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URAI 2011

2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Program Book

Songdo ConventiA, Incheon, Korea

November 23~26, 2011

Organized by

KROS KOREA ROBOTICS SOCIETY, ifez

Technically Co-Sponsored by

IEEE, RSJ, 台灣機器人學會 Robotics Society of Taiwan

Sponsored by

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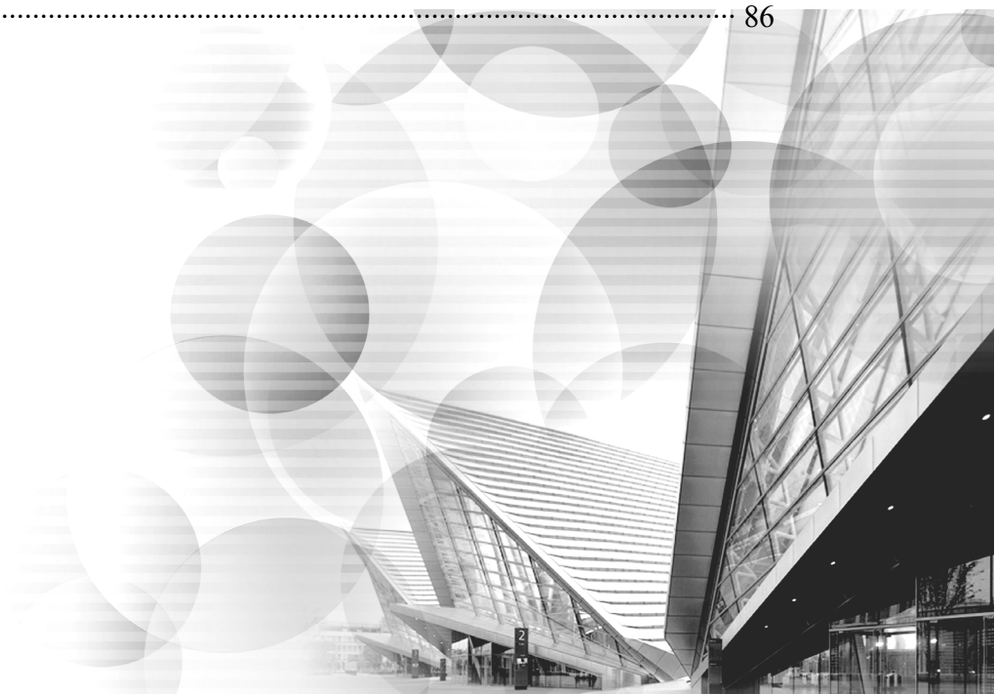
Contents of Final Program



URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Welcome to URAI 2011

General Chair
Professor Kang, Chul-Goo
Konkuk Univ., Korea

On behalf of the organizing and program committees, I welcome you to URAI 2011, the 8th International Conference on Ubiquitous Robots and Ambient Intelligence held in the newly built city, IFEZ Songdo, Korea. The aim of URAI 2011 is to bring together professors, researchers, engineers, and students to present their recent works and to discuss the state-of-the-art technologies related to robotics.

As the General Chair, it is my pleasure and honor to host URAI 2011 which is organized by Korea Robotics Society (KROS), and IFEZ, and technically co-sponsored by IEEE Robotics and Automation Society, IEEE Seoul Section, Robotics Society of Japan, and Robotics Society of Taiwan. During last 7 years, URAI has been growing considerably in both quality and quantity of the program along with Korean government policies promoting robotics industry. Now URAI is a prominent conference worldwide in the field of robotics.

In this year, 201 papers have been selected to present in URAI 2011 among 249 papers submitted from 22 countries in the world. I thank all the participants who have chosen URAI 2011 as the conference to present their valuable papers.

For this conference organization, there are too many to thank individually, but in particular I thank Dr. Sangrok Oh (KROS President), Prof. Sangyoon Lee and Prof. Satoshi Tadokoro (Program Chairs), and Prof. Chul Hee Lee (Local Chair) for their dedicated efforts for a long time. I thank all the committee members, KROS staff, and volunteers to make this conference a reality. I express my deep appreciation to Prof. Clarence de Silva, Prof. Makoto Kaneko, and Prof. Jae-Bok Song for their plenary talks. Also, I thank all the financial sponsors including KOFST, Konkuk University, and Doosan Infracore.

Finally, I hope that every participant has a rewarding and memorable time from plenary talks, technical sessions, workshops/tutorials, exhibitions, technical/cultural tours, banquet, and personal meetings during URAI 2011 in IFEZ Songdo, Korea.

URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Conference Organization

❑ Organizing Committee

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Tutorial/Workshop Chairs	Wonpil Yu (ETRI, Korea) Dukki Min (Konkuk Univ., Korea) Hye Kyung Cho (Hansung Univ., Korea)
Exhibition Chairs	Taesam Kang (Konkuk Univ., Korea) Yong-hoo Park (ED Corp., Korea) Suk Hee Kang (Dongbu Robot, Korea) Byoungsoo Kim (ROBOTIS, Korea)
Secretary	Mira Yoon (KROS, Korea)

❑ International Program Committee

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Jon Kim (Australian Nat'l Univ., Australia)
Alexei Makarenko (The Univ. of Sydney, Australia)
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William Singhose (Georgia Tech., U.S.A.)
Woosoon Yim (Univ. of Nevada, U.S.A)
Gerard Medioni (Univ. of Southern California, U.S.A.)
Mark Yim (Univ. of Pennsylvia, U.S.A)
Sunil K. Agrawal (Univ. of Delaware, U.S.A.)
Kok-Meng Lee (Georgia Tech., U.S.A)
Nikos Papanikolopoulos (Univ. of Minnesota, U.S.A.)
Ben J.A. Krose (Univ. of Amsterdam, Netherland)
Antonio Bicchi (Univ. of Pisa, Italy)
Bruno Siciliano (Universita degli Studi di Napoli Federico II, Italy)
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Mauro Dragone (Univ. College Dublin, Ireland)
Ruediger Dillmann (Univ. of Karlsruhe, Germany)
Aude Billard (EPFL, Switzerland)
Yacine Amirat (Univ. of Paris Est Créteil -Lissi Lab, France)

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Exibitors

Company Name	**National Instruments Korea**	President	Michael Chuyop Kim
Address	8th Floor, Daewha building 169 Samsung-Dong, Kangnam-ku, Seoul 135-882	Country	Korea
Tel	+82-2-3451-3400	Fax	+82-2-3451-3451
Email	nifokorea@ni.com	Website	ni.com/korea
Contents of Exhibit	Delta-Robot, Big-eye		
Introduction			

National Instruments transforms the way engineers and scientists around the world design, prototype, and deploy systems for test, control, and embedded design applications. Using NI open graphical programming software and modular hardware, customers at more than 30,000 companies annually simplify development, increase productivity, and dramatically reduce time to market. From testing next-generation gaming systems to creating breakthrough medical devices, NI customers continuously develop innovative technologies that impact millions of people.

Company Name	**Yujin Robot Co., Ltd**	President	Kyung Chul Shin
Address	#1214, Namsung Plaza, 345-30, Gasan-dong, Guemcheon-gu, Seoul	Country	Korea
Tel	02)2026-1400	Fax	+82-2-2026-1440
Email	kcshin@yujinrobot.com	Website	www.yujinrobot.com
Contents of Exhibit	ROBOSEM		
Introduction			

Yujin Robot Co. Ltd, was established in March of 1988 and has researched, developed and sold various service robots with over 20years experiences in robot technology. Our major products are intelligent robots such as iClebo (Robot vacuum cleaner), iRobi(The world first children education network robot), Robosem (Foreign language education robot) and Social security robot etc…We, Yujin Robots, are consistently making efforts to be a company that consumers can trust and respect keeping quality improvement and good quality control.

Company Name	**ROBOBUILDER CO., LTD**	President	Chang Bae Park
Address	#611, Dmc Center, 1580 Sangam, Mapo, Seoul	Country	Korea
Tel	+82-2-3141-5101	Fax	+82-2-3141-5107
Email	sunnykim@robobuilder.net	Website	http://www.robobuilder.net
Contents of Exhibit	Humanoid Robot R&D Platform, Robot Module (Actuators)		
Introduction			

ROBOBUILDER is a professional manufacturer, which has developed another concept of actuator with enhanced precision and improved cost efficiency, applicable to a greater range of areas as well as robotics field. Since even a small actuator module has a complex of advanced level of technological capacity, ROBOBUILDER is pursuing active research and development as well as production and marketing.

ROBOBUILDER smart actuator has such worldwide competitive features as functional diversity and easy-to-assemble, so that the users can assemble modules just by inserting a robot articulation device, which helps user-centered creative design and reduce the time spent to assemble dramatically. And especially, the actuator adopts Proportional Integral Derivative(PID) precision control algorithm, so that realizes the precision level equivalent to those of industrial servo motors.

ROBOBUILDER smart actuator also enables direct connection to wCK module with no additional communication devices in an exterior controller, by using the world-first Full Duplex UART two-directional parallel communication technique.

Company Name	**ROBOTIS CO., LTD.**	President	Byoung Soo Kim
Address	(153 - 787) #1506 Ace High-end Tower No.3, 371-50 Gasan-dong Geumcheon-gu Seoul	Country	Korea
Tel	+82-70-8671-2600	Fax	+82-70-8230-1336
Email	korea@robotis.com	Website	www.robotis.com
Contents of Exhibit	Open Platform Humanoid [DARwIn-OP] Robot exclusive actuator [DYNAMIXEL]		
Introduction			

ROBOTIS CO., LTD, founded in April of 1999, is a robot solution company that offers from robot platform, actuators, controllers, and sensor modules to contents based on the software and hardware for robot movements.

Company Name	**FUTUREROBOT Co., Ltd**	President	Se-Kyong Song
Address	(463-828) #603 Bundang Amigo Tower, 358-2 Yatap-dong, Bundang-gu, Sungnam-City, Kyeonggi-do	Country	Korea
Tel	+82-31-252-6860	Fax	+82-31-252-6865
Email	furo@futurerobot.co.kr	Website	http://www.futurerobot.com
Contents of Exhibit	Smart Service Robot 'FURO'		
Introduction			

FUTUREROBOT Co., Ltd. launched in 2009 to came up with Smart Service Robot named as **FURO.**

FURO is the **smart service robot** which performs **user-friendly services** useful to the well-being of human with **autonomous recognition and judgment**.

FURO enables not only **Human-Robot Interaction** as like a Smart Phone but **labor-saving** as like ordering a meal, getting all information without guide **in many languages** and **different situation** with a lot of **fun and entertainment**.

Company Name	**SimLab Co., Ltd.**	President	Kyong-Sok (KC) Chang
Address	Hyobong8 Bldg 2nd Fl 1425-9 Seocho-dong Seocho-gu Seoul 137-864	Country	Korea
Tel	+82-2-3471-2014	Fax	+82-2-6280-9931
Email	info@simlab.co.kr	Website	www.simlab.co.kr
Contents of Exhibit	RoboticsLab, RealtimRobotics		
Introduction			

RoboticsLab is a Robotics Software Development Environment including Dynamics and Control Engines. It provides accurate and effective simulation for robotic manipulation tasks and mobile robot navigation. It was developed to support rapid-prototyping, customizing, and testing of reusable robotic algorithms. Robotics engineers and researchers can utilize RoboticsLab for a variety of fields such as robot/environment modeling, dynamic simulation, controller development, content creation as well as robotics education.

RealtimeRobotics is a RoboticsLab premium add-on which implements a commercial RTOS-based realtime control framework for RoboticsLab. It provides seamless integration of real robotic systems on RTOS(realtime OS) with user-created control algorithm plug-ins on RoboticsLab. Users can perform hard realtime control of real(another word?) robots using RoboticsLab's high-quality control SDK. This control SDK supports a variety of system interfaces such as EtherCAT, CAN, IEEE1394 as well as a number of PCI and ISA based DAQ boards.

Company Name	**Dongbu Robot Co., Ltd.**	President	Kang Seok-Hee
Address	401-11F, Bucheon Technopark, 193, Yakdae-dong, Wonmi-gu, Bucheon, 420-734	Country	Korea
Tel	+82-32-329-5551(ext.112)	Fax	+82-32-329-5569
Email	sdbaek@dongbu.com	Website	www.dongburobot.com
Contents of Exhibit	TETRA-DSIV : Intelligent Mobile Robot Platform HerkuleX Series : Lightweight & Low power-high performance Robot Servo HOVIS Series : 3rd Gen. Humanoid (Educational, Home Service Robot) Genibo SD : Robot Pet Dog		
Introduction			

Dongbu Robot, the history of Korean Robot Industry, was established in 1998.
Manufacturing Robot : Automation, Application & Solution
Service Robot : Intelligent Mobile Platform, Public Service Robot, Security Robot
Intelligent Robot : Edu-tainment Robot, Home Service Robot, Educational Humanoid, etc.

