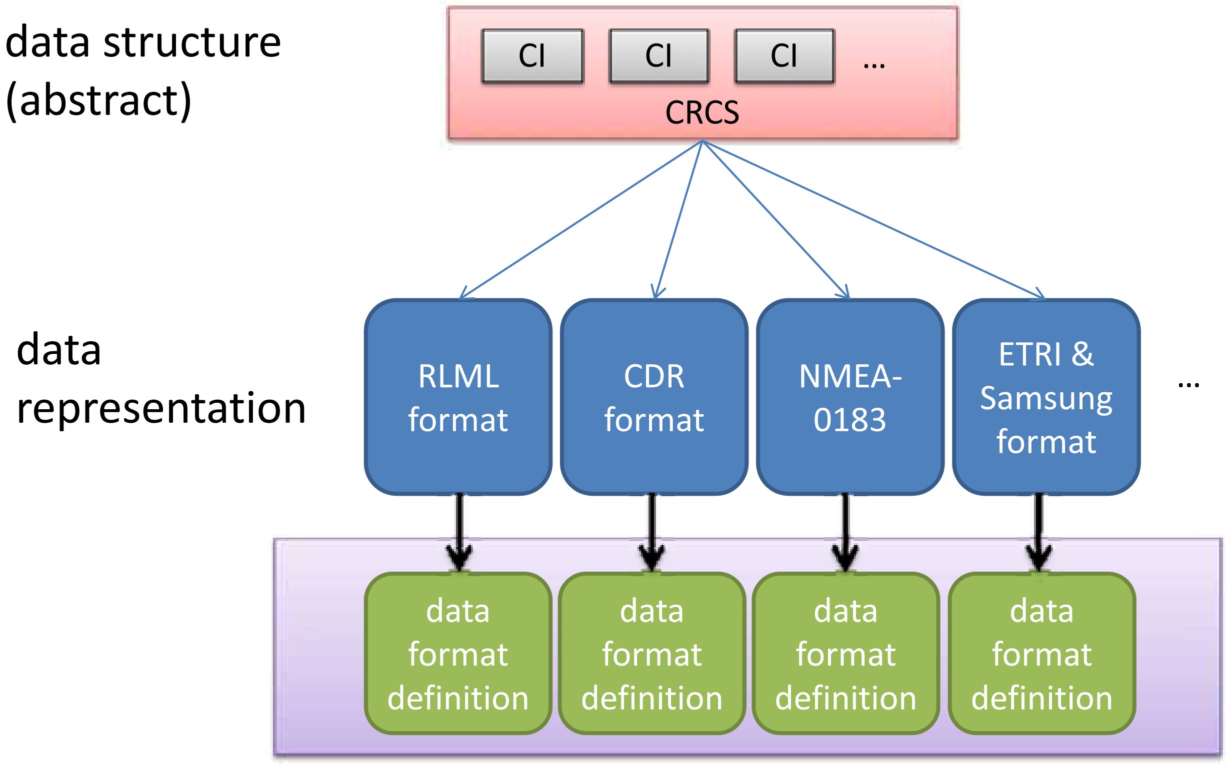
Japan Robot Association (JARA) /

ATR Intelligent Robotics and Communication Laboratories

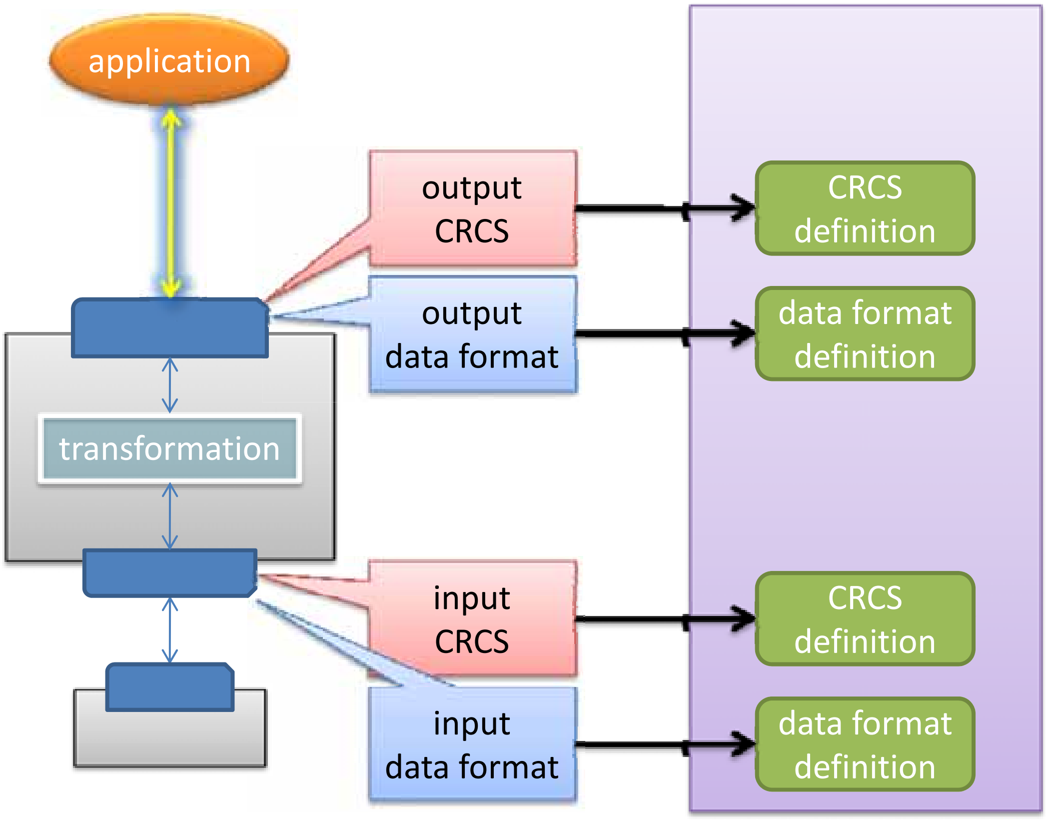
CRCS definition



CRCS and data formats



Transformation



Example: GPS receiver output

- Sample NMEA output

  $GPGGA,123519.00,3601.038247,N,13631.324523,E,1,08,1.2,68.42,M,46.93,M,, *42

  <data type>, <time in UTC>, <latitude>, <north>, <longitude>, <east>, <GPS quality indication>,<number of satellites>, <HDOP>, <height from average sea level>, <unit (meter)>,<height from WGS-84ellipsode>, <unit(meter)>

coordinate system of RLS_cs_UTC
dimension: 1

coordinate system of RLS_cs_WGS84
dimension: 2

coordinate system of RLS_cs_indication
dimension: 1

coordinate system of RLS_cs_number_of_sattellites
dimension: 1

coordinate system of HDOP
dimension: 1

coordinate system of RLS_cs_sealevel_hight
dimension: 1

Robotics-DTF

Date: Friday, 14th December, 2007
Chair: Tetsuo Kotoku and Yun-Koo Chung
Group URL: http://robotics.omg.org/
Group email: robotics@omg.org

➢Highlights from this Meeting:

Initial Submission Presentation of Robotic Localization Service RFP:

- ETRI & Samsung Joint Submission [robotics/2007-12-06]
- JARA Submission [robotics/2007-12-07]

Robotics Plenary: (20 participants)

- 3 Special Talk:
  - RTC Specification and OpenRTM-aist [robotics/2007-12-13,14]
  - Willow Garage (Eric Berger) [robotics/2007-12-15]
  - Real World Robot Challenge in Tsukuba (RWRC2007) [robotics/2007-12-10]
- 2 WG Reports [robotics/2007-12-11,12]
- 3 Contact Reports [robotics/2007-12-16,17,19]
- Preliminary Agenda for Washington DC [robotics/2007-12-21]

Robotics-DTF

Date: Friday, 14th December, 2007
Chair: Tetsuo Kotoku and Yun-Koo Chung
Group URL: http://robotics.omg.org/