Company Name	**HYUNDA MOTOR COMPANY**	President	Mong-Koo Chung
Address	231 Yangjae-Dong Seocho-Gu Seoul	Country	Korea
Tel	+82-31-368-7960	Fax	+82-31-368-3988
Email	mh900@hyundai.om	Website	http://www.hyundai.com/
Contents of Exhibit			
Introduction			

Hyundai-Kia Motors is now recognized for its world-leading quality and technology, as seen through the increasing number of awards and accolades from prominent overseas industry organizations and media. We have also grown into the world's fifth largest automaker with global production bases in the US, China, India, Turkey, the Czech Republic, Slovakia, Russia and Brazil. To drive our future growth, we will work to further enhance the emotional attributes of our brand while continually raising quality standards so that Hyundai-Kia Motors stands out from the rest of the pack.

By making bold investments and actively supporting a culture of innovation, we will secure top class research and development capabilities and turn Hyundai-Kia Motors R&D Center into a cradle of global best vehicles.

Company Name	**ED Co., Ltd.**	President	Yong Hoo Park
Address	[Head office] 517-15, Sangdaewon-Dong, Jungwon-Gu, Seongnam-City, Gyeonggi-Do, [Seoul branch office] 1024-4, Deoksan bldg., Banngbae-Dong, Seocho-Go, Seoul,	Country	Korea
Tel	[Head office] +82-31-730-7300 [Seoul branch office] +82-2-2046-7100	Fax	[Head office] +82-31-730-7312 [Seoul branch office] +82-2-2046-7170
Email	trade@ed.co.kr	Website	http://www.ed.co.kr
Contents of Exhibit	ED-7255 (5-AXISARM ROBOT TRAINER)		
Introduction			

ED has established not only solid fame as a leading didactic business in the field of education and training , but also carve out a new business area including human-like intelligent robots targeted to the commercial sector.
We will make a strong system to meet market trend and to develop differentiated technology. Furthermore, we will make an investment in new business field.
Launching service robot (ARO) development, the domestic market share has been increased and the future market position will be higher than ever through the Hybrid Ticketing Robot developed
As starting robot for bio examination and mobile assisted, we will expand the market of medical equipment business, reinforce the experienced engineers and make an investment in R&D (Research and Development).

Company Name	**Huintech.**	President	Hee Soo Kwak
Address	#306 Seoul Business Incubation Center,72, Digital-ro 26-gil Guro-gu , Seoul .	Country	Korea
Tel	82-2-6745-6800	Fax	82-2-6745-6801
Email	heesung@huintech.com	Website	www.huintech.com
Contents of Exhibit	Touch Pointer (TP-140B): Touch Pad Presenter Mouse		

Introduction

Huintech is a venture company with expertise in the development and manufacturing of human interface devices. **Huintech** is an innovative company creating the new market, based on its hands-on experiences and technical-knows in hardware development. Especially **Huintech** posses a series of patents regarding the entry method of the coordinates and letters using touch panels.

Touch Pointer is the product that functions both as a mouse and a presenter and can manipulate PC located within 15 meters using 2.4 GHz RF technologies. For the entry method, **Touch Pointer** provides smooth feeling of touch and instant clicking, eventually enabled by the technologies combining the micro switches and electrostatic-capacity-type touch panel which has been widely applied to the laptop computers.

Major functions of this product can be summarized as follows;

Presentation function: When you use presentation software such as Power Point and Keynote, with just one click and touch of **Touch Pointer**, you can move to next & previous pages, start & end slid shows, use black/white function, and jump up to the designated pages.

Mouse Pointing: Thanks to the electrostatic capacity touch panel, you can move the coordinates fast and demonstrate various gesture functions with simple use of thumb.

Media Player Control: You can control media player for movie or music remotely with Touch Pointer. All the functions you need such as play, stop, forward, rewind, and control of volumes can be manipulated with simple use of thumb.

Letter entry: If you install the software for **Touch Pointer**, you can even enter the letters remotely using virtual keyboard to be shown on the monitor.

Touch Pointer is good for business men who make formal presentations often and remote controller for Home Theater PC and mobile PC and for the smart

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Social / Tour Program

❑ Social Programs

● Welcome Reception

All participants are invited to attend the Welcome Reception to be held on Wednesday, November 23 from 18:00 on the Room #104~105 (1F) of Venue.

● Banquet

A banquet will be held on Tuesday, November 24 from 19:00 at the Grand Ballroom A (2F) of Venue. Banquet ticket is included in regular registration fee.

❑ Tour Programs

● Technical Tour

For the Doosan Infracore Corporate (Incheon) technical tour on Friday, November 25 from 15:00, confirmed tour participants should be at Songdo ConvensiA at 14:00 in front of the main gate.

● Cultural Tour

Cultural Tour will be operated as the following schedule:

* Date and time: Nov. 26, 2011 / 09:30 ~ 14:00
* Course: Ganghwa Dolmen - DMZ Ganghwa Peace Observatory
* Price: USD 5
* The bus will depart from Songdo ConvensiA at 09:30 in front of the main gate.

Ganghwa Dolmen

Dolmens are large burial monuments, which are numerous in Asia, Europe and North Africa. Korea has the greatest number of dolmens in the world. These are of great archaeological value for the information they provide on the prehistoric peoples who erected them, and their social and political systems, beliefs and worship rituals, arts and celebrations and other secrets.

Gochang, Hwasun and Ganghwa Dolmen Sites have the highest density and variety of dolmens in Korea.

People marvel at not only their numbers, but also the diverse types; the table type, known as the northern type, the go-board type, known as the southern type, the capstone type and others. These sites also keep intact evidence of how the stones were quarried, transported and lifted, and of how dolmen types changed over Northeast Asia.

Dolmens were erected in Korea from 1000 B.C. to the dawn of the first millenium. They straddled a long span of ancient history, varying by time and region. Korea seems to have flourished the most with regard to erecting various dolemens in Northeast Asia, judging from the great density of dolmens found

here.

With growing awareness of the importance of dolmens, the central government and local governments have designated dolmen sites as historical sites or provincial monuments, and performed precise geographical and topographical surveys and scientific excavations. Those efforts to explore the dolmen sites archaeologically are done in accordance with environmental concerns.

Demilitarized Zone(D.M.Z)

D.M.Z.(Demiliterized Zon)is the only divided country in the world. After the Korean War (June 25, 1950), and negotiated and then designated the DMZ [demilitarized zone] 2km away from the truce line on each side of the border. As one of the last relics of the Cold War, the DMZ attracts a great deal of public interest.

DMZ tourist sites have been created to quench peoples' curiosity on this unique area where tension and peace coincide. These sites are especially popular among foreign tourists.

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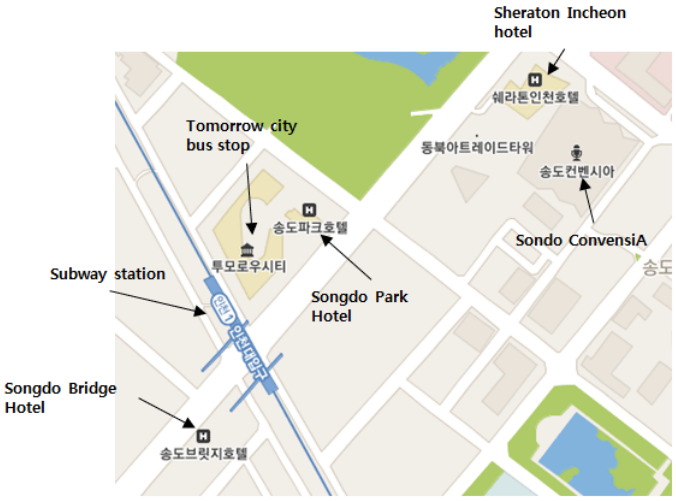
Conference Information

❑ Transportation (How to get to Songdo ConvensiA)



● **By Bus** (from Incheon Int'l Airport)

* Bus No.: 303 (Take the bus 9B gate (1F) of Incheon Int'l airport.)
* Travel Times: 70 min.
* Intervals: About 20 min.
* Cost: KRW 2,500

● **By Taxi** (from Incheon Int'l Airport)

* Fare: KRW 30,000 ~ 40,000
* Travel Times: About 30 min.

❑ Accommodation

● **Sheraton Incheon Hotel**

* Room Rate: KRW 120,000 ~ 215,000 (Excluded to 21% service charge & tax.)
Single occupancy without breakfast KRW 120,000
Single occupancy with breakfast KRW 135,000
Club room Single KRW 185,000
Club room Double KRW 215,000
* Tel: +82-32-835-1004
* Location from Venue: 2 min. on foot.

● **BestWestern Premier SongdoPark Hotel**

* Room Rate: KRW 115,000 ~ 130,000 (10% tax will be added.)
Premier Double KRW 115,000
Premier Twin KRW 130,000
* Tel: +82-32-210-7000
* Location from Venue: 5 min. on foot.

● **Songdo BRIDGE Hotel**

* Room Rate: KRW 99,000 (10% tax is included.)
Standard Double / Twin
* Tel: +82-32-210-3000
* Location from Venue: 5 min. on foot.

General Information

❑ About Korea

Tucked away in northeast Asia, Korea is a nation that boasts a fast growing economy and a lifestyle that brings together the old and the new. Once known simply as a quiet nation in the East, the peninsula now hardly sleeps as it pulsates with life and commerce. Numerous branch offices of international corporations and businesses can be found throughout the country as well as most western franchises. Despite all such enthusiasm for modernization and globalization, Koreans still greatly value their 5,000 years of history and the Confucian philosophy that has governed the lives of their ancestors. Many global events take place here annually.

❑ Location

Korea lays in the northeastern part of the Asian continent. It is located between 33 degrees and 43 degrees in Northern Latitude, and 125 degrees and 132 degrees in Eastern Longitude. China, Russia, and Japan are adjacent to Korea. Local time is nine hours ahead of GMT.

❑ Electricity

In Korea, an outlet for 220 Volt is the most common. Overseas delegates bringing laptop computers and other electrical appliances are advised to check whether a transformer is required.

❑ Currency Exchange

Only Korea currency (Won) is acceptable at regular stores and restaurants. The unit of Korean currency is the Korean Won (₩). Coin denominations are ₩10, ₩50, ₩100, ₩500. Banknotes are ₩1,000, ₩5,000, ₩10,000 and ₩50,000.

❑ Tipping

Tipping is not customary in Korea. Service charges are included in your bill on the price of rooms, meals, and other services at hotels and elite restaurants. Sometimes, expensive restaurants and luxury hotels may add a service charge of 10%. Otherwise when they are especially pleased with the service they receive or when a taxi driver, for example, goes out of his or her way to help them. Thus, you do not necessarily have to prepare for extra charges since it will be included in the bill.

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Workshops and Tutorials

Title	[Tutorial] **DARwIn-OP: Open Platform Humanoid Project**
Date & Time	November 23, 2011 & 13:00 ~ 17:00 (Half day session)
Place	Room # 109
Organizers	ROBOTIS Co., LTD. Korea
Language	English
Registration Fee	Free

Abstract

DARwIn-OP is an open platform humanoid with advanced computational power, sophisticated sensors, high payload capacity, and dynamic motion ability to enable many exciting research and education activities. In this tutorial, we will introduce basic specifications and how to program DARwIn-OP.

Program

Introduction to DARwIn-OP: H/W architecture and S/W framework, Jinux Kim, **Director of ROBOTIS**
How to program DARwIn-OP in C++ on Linux Ubuntu, Chase Noh, **Research Engineer of ROBOTIS**

Title	[Tutorial] **OPRoS: Toward the future Robot**
Date & Time	November 23, 2011 & 13:00 ~ 17:00 (Half day session)
Place	Room # 110
Organizers	Hong Seong Park, Professor, Kangwon National University, Korea
Language	Korean (It is subject to change depending on audiences.)
Registration Fee	Free

Abstract

OPRoS is an abbreviation of "Open Platform for Robotic Services." It has an engine that executes programed robot software connected to robot hardware, and includes many tools as well as a simulator to permit creation of this programming easier and faster. The LGPL license is applied to all the source code from its research results, and it is available to the public on OPRoS hompage, www.opros.or.kr. This tutorial would be an excellent opportunity to discover the operation of OPRoS core elements as a robot software platform including its convenient IDEs, and to hear about the experiences of OPRoS Users. In this tutorial an OPRoS researcher will explain core elements of OPRoS and provide/demonstrate a simple example using OPRoS IDE and reference robot. Additionally OPRoS users from several robot companies will talk about their experience in applying OPRoS to their products. OPRoS would like to achieve expanding number of users,

Program

"A robot programming tool: OPRoS",
Mi-sook Kim, Kangwon National University
Core elements of OPRoS framework and specification of OPRos Component will be explained. With a KOBOT (KNU OPRoS Reference Robot), a simple example using OPRoS tools will be demonstrated.

"OPRoS Unmanned Vehicle ESTRO(ETRI Smart Transport Robot)"
Seong Hoon Kim, Electronics and Telecommunications Research Institute
A unmanned Vehicle controlled by OPRoS platform having atomic components and composite components runs to a designated location with avoiding obstacles.

"An applying OPRoS to Furo"
Se-kyong Song, FUTUREROBOT
Sharing an experience applying OPRoS to a service robot Furo will be presented in aspects of developer's and maintenance view points.

"Implement OPRoS on education robots"
Hyun Chul Jung, Yujin Robot,
Experimenting of comparison with the existed program and applying OPRoS program in a educational robot shows positive contributions of OPRoS in commercial robots.

Title	[Workshop] **Korea-Japan workshop on Firefighting and Disaster Robots**
Date & Time	November 23, 2011 & 09:00 ~ 18:00 (Full day session)
Place	Room # 111
Organizers	Min Young Kim, Assistant Prof., Kyungpook National University, Korea
Language	English
Registration Fee	Free
Abstract	

Intelligent disaster robot systems have been proposed to mitigate disaster damages. In particular, it is has been stressed the importance of developing robots for search and rescue tasks, which can actually work in a real disaster site. This workshop focuses on field robotics to contribute response actions against natural and man-made disasters including firefighting. Autonomous / semi-autonomous firefighting and urban disaster monitoring and searching is important humanitarian theme as one of critical applications of robotics. Robotic systems and technologies are powerful tools to avoid secondary damage. The wide-range presentations and discussions in this workshop will promote robotics research and application in this area. Especially, Korea, Japan, EU and USA have been developing various kinds of firefighting and disaster response robots with government supports. Robotics, automation, intelligent machines, systems and devices can play an important role in providing technology that can contribute to firefighting and disaster response activities. The technical knowledge and skills, that the members of our Society can provide, in support of this cooperative international effort, are invaluable. In this workshop, the following topics are discussed;

- Korea national disaster management system with robots
- Japan national disaster management system with robots
- Korea firefighting robot market expansion project
- History of Korea firefighting and disaster robots
- History of Japan firefighting and disaster robots
- New research projects and State-of-the-art of disaster robot system

Title	[Workshop] **Korea-Japan Young Scientists Meeting**
Date & Time	November 23, 2011 & 13:00 ~ 17:00 (Half day session)
Place	Room # 107
Organizers	Jinhyun Kim Assistant Prof., Seoul National University of Science and Technology, Korea
Language	English
Registration Fee	Free
Abstract	

In this workshop, young research scientists from Korea and Japan present their on-going research topics and work out a strategy for more active international research collaboration in the field of robotics.

URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Plenary Talks

Plenary Talk 1 Chair: Sangyoon Lee (Konkuk University, Korea)

Nov. 24, 2011 (Thu.) / 13:30~14:20

Clarence W. de Silva
Professor, Canada Research Chair Professor of Mechatronics & Industrial Automation
Department of Mechanical Engineering
University of British Columbia, Vancouver, BC, Canada

Two Directions in the Application of Homecare Robotics

[Abstract]

This talk will address several important aspects of research and development in homecare robotics. Particular attention will be given to two specific domains of application: autonomous robots that provide basic assistance to the elderly and the disabled in a home setting (e.g., serving food and medicine, cleaning, bathing, and providing assistance for mobility); teleoperation of a robot from a hospital control room to provide first aid while the traditional emergency help is forthcoming. The vast majority of the elderly and the disabled prefer to maintain independent households. A significant fraction of the public cost for supporting the disabled and the elderly goes into homecare and related expenses. In this context, the benefits of homecare robotics are tremendous. In particular, the quality of life of the elderly and the disabled will improve, allowing them more flexibility and comfort, in the presence of round-the-clock and reliable care. Also, other members of the household will have increased freedom and peace of mind to pursue their normal activities including employment and education. Furthermore, the related public spending will be more uniform, fair, and cost effective.

In the anticipated robotic homecare scenario, one or more robots will be available with their local sensors and a range of networked global sensors in the home environment. Adequate robotic intelligence is crucial for autonomous operation while haptic feedback is important in teleoperation. Sensory, mobility, grasping, manipulation, and control capabilities are needed for both categories of operation. The needed basic technologies of robotics, networked communication, control, and teleoperation are sufficiently mature and are available at reasonable cost. Further development is needed in assistive technologies, specialized end-effector devices, and haptics. The talk will particularly highlight key technologies of object identification and localization, detection and evaluation of abnormal motions in humans, robotic navigation in the presence of static and dynamic obstacles, grasping and manipulation, networked intelligent sensor fusion and feedback, impedance control in haptic teleoperation, and stable operation, which are pertinent in the two application domains.

[Biography]

Clarence W. de Silva is a Professor of Mechanical Engineering and occupies the Tier 1 Canada Research Chair Professorship in Mechatronics & Industrial Automation at the University of British Columbia, Vancouver, Canada. A Professional Engineer (P.Eng.), he is also a Fellow of: ASME, IEEE, Canadian Academy of Engineering, and the Royal Society of Canada. He has received many awards including the Paynter Outstanding Investigator Award and the Takahashi Education Award of ASME Dynamic Systems and Control Division; Killam Research Prize; and Outstanding Engineering Educator Award of IEEE Canada. He has served as Editor/Associate Editor of 14 journals including ASME and IEEE transactions; and is the Editor-in-Chief of the International Journal of Control and Intelligent Systems. He received Ph.D. degrees from Massachusetts Institute of Technology, USA (1978) and the University of Cambridge, UK (1998), and an Honorary D.Eng. from the University of Waterloo (2008). He has authored 20 books and over 400 papers, half of which are in journals. The most recent books are: De Silva, C.W., Mechatronics-a

Foundation Course, Taylor & Francis/CRC Press, Boca Raton, FL, 2010; De Silva, C.W., Modeling and Control of Engineering Systems, Taylor & Francis/CRC Press, Boca Raton, FL, 2009; De Silva, C.W., Vibration-Fundamentals and Practice, 2nd Edition, Taylor & Francis/CRC Press, Boca Raton, FL, 2007; and De Silva, C.W., SENSORS AND ACTUATORS-Control System Instrumentation, Taylor & Francis/CRC Press, Boca Raton, FL, 2007.

Plenary Talk 2 Chair: Woojin Chung (Korea University, Korea)

Nov. 25, 2011 (Fri.) / 13:00~13:50

Makoto Kaneko
Professor, School of Mechanical Engineering, Department of Mechanical Engineering, Graduate School of Engineering, Osaka University, Japan

A Future View of Grasp and Manipulation

[Abstract]

Where future robots should go and should not go and what is an adequate style of collaboration between human and robots? These questions are really interesting for discussing the future direction of robot. It is important to know that current robot technologies have already exceeded human capability in some particular functions, such as sensing speed and actuation speed, while human are even more sophisticated than robots in global sense. While it is really hard to find a general answer for these questions, we try to provide our personal views, particularly focusing on manipulation area, by reviewing our former works and by exploring success examples of robot business. Furthermore, as a new direction of manipulation area, we introduce an innovative cell manipulation where we give geometrical constraint to each cell, so that 3-D manipulation can be eventually resulted in 1-D manipulation problem. Such a geometrical contrined cell manipulation may bring a new business in biomedical fields.

[Biography]

Makoto Kaneko received Ph.D in Mechanical Engineering from Tokyo University in 1981.1981-1990 Researcher at Mechanical Engineering Laboratory. 1990-1993 Associate Professor at Kyushu Institute of Technology. 1993-2006 Professor at Hiroshima University. 2006-Professor at Osaka University. His research interests include tactile-based active sensing, grasping strategy, hyper human technology and its application to medical diagnosis. He was a vice president of IEEE Robotics and Automation Society during 2004 through 2005. He got IEEE Fellow (2006) and more than 20 awards, such as the Humboldt Research Award from Humboldt Foundation (1997), IEEE ICRA the Best Manipulation Paper Award(2000), IEEE Int.Symp. on Assembly and Task Planning, the Outstanding Paper Award(2001), IEEE RAS King-Sun Fu Memorial Best Transactions Paper Award(2004), and IEEE Int. Conf. on Information Acquisition, the Best Conference Paper Award(2005).

Plenary Talk 3 Chair: Woojin Chung (Korea University, Korea)

Nov. 25, 2011 (Fri.) / 13:50~14:40

Jae-Bok Song
Professor, School of Mechanical Engineering, Korea University
Director, Center for Autonomous Intelligent Manipulation

Robotic Applications based on Variable Stiffness and Safe Robot Arms

[Abstract]

This plenary speech consists of two parts: variable stiffness actuators and their applications are discussed in part 1, and safe robot arms and safety strategy are presented in part 2.

Either position control or force control is available for one degree of freedom of a robot joint unlike human joints that can execute position and force control simultaneously. To deal with this limitation of a robot joint, the variable impedance actuation has been used to simultaneously control the stiffness and position of a robot arm while guaranteeing collision safety in physical contact with the environment. In this speech, three types of variable stiffness actuators (VSA) such as serial-type VSA, Antagonistic-type VSA, hybrid-type DAU, which were developed at Korea University, will be introduced. The VSAs can be used for various robotic applications including precision assembly, grasping of a robot hand, rehabilitation devices, and so on.

In recent years, collisions between humans and robots have drawn much attention since service robots are increasingly being used in human environments. A safe robot arm can be achieved using either an active or passive compliance method. A passive compliance system composed of purely mechanical elements often provides faster and more reliable responses for dynamic collision than an active one involving sensors and actuators. Since both positioning accuracy and collision safety of a service robot arm used in human environments are equally important, a robot arm should have very low stiffness when subjected to a collision force greater than that which could cause human injury, but should otherwise maintain very high stiffness. A safe joint mechanism (SJM)is introduced in this speech. The active compliance approach based on joint torque sensing and motor control is also introduced. Finally, the three-stage safety strategy is discussed for safe physical human-robot interaction.

[Biography]

Professor Jae-Bok Song received the B.S. and M.S. degrees in mechanical engineering from Seoul National University, Korea, in 1983 and 1985, respectively, and the Ph.D. degree in mechanical engineering from MITin 1992. He joined the faculty of the Department of Mechanical Engineering, Korea University, Korea in 1993. Currently, he is a director of National Robotics Research Center for Autonomous Intelligent Manipulation by the Ministry of Knowledge Economy. Dr. Song is working as a vice president of Korea Robotics Society and as a director of the Institute of Control, Robotics and Systems Engineers. He is also an Editor-in-Chief for International Journal of Control, Automation and Systems.

Dr. Song received the Fumio Harashiam Mechatronics Award for his contribution to the Mechatronics area in 2005. He also received the ICROS Academic Award from the Institute of Control, Robotics and System Engineers in 2006 and the Best Paper Award from SCIE-ICASE International Joint Conference in 2006 and from International Conference on Control, Automation, and Systems in 2008. He received the Best Paper Award in Science and Technology for the Korean Federation of Science and Technology Societies in 2010. He is the fellow of ICROS.

His current research interests are design and control of various robotic and mechatronic systems, and navigation of a mobile robot.

URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Technical Program at a Glance

Nov. 23, 2011 (Wed.)				
Time	Room #107	Room #109	Room #110	Room #111
09:00~18:00	[Workshop] Korea-Japan Young Scientists Meeting (13:00 ~ 17:00)	[Tutorial] OPRoS: Toward the future Robot (13:00 ~ 17:00)	[Tutorial] DARwIn-OP: Open Platform Humanoid Project (13:00 ~ 17:00)	[Workshop] Korea-Japan workshop on Firefighting and Disaster Robots (09:00 ~ 18:00)
18:00~19:30	Welcome reception [Room #104 ~ 105]			

Nov. 24, 2011 (Thu.)				
Time	Room #108	Room #109	Room #110	Room #111
09:00~10:15	TA1 Human-Robot Interaction 1	TA2 Localization & Navigation	TA3 (OS) Unmanned Flying Robot for Disaster Monitoring	TA4 (OS) Intelligent Sensors and Actuators
10:15~10:30	Break			
10:30~11:45	TB1 Service Robots 1	TB2 Robot Vision 1	TB3 (OS) Distributed Intelligent Robot System	TB4 (OS) Smart Actuators and Applications
11:45~12:50	Lunch			
12:50~13:00	Opening Ceremony			
13:00~13:30	Special Talk 1 : Ubiquitous Development and New Growth Industry Inducement Prospect of IFEZ Lee, Jong Cheol (Commissioner, Incheon Free Economi Zone Authority) [Room #113+114]			
13:30~14:20	Plenary Talk1 : Prof. Clarence de Silva (Univ. of British Columbia, Canada) [Room #113+114]			
14:20~15:20	Poster Session [Room #116+117]			
15:20~15:30	Break			
15:30~16:45	TC1 Service Robots 2 Industry Session : Yujin Robot	TC2 Robot Control 1	TC3 Robotics for Biomedical Applications	TC4 (OS) ROTUS (RObust navigaTion for Urban Space)
16:45~17:00	Break			
17:00~18:15	TD1 Robot Intelligence 1	TD2 Robot Kinematics &Dynamics 1	TD3 Video Session: Biologically Inspired Robots (OS) and Other Robots	TD4 (OS) Mobile Robot Navigation
18:20~18:55	Board Meeting [Room #110]			
19:00~21:30	Banquet [Grand Ballroom A]			

URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Technical Program at a Glance

Nov. 25, 2011 (Fri.)				
Time	Room #108	Room #109	Room #110	Room #111
09:00~10:15	FA1 Human-Robot Interaction 2	FA2 Robot Intelligence 2	FA3 Sensors and Actuators	FA4 (OS) Multifingered Robot Hand 1
10:15~10:30	Break			
10:30~11:45	FB1 Distributed Robotics	FB2 Robot Vision 2	FB3 Robot Control 2	FB4 (OS) Multifingered Robot Hand 2
11:45~13:00	Lunch			
13:00~13:50	Plenary Talk 2: Prof. Makoto Kaneko (Osaka Univ., Japan) [Room #113+114]			
13:50~14:40	Plenary Talk 3: Prof. Jae-Bok Song (Korea Univ., Korea) [Room #113+114]			
14:40~15:00	Break			
15:00~16:15	FC1 Robot Kinematics & Dynamics 2	FC2 Biomedical Robots and Biomimetics	FC3 (OS) Robot and Future Information Device	FC4 (OS) OFTDPR (Original Fusion Technology Development Program for Robot) 1
16:15~16:30	Break			
16:30~18:00	FD1 Robot Intelligence 3	FD2 (OS) Roll-to-roll Printed Electronics Process and System	FD3 (OS) Robot-based Learning	FD4 (OS) OFTDPR (Original Fusion Technology Development Program for Robot) 2
15:00~18:00	Technical Tour			

Nov. 26, 2011 (Sat.)	
09:30~14:00	Social / Cultural Tour (Ganghwa Dolmen - DMZ Ganghwa Peace Observatory)

URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Technical Program

❑ Thursday, November 24

[TA1] Human-Robot Interaction 1

Chair: **Luigi Pagliarini**, Technical Univ. of Denmark, Denmark

09:00~09:15 **TA1-1** Human Activity Recognition Using a Mobile Camera
Kai-Tai Song, Wei-Jyun Chen
National Chiao Tung University, TAIWAN

09:15~09:30 **TA1-2** Wearable Playware
Luigi Pagliarini[1] Henrik Hautop Lund[2]
[1]Technical University of Denmark, DENMARK, [2]Academy of Fine Arts of Bari, ITALY

09:30~09:45 **TA1-3** Real-time Estimation of Human's Intended Walking Speed for Treadmill-style Locomotion Interfaces
William Haiwei Dong[1], Jianjun Meng[2], Zhiwei Luo[1]
[1]Kobe University, JAPAN, [2]Shanghai Jiao Tong University, CHINA

09:45~10:00 **TA1-4** Pattern-Preserving-based Motion Imitation for Robots
Bonggun Shin, Sungho Jo
KAIST KOREA,

10:00~10:15 **TA1-5** Experiments of GMM Based Speaker Identification
Peng Qi, Lu Wang
Royal Institute of Technology, SWEDEN

[TA2] Localization & Navigation

Chair: **M. C. Lee**, Pusan Nat'l University, Korea

09:00~09:15 **TA2-1** Reducing Localization Ambiguity of Immobile Passive UHF RFID Tagged Physical Objects
Jae Sung Choi[1], Hyun Lee[2], Sang Cheol Lee[2], Dong Ha Lee[2]
[1]University of Texas at Arlington, USA, [2]DGIST, KOREA

09:15~09:30 **TA2-2** A Path Planning Algorithm using Artificial Potential Field Based on Probability Map
Min-Ho Kim, Jung-Hun Heo, Yuanlong Wei, Min-Cheol Lee
Pusan National University, KOREA

09:30~09:45 **TA2-3** Neural Networks and Fuzzy Logic Navigation Approach for a Bi-Steerable Mobile Robot
O. Azouaoui, N. Ouadah, I. Mansour, A. Semani
CDTA, ALGÉRIE

09:45~10:00 **TA2-4** Q Learning Behavior on Autonomous Navigation of Physical Robot
Handy Wicaksono
Petra Christian University, INDONESIA

10:00~10:15 **TA2-5** Map Management System for cv-SLAM
Hyukdoo Choi[1], Euntai Kim[1], Yong Woon Park[2], Chong Hui Kim[2]
[1]Yonsei University, KOREA, [2]ADD, KOREA

[TA3] OS: Unmanned Flying Robot for Disaster Monitoring

Chair: **Eun-Jin Im**, Kookmin University, Korea

09:00~09:15 **TA3-1** Design and Implementation of Coaxial Quadrotor for an Autonomous Outdoor Flight
Gilar Budi Raharja, Kim Gyou Beom, Yoon Kwangjoon
Konkuk University, KOREA

09:15~09:30 **TA3-2** **[Invited]** Control of Unmanned Flying Vehicle Based on MPEG-V International Standard
Kyoungro Yoon, Doohyun Kim, Young-Guk Ha
Konkuk University, KOREA,

09:30~09:45 **TA3-3** Optical Flow Computation on a Heterogeneous Platform
Jinsoo Oh[1], Eun-Jin Im[1], Kyoungro Yoon[2]
[1]Kookmin University, KOREA, [2]Konkuk University, KOREA

09:45~10:00 **TA3-4** Attitude Control System Design for a Quadrotor Flying Robot
Gigun Lee, Dongg Yun Jeong , Nguyen Dang Khoi, Taesam Kang
Konkuk University, KOREA

10:00~10:15 **TA3-5** Fault Tolerant Controller Design for Component Faults of a Small Scale Unmanned Aerial Vehicle
Vishnu Kumar Kaliappan, Hanmaro Young, Agus Budiyono, Dugki Min
Konkuk University, KOREA

[TA4] OS: Intelligent Sensors and Actuators

Chair: **Tao Liu**, Kochi University of Tech., Japan

09:00~09:15 **TA4-1** Frame Vibration Suppression for Wafer Transfer System
Yanjie Liu, Mingyue Wu, Guobao Xu, Lining Sun
Harbin Institute of Technology, CHINA

09:15~09:30 **TA4-2** Cerebral Activation Patterns of Bimanual and Unilateral-limb Trainings —Additional Verification of an Upper-limb Rehabilitation Robot by Using Near-infrared Spectroscopic Technology

Chunguang Li[1,2], Tao Liu[1,2], Lining Sun[1], Yoshio Inoue[2], Kyoko Shibata[2]
[1]Soochow University, CHINA, [2]Kochi University of Technology, JAPAN

09:30~09:45 **TA4-3** Design of a Sliding Wall Climbing Robot with a Novel Negative Adsorption Device

Shanqiang Wu[1], Lijun Wu[1], Tao Liu[2]
[1]China Jiliang University, CHINA, [2]Kochi University of Technology, JAPAN

09:45~10:00 **TA4-4** A Learning Algorithm for Model based Object Detection

Chen Guodong[1], ZeyangXia[2], Rongchuan Sun[1], Zhenhua Wang[1], Zhiwu Ren[1], Lining Sun[1]
[1]Soochow University, CHINA, [2]PurdueSchool of Engineering and Technology, USA

10:00~10:15 **TA4-5** **[Invited]** Three-dimensional Gait Analysis System with Mobile Force Plates and Motion Sensors

Tao Liu[1], Yoshio Inoue[1], Kyoko Shibata[1], Kouzou Shiojima[2]
[1]Kochi University of Technology, JAPAN, [2]TEC GIHAN Co., LTD, JAPAN

[TB1] Service Robots 1

Chair: **Y. G. Ha**, Konkuk University, Korea

10:30~10:45 **TB1-1** Detection, Motion Planning and Control of Human Tracking Mobile Robots

Dong-Hyung Kim[1], Youngmyung Lee[2], Ji-Yeong Lee[3], Gyung-Jin Park[4], Chang-Soo Han[5], Sunil K. Agrawal[6]
[1]Hanyang University, KOREA, [2]University of Delaware, USA

10:45~11:00 **TB1-2** Architecture of Kukanchi Middleware

Yuhki ISHIGURO[1], Yoshio MAEDA[1], Ngo Lam Trung[1], Takeshi SAKAMOTO[2] Makoto MIZUKAWA[1], Takashi YOSHIMI[1], Yoshinobu ANDO[1]
[1]Shibaura Institute of Technology, JAPAN, [2]Global Assist Co., Ltd.

11:00~11:15 **TB1-3** Component-based Robot Software Design for Pick-and-Place Task Described by SysML

Kenichi Ohara, Kyohei Iwane, Tomohito Takubo, Yasushi Mae, Tatsuo Arai
Osaka University, Osaka, JAPAN

11:15~11:30 **TB1-4** Hybrid Semantic Mapping using Door Information

Joong-Tae Park, Jae-Bok Song
Korea University, KOREA

11:30~11:45 **TB1-5** WINDORO : The World's First Commercialized Window Cleaning Robot for Domestic Use

Young-Ho Choi, Kwang-Mok Jung
Pohang Institute of Intelligent Robotics, KOREA

[TB2] Robot Vision 1

Chair: **Dong-il Dan Cho**, Seoul Nat'l University, Korea

10:30~10:45 **TB2-1** Moving Object Tracking in Driving Environment
Jae-Yeong Lee, Wonpil Yu
ETRI, KOREA

10:45~11:00 **TB2-2** Adding Image Information Corresponding to the Shape of the Objects' Surfaces on Environmental Maps
Shinya KAWAKAMI, Tomohito TAKUBO, Kenichi OHARA, Yasushi MAE, Tatsuo ARAI
Osaka University, JAPAN

11:00~11:15 **TB2-3** A Novel Method for Vision Tracking with Line of Sight Control, Using a Fuzzy Logic Controller and Euler Angle Orientation in the Feedforward Loop
Jaehong Park[1], Wook Bahn[1], Chang-hun Lee[1], Tae-il Kim[1], Kwang-soo Kim[2], Dong-il "Dan" Cho[1]
[1]Seoul National University, KOREA, [2]Hanbat National University, KOREA

11:15~11:30 **TB2-4** Comparison of Plane Extraction Performance using Laser Scanner and Kinect
Chan-Soo Park, Sung-Wan Kim, Doik Kim, Sang-Rok Oh
KIST, KOREA

11:15~11:45 **TB2-5** Probabilistic Shape Vision for Embedded Systems
Sven Olufs[1], Markus Vincze[1], Paul G. Pl¨oger[2]
[1]Automation and Control Institute, AUSTRIA, [2]University of Applied Sciences GERMANY

[TB3] OS: Distributed Intelligent Robot System

Chair: **Young-Jo Cho**, ETRI, Korea

10:30~10:45 **TB3-1** Comparison and Analysis of Scan Matching Techniques for Cooperative-SLAM
Heon-Cheol Lee, Seung-Hee Lee, Seung-Hwan Lee, Tae-Seok Lee, Doo-Jin Kim, Kyung-Sik Park, Kong-Woo Lee, Beom-Hee Lee
Seoul National University, KOREA

10:45~11:00 **TB3-2** **[Invited]** Task Allocation Strategy of Heterogeneous Multi-robot for Indoor Surveillance
Seohyun Jeon, Minsu Jang, Seunghwan Park, Daeha Lee, Young-Jo Cho, Jaehong Kim
ETRI, KOREA

11:00~11:15 **TB3-3** Decentralized Task-Oriented Local Group Generation for Robot Swarms
Geunho Lee, Yukinori Sato, Nak Young Chong
JAIST, JAPAN

11:15~11:30 **TB3-4** Collective Searching Algorithm for Multi-Robot System with Bounded Communication Range

Sang-Hoon Ji[1], Jae-Seong Han[1], Sang-Moo Lee[1], Yong-Sun Moon[2], Tae-Yong Kuc[3]
[1]KITECH, KOREA, [2]Redone Technologies Co. Lt, KOREA, [3]Sungkyunkwan University, KOREA

11:30~11:45 **TB3-5** Network Management in Collective Intelligent Robotic Environment