Group email: robotics@omg.org

➢Deliverables from this Meeting:

- Two Initial Submissions of Robotic Localization Service RFP [robotics/2007-11-01,03]

➢Future deliverables (In-Process):

- User Recognition Service RFP

➢Next Meeting (Washington DC, USA):

- 1st Revised Submission Presentation of Robotic Localization Service RFP
- 1st review of User Recognition Service RFP
- Guest presentations
- Roadmap discussion
- Contact reports
- Robotics-DTF Co-chair election

Minutes of the Robotics DTF Plenary Meeting – Draft
December 10-14, 2008, Burlingame, USA
(robotics/2007-12-24)

Minutes Highlights
. Initial submission presentation of Robotic Localization Service RFP by ETRI /Samsung and JARA
. 2 WG reports
. 3 Special talks:
- RTC Specification and OpenRTM-aist by Noriaki Ando and Introduction to RTC by Takeshi Sakamoto
- Willow Garage by Eric Berger
- Real World Robot Challenge in Tsukuba (RWRC2007) by Takashi Tsubochi

. 3 Contact report (ISO/TC184/SC2, conferences, KIRSF)

List of Generated documents

document number:
- robotics/2007-12-01 Final Agenda (Tetsuo Kotoku)
- robotics/2007-12-02 Jacksonville Meeting Minutes [approved] (Su-Young, Chi and Shuichi Nishio)
- robotics/2007-12-03 Steering Committee Presentation (Tetsuo Kotoku)
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- robotics/2007-12-24 Burlingame Meeting Minutes - DRAFT (Yun-Koo Chung and Geffrey Biggs)

MINUTES

Monday, December 10, 2007, Sandpebble B, Lobby Lvl

09:50-10:10 Plenary Opening, Chair: Dr Kotoku, (Quorum: 4)
- Joined organizations: AIST, ETRI, JARA, Samsung, Shibaura IT, Technologic Arts, John Deere
- Burlingame Meeting Minute takers: Dr Biggs and Dr Yun Koo Chung
- Approval of the Jacksonville minutes

  Jacksonville minutes (Dr Nishio and Dr Chi) was approved.