Dong-Bum Kim[1,2], Chang-Eun Lee[1], Hyun-Ja Im[1], Seung-Ik Lee[1,2], Young-Jo Cho, Sung-Hoon Kim[1]
[1]ETRI, KOREA, [2]University of Science and Technology, KOREA

11:45~12:00 **TB3-6** Coverage Control of a Robotic Swarm for Pollution Monitoring

Suwantaweekul Lalitta, Geunho Lee, Nak Young Chong
JAIST, JAPAN

[TB4] OS: Smart Actuators and Applications

Chair: **Nam Seo Goo**, Konkuk University, Korea

10:30~10:45 **TB4-1** Camber-Adjustable Flapping Wing Air Vehicles

Jun-Seong Lee[1], Jae-Hung Han[1], Dae-Kwan Kim[2]
[1]KAIST, KOREA, [2]KARI, KOREA

10:45~11:00 **TB4-2** Design and Modeling of Spherical Joint Haptic Master for MIS Robot Using Electrorheological Fluid

Jong-Seok Oh, Seung-Bok Choi, Han-Jun Cho
Inha University, KOREA

11:00~11:15 **TB4-3** **[Invited]** Performance of a Piezo-Composite Generating Element

H. T. Luong[1], C. M. T. Tien[1], N. S. Goo[2]
[1]Konkuk University, KOREA, [2]Konkuk University, KOREA

11:15~11:30 **TB4-4** Energy-Efficient Fire Monitoring Using Ubiquitous Sensor Network

Heemin Kim, Lengieng Ing, Young-guk Ha
Konkuk University, KOREA

[TP] Poster Session

TP-01 Modified Floyd Algorithm for Intelligent Walking Frame

Hansoo Lee, Sudae Kim, Gyeongdong Baek, Sungshin Kim
Pusan National University, KOREA

TP-02 Enhanced Obstacle Recognition Method based on Complementary use ofMmultiple Sensors

Dae-Han Hong, Yoon-Gu Kim, Jeong-Hwan Kwak, Jinung An
DGIST, KOREA

TP-03 Optical Sensor-based Object Detection for Autonomous Robots
Jonghwan Kim, Chung-Hee Lee, Young-Chul, Soon Kwon, Chi-Ho Park
DIST, KOREA

TP-04 A User Reactivity Research for Improving Performance of Service Robot
Seunghwan Park, Wonpil Yu, Jaeil Cho
ETRI, KOREA

TP-05 Fast SLAM using Polar Scan Matching and Particle Weight based Occupancy Grid Map for Mobile Robot
Hyun Chul Roh, Chang Hun Sung, Min Tae Kang Myung Jin Chung
KAIST, KOREA

TP-06 Moving Object Detection and Tracking from Moving Camera
Won Jin Kim, In-So Kweon
KAIST, KOREA

TP-07 Hole Filled 3D Map Using Mobile Robots in the Urban Environment
Sang Un Park, Inwook Shim, Myung Jin Chung
KAIST, KOREA

TP-08 A Multimodal Ubiquitous Interface System Using Smart Phone for Human-Robot Interaction
Young-Hoon Jeon, Hyunsik Ahn
Tongmyong University, KOREA

TP-09 Research on a System for Collecting, Storing and Utilizing Potential Energy from Mobile Vehicle for Public Devices
Manh Tuan Ha
Hanoi University of Science and Technology, VIETNAM

TP-10 Progress on Standard Development of Map Data Representation
Wonpil Yu[1], Hyungpil Moon[2], Geoffrey Biggs[3], Raj Madhavan[4]
[1]ETRI, KOREA, [2]Sungkyunkwan University, KOREA, [3]AIST, JAPAN, [4]University of Maryland, USA

TP-11 Design and Implementation of an Optimal In-pipe Navigation Mechanism for a Steel Pipe Cleaning Robot
Yoon-Gu Kim, Dong-Hwan Shin, Jeon-Il Moon, Jinung An
DIST, KOREA

TP-12 Experimental Results of the Teaching Force Shaping Algorithm in Case of the Impact
Chanhun Park, Jin Ho Kyung, Hyun-min Do
KIMM, KOREA

TP-13 The Difference between the Double Stages of Impedance and the Single Stage of the Impedance for a Direct Teaching Method in a Constraint Condition
Chanhun Park, Jin Ho Kyung, Tae-yong Choi
KIMM, KOREA

TP-14 Study on Teaching Path Reconstruction Algorithm based Direct Teaching and Playback Method

ChengJie Li[1], ChanHun Park[1], JinHo Kyung[1], GwangJo Chung[1], ChangSoo Han[2]
[1]KIMM, KOREA, [2]Hanyang University, KOREA

TP-15 Feature Point Recognition for the Direct Teaching Data in Industrial Robot

Taeyong Choi, Chanhun Park, Jinho Kyung
KIMM, KOREA

TP-16 Hybrid Control Architecture of the Robotic Surveillance System Using Smartphones

Hui-Kyung Oh, In-Cheol Kim
Kyonggi University, KOREA

TP-17 Measurement of Joint Toque and Signal Processing Using FIR Filter

Yijun Yoo, Chanhun Park, Dongil Park, Jinho Kyung, Gwangjo Chung
KIMM, KOREA

TP-18 Mobile Robot Navigation Based on Interactive SLAM with an Intelligent Space

Fumitaka HASHIKAWA, Kazuyuki MORIOKA
Meiji University, JAPAN

TP-19 Topological Map Building for Mobile Robots Based on GIS in Urban Environments

Yu-Cheol Lee, Christiand, Seung-Hwan Park, Wonpil Yu, Sung-Hoon Kim
ETRI, KOREA

TP-20 Nonlinear Disturbance Observer Design for Euler-Lagrange Systems: An Initial Study

Min Jun Kim, Wan Kyun Chung
POSTECH, KOREA

TP-21 Dynamic Analysis of Beam Type Substrate Handling Robot in Solar Cell Manufacturing

Dong Il Park, Cheolhoon Park, Yi-Jun Yoo, Hyunmin Do, Jin-Ho Kyung
KIMM KOREA

TP-22 Motion Simulation Model for Beam Type Solar Cell Substrate Transport Robot

Cheol Hoon Park[1,2], Dong Il Park[1], Hyun Min Do[1]
[1]KIMM, KOREA, [2]KAIST, KOREA

TP-23 Combined Method of Weighted Least Norm and Gradient Projection for Avoiding Joint Limit

Seong Sik Park, Wan Kyun Chung
POSTECH, KOREA

TP-24 Design and Simulation of a Robot that Can Walk and Jump

Hyunsoo Seung, Sangyoon Lee
Konkuk University, KOREA

TP-25 Probabilistic Voxel Mapping using Stereo Matching Confidence
Sijong Kim, Seunguk Ahn, Myung Jin Chung
KAIST, KOREA

TP-26 3D Mapping in Urban Environment using Geometric Featured Voxel
Inwook Shim, Yungeun Choe, Myung Jin Chung
KAIST, KOREA

TP-27 Vision-based Detection and Classification of Pavement Mark using Neural Network for Autonomous Driving System
Yu-Bin Yoon, Se-Young Oh
POSTECH, KOREA

TP-28 Motion Prior Based on General Motion Statistics
RockHun Do, In So Kweon
KAIST, KOREA

TP-29 Haze Removal using Visible and Infrared Image Fusion
Byungtae Ahn, Taewuk Bae, Inso Kweon
KAIST, KOREA

TP-30 A Search and Coverage Algorithm for Mobile Robot
Seuk-Woo Ryu[1], Young-ho Lee[1], Tae-Yong Kuc[1], Sang-Hun Ji[2], Yong-Seon Moon[3]
[1]Sungkyunkwan University, KOREA, [2]KITECH, KOREA, [3]Sunchon National University, KOREA.

TP-31 Cell Phone Controlled Rocker-bogie Suspension Type Rover with a Scooping Arm
Suhas Divakar
Rashtreeya Vidyalaya College of Engineering Bangalore, INDIA

TP-32 Analysis of Pneumatic Balloon Actuator
Dongwon Yun[1], Kyung-Soo Kim[2], Soohyun Kim[2], Heechang Park[1]
[1]KIMM, KOREA, [2]KAIST, KOREA

TP-33 Teaching Data Extraction for the Direct Teaching in Industrial Robot
Taeyong Choi, Hyunmin Do, Dongil Park, Kwangcho Chung
KIMM, KOREA

TP-34 Simulated 3D Underwater Localization based on RF Sensor Model using EKF
Daegil Park[1], Jinhyun Kim[2], Wan Kyun Chung[1]
[1]POSTECH, KOREA, [2]SEOULTECH, KOREA

TP-35 Detection of a Human Approaching to Maintain a Safety In Human-Robot Cooperation
Hyun Min Do, Jin Ho Kyung, Gwang Jo Chung
KIMM, KOREA

TP-36 Analysis and Design of LVDT
Dongwon Yun, Sangyong Ham, Jungho Park, Sonam Yun
KIMM, KOREA

TP-37 A Study on Train Network and Control in Korea Tilting Train
Su-Gil Lee
KRRI, KOREA

TP-38 The Study of Tilting Actuator Control for Korea Tilting Train
Su-Gil Lee, Seong-Ho Han
KRRI, KOREA

TP-39 A Study on the UUV Docking System by using Torpedo Tubes
Jinhyun Kim, GiHyeon Lee
Seoul National University of Science and Technology, KOREA

TP-40 User-oriented Tele-presence Service Robot
Seunghwan Park, Wonpil Yu, Jaeil Cho
ETRI, KOREA

TP-41 Modified Mean-Shift for Head Tracking
Daeha Lee, Jaehong Kim, JooChan Sohn
ETRI, KOREA

TP-42 Design Study of Three Segment Leg with Stable Region at Low and High Speed Running
Oh-Seok Kwon, Dong-Ha Lee
DGIST, KOREA

TP-43 Design and Analysis of a Robotic Vehicle for Entertainment Using Balancing Mechanism
Hyun Wook Kim, Seul Jung
Chungnam National University, KOREA

TP-44 Implementation and Control of Balancing Line Tracer Robot Using Vision
Taehwa Jung, Hyun Wook Kim, Seul Jung
Chungnam National University, KOREA

TP-45 Novel Design and Control of a Home Service Mobile Robot for Korean Floor-Living Life Style: KOBOKER
Seungjun Lee, Seul Jung
Chungnam National University, KOREA

[TC1] Service Robots 2

Chair: **Dong Hwan Kim**, Seoul Nat'l University of Science and Tech., Korea
Su-Young Chi, ETRI, Korea

15:30~15:45 **TC1-1** Implementation of Smartphone Environment Remote Control and Monitoring System for Android Operating System-based Robot Platform
Sung Wook Moon[1] ,Young Jin Kim[1], Ho Jun Myeong[1], Chang Soo Kim[2], Nam Ju Cha[2], Dong Hwan Kim[1]
[1]Seoul National University of Science and Technology, KOREA, [2]DUNET, KOREA

15:45~16:00 **TC1-2** Automatiic Fire Extinguisher Robot
B.Swetha Sampath
Vignana Bharathi Institute of Technology, INDIA

16:00~16:15 **TC1-3** Revised Robotic Interaction Service(RoIS) Framework
Su-Young Chi[1], Young-Jo Cho[1], Jae-Yeon Lee[1], Ho-Sub Yoon[1], Do-Hyung Kim[1], Jae-Hong Kim[1], Toshio Hori[2], Miki Sato[2]
[1]ETRI, KOREA, [2]JARA, JAPAN

16:15~16:45 **TC1-4 [Industry Session: Yujin Robot]** Robosem - General purpose research platform

[TC2] Robot Control 1

Chair: **Alireza Alikhani**, Aerospace Research Inst.,, Iran

15:30~15:45 **TC2-1** Adaptive Variable Structure Position Control of Servo Systems with System Uncertainty
Kyoung Taik Park, Doo Hyung Kim, Seock Joon Kim, Han Me Kim
KIMM, KOREA

15:45~16:00 **TC2-2** The Software Architecture of a Reconfigurable Real-time Onboard Control System for a Small UAV Helicopter
Yi-Rui Tang, Yangmin Li
University of Macau, CHINA

16:00~16:15 **TC2-3** Joint Trajectory Generation of Humanoid Robot's Front Kick
Min-Goo Choi, Nak-Yoon Choi, Young-Lim Choi, Jong-Wook Kim
Dong-A University, KOREA

16:15~16:30 **TC2-4** Modeling and Robust Control of a New Large Scale Suspended Cable-driven Robot under Input Constraint
Alireza Alikhani Mehdi Vali
ARI, IRAN

16:30~16:45 **TC2-5** Real-time Trajectory Planning for Mobile Manipulator Using Model Predictive Control with Constraints
Satoshi Ide, Tomohito Takubo, Kenichi Ohara, Yasushi Mae, Tatsuo Arai
Osaka University, JAPAN

[TC3] Robotics for Biomedical Applications

Chair: **Takahiro Kagawa**, Nagoya University, Japan
Byung-Ju Yi, Hanyang University, Korea

15:30~15:45 **TC3-1** Modularity for Modulating Exercises and Levels– Observations from Cardiac, Stroke, and COLD Patients Therapy
Henrik Hautop Lund, Camilla Balslev Nielsen
Technical University of Denmark, DENMARK

15:45~16:00 **TC3-2** Posture Adjustment of Standing on a Slope with a Wearable Robot
Takahiro Kagawa, Takaaki Goto, Yoji Uno
Nagoya University, JAPAN

16:00~16:15 **TC3-3** Variable Impact Dynamics of a Finger Mechanism
Jae Yeon Choi, Hwan Taek Ryu, Byung-Ju Yi
Hanyang University, KOREA

16:15~16:30 **TC3-4** Requirements of Lower-Extremity Robotic Exercise System for Severely Disabled
Hwi-Young Lee, Kyung Kim, Jongbae Kim, Won-Kyung Song
National Rehabilitation Center, KOREA

[TC4] OS: ROTUS (RObust navigaTion for Urban Space)

Chair: **Wonpil Yu**, ETRI, Korea

15:30~15:45 **TC4-1** Autonomous Driving through Curb Detection and Tracking
Jaemin Byun[1], Junyoung Sung[2], Myung Chan Roh[1], Sung Hoon Kim[1]
[1]ETRI, KOREA, [2]NSTC, KOREA

15:45~16:00 **TC4-2** Design of Mappinng System for Unmanned Grounnd Vehicle
Dong-Jin, Yoon, Suk-Ho Jang, Jung-Ha Kim
Kookmin University, KOREA

16:00~16:15 **TC4-3** **[Invited]** EKF Localization with Lateral Distance Information for Mobile Robots in Urban Environments
Christiand, Yu-Cheol Lee, Wonpil Yu
ETRI, KOREA

16:15~16:30 **TC4-4** **[Invited]** Compensating for Visually Missing Features: Scale Adaptive Recognition of Objects Using Probabilistic Voting
M. S. Ryoo[1], Ji Hoon Joung[2], Wonpil Yu[1]
[1]ETRI, KOREA, [2]Hyundai Heavy Industries Co., Ltd., KOREA

[TD1] Robot Intelligence 1

Chair: **Henrik Hautop Lund**, Center for Playware, Denmark
Guanghui Li, The University of Tokyo, Japan

17:00~17:15 **TD1-1** Adaptive Modular Playware
Henrik Hautop Lund, Arnar Tumi Thorsteinsson
Technical University of Denmark, DENMARK

17:15~17:30 **TD1-2** Real-Time Human BodyMotion Estimation Based onMulti-Layer Laser Scans
Wei Wang[1], Dražen Brščić[2], Zhiwei He[1], Sandra Hirche[1], Kolja Kühnlenz[1]
[1]Technische Universität München, GERMANY, [2]ATR, JAPAN

17:30~17:45 **TD1-3** A Terrain Classification Method for UGV Autonomous Navigation Based on SURF
Seung-Youn Lee, Dong-Min Kwak
ADD, KOREA

17:45~18:00 **TD1-4** A Comparative Study of Dynamical Sequential and Global Optimal Task Reallocation Methodology for Distributed Multi-robot System
Guanghui Li, Yusuke Tamura, Hajime Asama
University of Tokyo,, JAPAN

18:00~18:15 **TD1-5** Impact-based Contextual Service Selection in a Ubiquitous Robotic Environment
Benjamin Cogrel, Boubaker Daachi, Yacine Amirat
University of Paris-Est Cr´eteil, France

[TD2] Robot Kinematics & Dynamics 1

Chair: **Woosoon Yim**, University of Nevada, USA

17:00~17:15 **TD2-1** Posture and Workspace Analysis of KU Hybrid Robotic Hand
Hyunhwan Jeong, Joono Cheong
Korea University, KOREA

17:15~17:30 **TD2-2** Dynamic Model of A Cylindrical Ionic Polymer-metal Composite Actuator
Shivakanth Gutta[1], Jonathan Realmuto[1], Woosoon Yim[1], Kwang J. Kim[2]
University of Nevada, U.S.A.

17:30~17:45 **TD2-3** A Safe Joint with a Joint Torque Sensor
Dong-Eun Choi[1], Gi-Hun Yang[2], Junho Choi[2], Woosub Lee[3], Changhyun Cho[4], Sungchul Kang[5]
[1]KIST, KOREA, [2]KITECH, KOREA, [3]KITECH, KOREA, Tokyo Institute of Technology, JAPAN, [4]Chosun University, KOREA, [5]KIST, KOREA

17:45~18:00 **TD2-4** Planning of Kicking Motion with Via-Point Representation for Humanoid Robots
Chang Hyun SUNG, Takahiro KAGAWA, Yoji UNO
Nagoya University, JAPAN

18:00~18:15 **TD2-5** Adaptive Kinematic Control of Robot Tracking
Shin-Guk Kim[1], Young-Ho Lee[1], Tae-Yong Kuc[1], Sang Hoon Ji[2], Yong Sun Moon[3]
[1]Sungkyunkwan University, KOREA, [2]KITECH, KOREA, [3]Sunchon National University, KOREA.

[TD3] Video Session: Biologically Inspired Robots (OS) and Other Robots

Chair: **Hoon Cheol Park**, Konkuk University, Korea

17:00~17:10 **TD3-1** Biologically Inspired Robots using Smart Composite Microstructures
Je-sung Koh, Seung-won Kim, Min-kyun Noh, Kyu-jin Cho
Seoul National University, KOREA

17:10~17:20 **TD3-2** **[Invited]** Improvement of Stability for Vertical Take-off of an Insect-mimicking Flapping-wing System
Hoang Vu Phan, Quoc Viet Nguyen, Hoon Cheol Park, Nam Seo Goo, Doyoung Byun
Konkuk University, KOREA

17:20~17:30 **TD3-3** Mobile Manipulation: Bring Back the Cereal Box Video Proceedings of the 2011 ogX Spring School
Kai Zhou, Michael Zillich, Markus Vincze
Vienna University of Technology, AUSTRIA

17:30~17:40 **TD3-4** Human-Demonstration based Approach for Grasping Unknown Objects
Hyoungnyoun Kim[1,2], Inkyu Han[1,2], Shin-Jung Kim[1], Bum-Jae You[1,2], Ji-Hyung Park[1,2]
[1]KIST, KOREA, [2]University of Science and Technology, KOREA

17:40~17:50 **TD3-5** Behavior Programming by Kinesthetic Demonstration for A Chef Robot
Jae-Pyung Hwang, Sang Hyoung Lee, Il Hong Suh
Hanyang University KOREA

17:50~18:00 **TD3-6** Active Morphing Robot Inspired by the Pre-strained Fiber Structure of the Venus Flytrap
Seung-Won Kim, Je-Sung-Koh, Kyu-Jin Cho
Seoul National University, KOREA

18:00~18:10 **TD3-7** Bio-inspired Gecko-mimicking Robot: from Locomotion Behaviour and Dynamics to Robot Design
DAI ZhenDong, JI AiHong
Nanjing University of Aeronautics and Astronautics, CHINA

[TD4] OS: Mobile Robot Navigation

Chair: **Kyoung Taik Park**, KIMM, Korea

17:00~17:15 **TD4-1** Efficient Calibration of Infrared Range Finder PBS-03JN with Scan-wise Cubic Hermite Splines for Indoor Mobile Robots
Jin-Baek Kim, Byung-Kook Kim
KAIST, Daejeon, KOREA

17:15~17:30 **TD4-2 [Invited]** The analysis of effect of observation models and data associations on the consistency of EKF SLAM
Young Hoon Lee[1], ChangHyun Jun[2], HyungA Choi[2], Soo-Hyun Ryu[2], Nakju Lett Doh[2]
[1]University of Southern California, USA., [2]Korea University, KOREA

17:30~17:45 **TD4-3** Localization of Outdoor Mobile Robots Using Road Features
Donghyeon Kim, Woojin Chung
Korea University, KOREA

17:45~18:00 **TD4-4** Human Tracking of a Mobile Robot with an onboard LRF(Laser Range Finder) using Human Walking Motion Analysis
Yoonchang Sung, Woojin Chung
Korea University, KOREA

18:00~18:15 **TD4-5** Trajectory Generation of Wheeled Mobile Robot using Convolution Method
Junghoon Kim, Youngjin Choi
Hanyang University

❑ Friday, November 26

[FA1] Human-Robot Interaction 2

Chair: **Hongsheng He**, Nat'l University of Singapore, Singapore

09:00~09:15 **FA1-1** Feature Extraction Based on Common Spatial Analysis for Time Domain Parameters
Xinyang Li[1], Shuzhi Sam Ge[1], Yaozhang Pan[2], Keum-Shik Hong[3], Zhengchen Zhang[1], Xiaosu Hu[3]
*[1]National University of Singapore, SINGAPORE, [2]A*STAR, SINGAPORE, [3]Pusan National University, KOREA*

09:15~09:30 **FA1-2** Guideline for Determination of Link Mass of a Robot Arm for Collision Safety
Sang-Duck Lee, Jae-Bok Song
Korea University, KOREA

09:30~09:45 **FA1-3** Human Motion Reconstruction Based on Inertial Motion Sensors
Kap-Ho Seo, Seungsub Oh, Yongsik Park, Sung Ho Park, Jin-Ho Suh
Pohang Institute of Intelligent Robotics San 31, KOREA

09:45~10:00 **FA1-4** Neural-Network-Based Human Intention Estimation for Physical Human-Robot Interaction
Shuzhi Sam Ge[1,2], Yanan Li[1], Hongsheng He[1]
[1]National University of Singapore, SINGAPORE, [2]USTC, CHINA

10:00~10:15 **FA1-5** A New Approach for the Two-Player Pursuit-Evasion Game
Hazem El-Alfy, Amr Kabardy
Alexandria University, Egypt

[FA2] Robot Intelligence 2

Chair: **Eiji Hayashi**, Kyushu Inst. of Tech., Japan

09:00~09:15 **FA2-1** Autonomous Motion Selection via Consciousness-based Architecture
Eiji Hayashi, Kei Ueyama, Motoki Yoshida
Kyushu Institute of Technology, JAPAN

09:15~09:30 **FA2-2** Study of Classification of Failure States for Small Unmanned Ground Vehicle by Response Surface Methodology
Young Kook Kim[1], Dooyeol Koh[1], Sang Hoon Lee[2], Soohyun Kim[1]
[1]KAIST, KOREA, [2]ADD, KOREA

09:30~09:45 **FA2-3** Development of Educational Material for Manufacturing Engineering Using Stereo Vision and 3D CAD/CAM
Yu Oshima, Takeshi Morishita
Toin University of Yokohama, JAPAN

09:45~10:00 **FA2-4** Advanced Community Model Using Daily Life Information Transmitter for Supporting Welfare Workers and Senior Citizens Living Alone in a Welfare Society
Akio Kumata[1], Yuya Tsuda[1], Kanagawa Pref.[2], Hideshi Suzuki[3], Emily Ra[4], Takeshi Morishita[1]
[1]Toin University of Yokohama, JAPAN, [2]Kanagawa Prefectural Government, JAPAN, [3]Kanagawa Prefectural Legislator, JAPAN, [4]McGill University, CANADA

[FA3] Sensors and Actuators

Chair: **Chul-Hee Lee**, Inha University, Korea

09:00~09:15 **FA3-1** Robustness Improvement by Convolving Two ZV Input Shapers
Chul-Goo Kang, Jung-Han Kwak
Konkuk University, KOREA

09:15~09:30 **FA3-2** Implementation of an Inertial Measurement unit Based Motion Capture System
Iman Prayudi, Eun-Ho Seo, Doik Kim, Bum-Jae You
KIST, KOREA

09:30~09:45 **FA3-3** A Study of Inchworm Robot by Using Smart Materials
Jeong-Heon Park, Chul-Hee Lee, Min-Soo Kim
Inha University, KOREA

09:45~10:00 **FA3-4** A Method to Recognize Road Terrain with 3D Scanning
Kazuki Hayashida, Jaehoon Lee, Shingo Okamoto
Ehime University, JAPAN

[FA4] OS: Multifingered Robot Hand 1

Chair: **Hyouk Ryeol Choi**, Sungkyunkwan University, Korea
Makoto Kaneko, Osaka University, Japan

09:00~09:15 **FA4-1** Compact Torque Sensor for a Robot Hand
Tetsuya Mouri[1], Haruhisa Kawasaki[1], Kazumi Koketsu[2]
[1]Gifu University, JAPAN, [2]Tec Gihan Co., Ltd., JAPAN