AIST (motion), Shibauru IT (second), Technologic Arts (white ballot)
- Bruce Boyes presentation not possible, replaced with presentation by Willow Garage
- University of Tsukuba scheduled to give presentation on Real World Robot Challenge in Tsukuba

10:15-12:00 Robotics Localisation Service RFP submissions. (2 submissions)

1) Joint submission of ETRI and Samsung (Kyueho Han)
   . Simple structure proposed: Localization object, Localization Aggregator, Localization sensor, Coordinate Manager
   . Coordinate system was proposed.
2) JARA submission (Shuichi Nisio)
   . A set of common information to represent location
   . Common interface for localization service to transfer data and commands.
   . Robotic service scenario

. Requirements and structure for RLS

Tuesday, December 11, 2007, Sandpebble B, Lobby Lvl
11:00-12:00 Real World Robot Challenge in Tsukuba (RWRC2007) by Takashi Tsubochi

- Presentation of introduction Autonomous navigation contest of robots in real world, Tsukuba
- Experiments on public street
- Test running days (several days, final test on Nov. 17)
- Introduction of robot system, strategy of obstacle avoidance

13:00 – 17:30 Plenary meeting continued

WG Reports and Roadmap Discussion
- Functional services WG Report by Hyun Soo Kim

. **Candidate title for HRI RFP:** "User Recognition Service Interface (URSI)"
. Mandatory requirements decided
. Optional requirements decided
. Schedule:
  1st RFP draft (unofficial): 18/01/2008
  2nd RFP draft (unofficial): 08/02/2008
  1st RFP draft (official): March 2008 OMG Meeting
  2nd RFP draft (official): June 2008 OMG Meeting
  Initial submission: December 2008 OMG Meeting

- Localization Service WG Report by Nishio

. Two presentations for initial submissions: ETRI + Samsung, and JARA
. Discussion towards revised submission
. Splitting of localization object
. Sensor module/localisation module (relation with Profile WG).
. Naming issue (of data format)
. Data abstraction format issue
. Necessity for meta-level information (RLML)
. Roadmap
  - Washington DC: Revised submission discussion (submit first version of revised submission to OMG server)
  - 26/05/2008: Revised submission due
  - 23/06/2008: Revised submission presentations

- No report from Infrastructure WG

- Special Talk: Introduction of RTC specifications and implementation OpenRTC_AIST by Ando and Sakamoto

. Introducing the RTC and RT middleware.
. Introducing the Features of OpenRTM-aist which is RT Middleware of AIST complying RTC specification.
. Presenting the Implementation of RTC and its demonstration
. Introducing the RTC specifications.

- Special Talk: Willow Garage by Eric Berger
. Hardware and software development framework for personal robotics
. Modular architecture, distributed computing, Open source, flexible tools are introduced
. ROS: Infrastructure, communications architecture, development tools,
Robotic libraries, Robotic-specific functionality were demonstrated.

- Contact report by Makoto Mizukawa:
. Conference: 2007 IEEE IN San Diego, Oct 29- Nov 2, 2007. http://www.iros2007.org
Topic: Network robots, Ubiquitous robots, Ubiquitous robotic space design and applications
. Conference: ICCAS 2007, Seoul, Oct.19,2007, 6 papers presented.
. Coming conference: ICRA 2008, Pasadena, CA, http://www.icra2008.org/
IROS 2008, Nice, France, Sept. 22-26,2008, http://www.iros2008.org/

- Contact report by Yun Koo Chung
. KIRSF Standardization activities in Korea were reports.
. The second stage of URC project planned to start in early 2008.

- Publicity report:
. Diagram and picture was changed
. Robot picture will be selected and will be voted for selection.

- Contact report of ISO/TC184/SC2/AG1 by Kotoku:
. Meeting held in Tokyo on Nov. 26th,2007, Attendee (15 people and 5 countries (Korea, Japan, UK, France, Sweden)
. Topics:
- Definition and scope of PT1 and PT2
- Performance / Safety Standards for Intelligent Robots in Korea
- OMG Activity report

. Next meetings:
- Feb. 19, 2008 in Wellington, New Zealand, June 23 ~ 26, 2008 in Paris, Oct 13 ~ 15 in Seoul, Korea

- Closing presentation and Next meeting agenda by Kotoku
. Calling for volunteers for Robotics DTF co-chair, Robotic Infrastructure WG Co-chair, Robotic Functional Service WG Co-chair, Robotic Data and Profiles WG Co-chair,
. Next meeting Agenda: March 10-14 (Washington DC, USA)

- Adjourned joint plenary meeting at 17:00

Attendee : 20 participants

Anthony Tarlano(DoCoMo)
Eric Berger (Willow Garage)
Geoffrey Biggs (AIST)
Hiroyuki Fukano (TSB Information)
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