09:15~09:30 **FA4-2** Evaluation of Fingertip F/T Sensor for Dexterous Manipulation
Kwangmok Jung[1], Seunghoon Shin[2], Kunwook Lee[2], Suwoo Park[1], Ja Choon Koo[2], Hyouk Ryeol Choi[2], Hyungpil Moon[2]
[1]Pohang Institute of Intelligent Robotics, KOREA, [2]Sungkyunkwan University, KOREA

09:30~09:45 **FA4-3** Compliance Control of a Position Controlled Robotic Hand Using F/T Sensors
Joonhee Jo[1,2], Sung-Kyun Kim[1], Yonghwan Oh[1], Sang-Rok Oh[1]
[1]KIST, KOREA, [2]UST, KOREA

09:45~10:00 **FA4-4** **[Invited]** Motion Planning of Multifingered Robotic Hand for Turning the Cap
Dongmin Choi, Seunghoon Shin, Kunwook Lee, Ja Choon Koo, Hyouk Ryeol Choi, Hyungpil Moon
Sungkyunkwan University, KOREA

10:00~10:15 **FA4-5** Framework of Grasping Planning for Multi-Fingered Robot Hands
Jae-Han Park, Ji-Hun Bae, Yong-Deuk Shin, Sung-Woo Park, Moon-Hong Baeg
KITECH, KOREA

[FB1] Distributed Robotics

Chair: **Euntai Kim**, Yonsei University, Korea

10:30~10:45 **FB1-1** Trajectory Planning and Control for Multiple-Vehicles Systems
Anugrah K. Pamosoaji[1], Keum-Shik Hong[1], Shuzhi Sam Ge[2]
[1]Pusan National University, KOREA, [2]USTC, CHINA and National University of Singapore, SINGAPORE

10:45~11:00 **FB1-2** Control of Swarming Robots in an Area with Dead-End Passage
Yasuhiro Nishimura, Geunho Lee, Nak Young Chong
JAIST, JAPAN

11:00~11:15 **FB1-3** Real Time Replanning based on A* for Collision Avoidance in Multi-Robot Systems
Fan Liu, Ajit Narayanan
Auckland University of Technology, NEW ZEALAND

11:15~11:30 **FB1-4** Automation of Air Data Test System
Syed Hayder Abbas[1], M. Yousaf Ali Khan[2], Imran Pervez[3]
[1]University of Engineering and Tech, PAKISTAN, [2]GC University of Faisalabad PAKISTAN, [3]NUST, PAKISTAN

11:30~11:45 **FB1-5** Self-Organizing Ad-Hoc Robotic Sensor Networks Based on Locally Communicative Interactions

Kazutaka Tatara, Geunho Lee, Nak Young Chong
JAIST, JAPAN

[FB2] Robot Vision 2

Chair: **Woojin Chung**, Korea University, Korea

10:30~10:45 **FB2-1** Range Image Analysis for Controlling an Adaptive 3D Camera

Peter Einramhof, Robert Schwarz, Markus Vincze
Vienna University of Technology, AUSTRIA

10:45~11:00 **FB2-2** Human Localization based on the Fusion of Vision and Sound System

Sung-Wan Kim[1,2], Ji-Yong Lee[1], Doik Kim[1], Bum-Jae You[1], Nakju Lett Doh[2]
[1]KIST, KOREA, [2]Korea University, KOREA

11:00~11:15 **FB2-3** Monocular Vision-Based Lane Detection Using Segmented Regions from Edge Information

Ji-Hun Bae, Jae-Bok Song
Korea University, KOREA

11:15~11:30 **FB2-4** People Tracking Method for a Mobile Robot with Laser Scanner and Omni Directional Camera

Hiroki UEDA[1], Jae Hoon LEE[1], Shingo OKAMOTO[1], Byung-Ju Yi[2], Shinichi YUTA[3]
[1]Ehime University, JAPAN, [2]Hanyang University, KOREA, [3]Tsukuba University, JAPAN

[FB3] Robot Control 2

Chair: **Taesam Kang**, Konkuk University, Korea

10:30~10:45 **FB3-1** The Method of Roll Maintain for Spherical Robot of Torque Driven Type from the External Impact

GYE-DO PARK, HYUN LEE, KYOUNG-HWAN KIM, JANG-MYUNG LEE
Pusan National University, KOREA

10:45~11:00 **FB3-2** Simulation of RC Helicopter Based on Dynamics of Quaternion by Using OpenGL and Simulink

Woonchul Ham, Jaebyung Park, Enkhbaatar Tumenjargal, Luubaatar Badarch, Hyeokjae Kwon
Chonbuk National University, KOREA

11:00~11:15 **FB3-3** Fuzzy Sliding Mode Control of Unicycle Robot

Lee Jae-Oh, Han In-Woo, Lee Jang-Myung
Pusan National University, KOREA

11:15~11:30 **FB3-4** Twisting Door Handle with Manipulator under Uncertainty
Peter K. Kim[1], Yisoo Lee[1], Jaeheung Park[1,2]
[1]Seoul National University, KOREA, [2]Advanced Institute of Convergence Science and Technology, KOREA

[FB4] OS: Multifingered Robot Hand 2

Chair: **Hyouk Ryeol Choi**, Sungkyunkwan University, Korea
Makoto Kaneko, Osaka University, Japan

10:30~10:45 **FB4-1** Teaching System for Multifingered Robot Hands Using Kinetic Information of Manipulated Objects
Akio Namiki, Sojung Kim, Kenzo Nonami
Chiba University, JAPAN

10:45~11:00 **FB4-2** A Design Framework for Dexterous Robotic Hand
Seunghoon Shin, Sangchul Han, Kunwook Lee, Hyungpil Moon, Hyouk Ryeol Choi, Ja Choon Koo
Sungkyunkwan University, KOREA

11:00~11:15 **FB4-3** Performance Evaluation of Twisted Strings Driven Robotic Finger
Ivan Godler[1], Takashi Sonoda[2]
[1]Kitakyushu University, JAPAN, [2]Science & Technology Foundation, JAPAN

11:15~11:30 **FB4-4** Design and Experimental Analysis of Embedded Servo Motor Driver for Robot Finger Joints
Jeong-Woo Lee, Tae-Won Kim
Kangwon National University KOREA

11:30~11:45 **FB4-5** Parameter Study on the Grasping Characteristics of the Humanoid Robot Hand with Spherical Four Bar Linkages
Sang-Mun Lee[1], Kyoung-Don Lee[1], Heung-Ki Min[1], Tae-Sung Noh[2], Sung-Tae Kim[2], Jeong-Woo Lee[3]
[1]Institute for Advanced Engineering, KOREA, [2]Robomec, Inc., KOREA, [3]Kangwon National University, KOREA

11:45~12:00 **FB4-6** The New 2 DOF Frame Torque Sensor for the Metacarpophalangeal Joint in Robotic Hand
Dae-Ho Kim[1], Bong-Seok Kim[2], Jung-Hoon Hwang[2], Eun-Tai Kim[1]
[1]Yonsei university, KOREA, [2]KETI, KOREA,

[FC1] Robot Kinematics & Dynamics 2

Chair: **Kyu Jin Cho**, Seoul Nat'l University, Korea

15:00~15:15 **FC1-1** Joint Demeanors of an Anthropomorphic Robot in Designing the Novel Walking Gait
Md. Akhtaruzzaman, Amir A. Shafie
International Islamic University Malaysia MALAYSIA

15:15~15:30 **FC1-2** Design and Development of Nancy, a Social Robot
S.S. Ge, J.J. Cabibihan, Z. Zhang, Y. Li, C. Meng, H. He, M.R. Safizadeh, Y.B. Li, J. Yang
[1]National University of Singapore, SINGAPORE, [2]UESTC, CHINA

15:00~15:45 **FC1-3** Inverse Kinematics Solution of PUMA 560 Robot Arm Using ANFIS
Mickael Aghajarian, Kourosh Kiani
Semnan University, IRAN

15:45~16:00 **FC1-4** Tool Handling System Using Hydraulic Actuator
Kyoung Taik Park, Doo Hyung Kim, Seock Joon Kim, Han Me Kim, Chang Don Lee
KIMM, KOREA

[FC2] Biomedical Robots and Biomimetics

Chair: **Quoc-Viet Nguyen**, Konkuk University, Korea
Wenwei Yu, Chiba University, Japan

15:00~15:15 **FC2-1** Construction of a Suction Cup Containing Integrated Mobile Micro Robot for Surgery Support in the Abdominal Cavity
Chika Hiroki, Wenwei Yu
Chiba University, JAPAN

15:15~15:30 **FC2-2** Development of a locust-like jumping mechanism
Quoc-Viet Nguyen, Hoon Cheol Park, Doyoung Byun
Konkuk University

15:30~15:45 **FC2-3** Robotic Homing through a Noisy Potential Field Using Information Entropy
Piljae Kim, Satoru Nakamura, Daisuke Kurabayashi
Tokyo Institute of Technology, JAPAN

15:45~15:45 **FC2-4** Biologically Inspired Robot Swarm Control for Subaqueous Environment
Dong-Uck Kong[1], Thomas Voegele[2], Dong Ha Lee[1] Frank Kirchner[2]
[1]DIST, KOREA, [2]German Research Center for Artificial Intelligence, GERMANY

15:45~16:00 **FC2-5** A Hierarchical Model of Expressive Robot Motion for Effective Gesture Editing
Jaewoo Kim, Seong-Yong Koo, Dong-Soo Kwon
KAIST, KOREA

[FC3] OS: Robot and Future Information Device

Chair: **Hyun Kim**, ETRI, Korea
Junho Kim, Kookmin University, Korea

15:00~15:15 **FC3-1** **[Invited]** Introduction to System Architecture for a Robotic Computer
Hyun Kim, Young-Ho Suh, Kangwoo Lee, Blagovest Vladimirov
ETRI, KOREA

15:15~15:30 **FC3-2** Robotized Products
Won-Sup Kim
Seoul National University of Science and Technology, KOREA

15:30~15:45 **FC3-3** A Behavior Model of Autonomous Mobile Projection Robot for the Visual Information
Tomoyuki Shiotani, Kosuke Maegawa, Joo-Ho Lee
Ritsumeikan University, JAPAN

15:45~16:00 **FC3-4** A Note on Hybrid Control of Robotic Spatial Augmented Reality
Joo-Haeng Lee[1], Junho Kim[2], Hyun Kim[1]
[1]ETRI, KOREA, [2]Kookmin University, KOREA

16:00~16:15 **FC3-5** Plane-dominant Object Reconstruction for Robotic Spatial Augmented Reality
Changwoo Nam[1], Min-Hyuk Sung[2], Joo-Haeng Lee[3], Junho Kim[1]
[1]Kookmin University, KOREA, [2]KIST, KOREA, [3]ETRI, KOREA

[FC4] OS: OFTDPR (Original Fusion Technology Development Program for Robot) 1

Chair: **Sanghoon Ji**, KITECH, Korea

15:00~15:15 **FC4-1** Building a Hierarchical Robot Task from Multiple Task Procedures
Hyuk Tae Kwon[1], Wan Chul Yoon[1], Rockwon Kim[2], Sunghoon Kim[2]
[1]KAIST, KOREA, [2]ETRI, KOREA

15:15~15:30 **FC4-2** A Study on 13bit Rotary Encoder of Serial Communication Output Using Single Bipolar Magnet and Detecting a Displacement of Singleturn and Multiturn
Hyun-Bae Lee[1], Jae-Hee Lee[1], Sang-Joon Lee[1], Jin-Sung Kim[2]
[1]LS Mecapion, KOREA, [2]Exact TRON, KOREA

15:30~15:45 **FC4-3** Real-time Supporting of OPRoS Component Platform
Choulsoo Jang, Byoungyoul Song, Seungwoog Jung, Kyeong-Ho Lee, Sunghoon Kim
ETRI, KOREA

15:45~16:00 **FC4-4** Implementation of Reactive Behaviors for an Industrial Manipulator based on OPRoS
Sang-Hoon Ji, Tae-Dong Park, Sang-Moo Lee, Eun-Cheol Shin, Byung-Wook Choi
KITECH, KOREA

16:00~16:15 **FC4-5** RPIST: Required and Provided Interface Specification-based Test Case Generation and Execution Methodology for Robot Software Component
Jeong-Seok Kang, Hong-Seong Park
Kangwon National University, KOREA

[FD1] Robot Intelligence 3

Chair: **Hye Kyung Cho**, Hansung University, Korea
Dugki Min, Konkuk University, Korea

16:30~16:45 **FD1-1** Behavioral Synchronization of Human and Humanoid Robot
Rustam Rakhimov Igorevich, Eldor Primov Ismoilovich, Dugki Min
Konkuk University, KOREA

16:45~17:00 **FD1-2** Development of Teaching & Learning Method for Application of User Created Robot in Digital Textbook
Young Ae Kim, Kyoung Hwa Chae
KERIS, KOREA

17:00~17:15 **FD1-3** S!Ci: a New Approach to User Created Robot Contents
Deukwoo Lee, Jinsung Kim, Hye-Kyung Cho
Hansung University, KOREA

17:15~17:30 **FD1-4** A Robot Museum "ROSIEUM"
Joongsun Yoon[1], Hyeongsun Yoon[2]
[1]Pusan National University, KOREA, [2]Wisebo-X, KOREA

17:30~17:45 **FD1-5** Temperature-Aided Fingerprinting for Localization in Wireless Local Area Networks
Kave Aryanpoo, Hadi Moradi
University of Tehran, IRAN

17:45~18:00 **FD1-6** Integration of Two Opto-Electronic Devices for Data Acquisition reducing External Influences
Jung-Han Kwak, Chul-Goo Kang
Konkuk University, KOREA,

[FD2] OS: Roll-to-roll Printed Electronics Process and System

Chair: **Sangyoon Lee**, Konkuk University, Korea

16:30~16:45 **FD2-1** **[Invited]** Improvement of Surface Roughness and Conductivity by Calendering Process for Printed Electronics
Ho-anh-duc Nguyen, Nguyen Hoang, Kee-Hyun Shin, Sangyoon Lee
Konkuk University, KOREA

16:45~17:00 **FD2-2** Investigation of Micro Fine Line Pattern Using Single Layer Gravure Printer
Huu Phuong Hoang, Kyung Joon Han, Sung Lim Ko
Konkuk University, KOREA

17:00~17:15 **FD2-3** Design of Multi-Purposed Roll-to-Roll Printing System for Printed Electronics
Chung Hwan Kim[1], Ha-Il You[2], Seung-Hyun Lee[3], Jeongdai Jo[3]
[1]Chungnam National University, KOREA, [2]LG Electronics, KOREA, [3]KIMM, KOREA,

17:15~17:30 **FD2-4** A Study on the Decision of Operating Tension by Analysis of Friction Coefficient Change in Rewinding Process
Jong Su Lee, Jin Woo Seong, Kee Hyun Shin
Konkuk University, KOREA

17:30~17:45 **FD2-5** A Study on Model Development of the Slot-die Coating Process through the Statistical Analysis
Janghoon Park, Jinwoo Seong, Hyunkyoo Kang, Keehyun Shin
Konkuk University, KOREA

[FD3] OS: Robot-based Learning

Chair: **Ji-Hyun Jung**, Kyungsung University, Korea

16:30~16:45 **FD3-1** A Basic Study for the Development of R-learning Curriculums in the Early Childhood School System
Lee, Yeon Seung[1], Seo, Hyun[2]
[1]Kyungsung University, KOREA, [2]Chosun University, KOREA

16:45~17:00 **FD3-2** Influence of R-learning Based Education on Kindergarten and Kindergarten Teacher
Jeong-Wook Lee[1] , Minjung Lee[2], Kyung-Sook Ahn[3], Soo-Jin Lim[4]
[1]Duksung Womne's University, KOREA, [2]DongEui University, KOREA, [3]HoWon University, KOREA, [4]DongShin University, KOREA

17:00~17:15 **FD3-3** The Directions of the Universal Contents Development for R-Learning at Kindergarten
Bookyung Cho[1], Sunghee Lee[2], Jeongsun Park[3], Youngmi Go[4]
[1]Korea National University of Education, KOREA, [2]Paichai University, KOREA, [3]Myongji College, KOREA, [4]Soonchunhyang University, KOREA

17:15~17:30 **FD3-4** A Study of the Use of R-learning Content in Kindergartens
Ji-Hyun Jung[1], Yoo-Seon Bang[2]
[1]Kyungsung University, KOREA, [2]Konkuk University, KOREA

[FD4] OS: OFTDPR (Original Fusion Technology Development Program for Robot) 2

Chair: **Yongkwun Lee**, KIST, Korea

16:30~16:45 **FD4-1** Development of a Robot Behavior Controller for an r-Learning System using OPRoS
Sang-Hoon Ji, Jae-Seong Han, Sang-Moo Lee, Byung-Wook Choi
KITECH, KOREA

16:45~17:00 **FD4-2** A Design of Slotless BLDC Motor for Robot Using Equivalent Magnetic Circuit Model

Jung-Moo Seo[1,2], Young-Kyun Kim[1], Se-Hyun Rhyu[1], In-Soung Jung[1], Hyun-Kyo Jung[2]
[1]KETI, KOREA, [2]Seoul National University, KOREA

17:00~17:15 **FD4-3** Anti-Vibration PID Control for a Robot Manipulator Experiments

Dong-Won Lim, Eun-Hye Kim, Yong-Kwun Lee
KIST, KOREA

17:15~17:30 **FD4-4** Periodic Task Scheduling Algorithm under Precedence Constraint based on Topological Sort

Si Wan Kim, Hong Seong Park
Kangwon National UniversityKOREA

17:30~17:45 **FD4-5** Development of Direct Teaching Robot System

Chanhun Park, Jin Ho Kyung, Hyun Min Do, Taeyong Choi
KIMM, KOREA

17:45~18:00 **FD4-6** EtherCAT based Multi-Model Robot Controller

Il-Kyun Jung, Sun Lim
KETI, KOREA

URAI 2011 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)

Abstracts of Papers

Some of the papers have been reduced to fit in the allotted spaces.

❑ Thursday, November 24

[TA1] Human-Robot Interaction 1

Time: 09:00-10:15
Room: #108
Chair: Luigi Pagliarini, Technical Univ. of Denmark, Denmark

09:00~09:15 TA1-1

Human Activity Recognition Using a Mobile Camera

Kai-Tai Song, Wei-Jyun Chen
National Chiao Tung University, TAIWAN

This paper presents a vision-based human activity recognition system using a mobile camera. This system aims to enhance human-robot interaction in a home setting for applications such as health care and companion. In the first place, the camera needs to find a human in image frames. The body pose is classified for the detected human. Then the human activity is recognized by combining information of human pose, human location and elapsed time. In order to determine the situated place of the person in a home setting, a novel …….

09:15~09:30 TA1-2

Wearable Playware

Luigi Pagliarini[1] Henrik Hautop Lund[2]
[1]*Technical University of Denmark, DENMARK,*
[2]*Academy of Fine Arts of Bari, ITALY*

In this paper we define and trace the contours of a new approach to robotic systems, composed of interactive robotic modules that can be worn on the body, as for an ordinary suit. We label the field as Modular Robotic Wearable (MRW). Further, we describe how the use of modular robotics in creating wearable, besides being possible, is a path to obtain a flexible wearable processing system, where freely inter-changeable input/output modules can be positioned ……

09:30~09:45 TA1-3

Real-time Estimation of Human's Intended Walking Speed for Treadmill-style Locomotion Interfaces

William Haiwei Dong[1], Jianjun Meng[2], Zhiwei Luo[1]
[1]*Kobe University, JAPAN,*
[2]*Shanghai Jiao Tong University, CHINA*

This paper addresses the problem of estimating human's intended walking speed. Compared with previous researches on walking speed estimation, we predict the walking intention before gait action. In this paper, we find a composite force index which is significantly correlated with the intended walking speed. We did two experiments. One gives a conclusion that intended walking speed has strong linear …….

09:45~10:00 TA1-4

Pattern-Preserving-based Motion Imitation for Robots

Bonggun Shin, Sungho Jo
KAIST KOREA,

This paper presents a new algorithm of encoding dynamic movements through pattern-preserving optimization by a physical robot. This research follows a recent robot programming approach called learning from demonstration in which the motion trajectory is learned from human demonstrations. The motivation of this work is to deal with major challenges in learning from demonstration such as embodiment mapping, generalization, adaptation, robustness to perturbations, stability, patternpreserving, and parameter …….

10:00~10:15 TA1-5

Experiments of GMM Based Speaker Identification

Peng Qi, Lu Wang
Royal Institute of Technology, SWEDEN

In human-robot interaction areas, the robot is often expected to recognize the identity of the speaker in some specific scenarios. It is a kind of biometric modality, and in general using statistical model is a classical and powerful method dealing with speaker identification problem. In this paper, we apply the Gaussian mixture model (GMM) on the speech feature distribution modeling and build the speaker …….

[TA2] Localization & Navigation

Time: 09:00-10:15
Room: #109
Chair: M. C. Lee, Pusan Nat'l University, Korea

09:00~09:15 TA2-1

Reducing Localization Ambiguity of Immobile Passive UHF RFID Tagged Physical Objects

Jae Sung Choi[1], Hyun Lee[2], Sang Cheol Lee[2], Dong Ha Lee[2]
[1]University of Texas at Arlington, USA, [2]DGIST, KOREA

Location sensing of physical objects is one of critical issues in many applications. Passive UHF Radio Frequency Identification (RFID) technique provides an efficient solution because of its low cost for installation and easy identification of the tagged physical objects. In this paper, we research on the localization problem using passive UHF RFID systems. We discuss theoretical and practical characteristics of a passive UHF RFID system. We propose novel algorithm to minimize the number of ambiguous tag points against a single RSSI value from a target tag and increase accuracy of location …

09:15~09:30 TA2-2

A Path Planning Algorithm using Artificial Potential Field Based on Probability Map

Min-Ho Kim, Jung-Hun Heo, Yuanlong Wei, Min-Cheol Lee
Pusan National University, KOREA

Path planning problem is the major issue of the control of mobile robot. Among the path planning methods the artificial potential field theory is widely used for mobile robots, because it provides simple and effective motion control input. But sometimes it is hard to detect exact obstacle shape, because some obstacle can move itself, thus we can detect its probability only. So we suggest the path planning method using potential field with the probability information. After that we simulate our algorithm and show the results.

09:30~09:45 TA2-3

Neural Networks and Fuzzy Logic Navigation Approach for a Bi-Steerable Mobile Robot

O. Azouaoui, N. Ouadah, I. Mansour, A. Semani
CDTA, ALGÉRIE

This paper presents an implementation of an intelligent navigation approach on a bi-steerable mobile robot Robucar. This approach is based on Neural Networks (NN) and Fuzzy Logic (FL) paradigms to provide Robucar with capability to acquire the obstacle avoidance, target localization, decision-making and action behaviors after learning and adaptation. To develop this approach, three (NN) and a FL controller to achieve the desired task are used. Experimental results are presented showing the effectiveness of the overall navigation control system.

09:45~10:00 TA2-4

Q Learning Behavior on Autonomous Navigation of Physical Robot

Handy Wicaksono
Petra Christian University, INDONESIA

Behavior based architecture gives robot fast and reliable action. If there are many behaviors in robot, behavior coordination is needed. Subsumption architecture is behavior coordination method that give quick and robust response. Learning mechanism improve robot''s performance in handling uncertainty. Q learning is popular reinforcement learning method that has been used in robot learning because it is simple, convergent and off policy. In this paper, Q learning will be used as learning mechanism for obstacle avoidance behavior in autonomous robot navigation. Learning rate of Q learning affect robot''s performance in learning phase. As the result, Q learning algorithm is successfully implemented in a physical robot with its imperfect environment.

10:00~10:15 TA2-5

Map Management System for cv-SLAM

Hyukdoo Choi[1], Euntai Kim[1], Yong Woon Park[2], Chong Hui Kim[2]
[1]Yonsei University, KOREA, [2]ADD, KOREA

This paper present a map management system for ceiling vision (cv)-SLAM where a map is comprised of line landmarks on the ceiling. Since the size of a map, which is the number of landmarks, is related to computational and memorial cost, it should be managed in an appropriate size. For this purpose, the binary Bayes filter is utilized to estimate the probability of existence of a landmark. We demonstrate the system in the real world experiment to prove its performance.

[TA3] OS: Unmanned Flying Robot for Disaster Monitoring

Time: 09:00-10:15
Room: #110
Chair: Eun-Jin Im, Kookmin University, Korea

09:00~09:15 TA3-1

Design and Implementation of Coaxial Quadrotor for an Autonomous Outdoor Flight

Gilar Budi Raharja, Kim Gyou Beom, Yoon Kwangjoon
Konkuk University, KOREA

This paper discuss about a design and implementation of coaxial quadrotor for autonomous outdoor flight. On every axis of the quadrotor installed two motors and propellers coaxially, thus it has eight in total. This configuration designed to fulfill the requirement for carrying some payload system for ground's still and clip capturing during the flight. The modeling and control design approach developed based on the quadrotor helicopter. An onboard control system powered by a classical control, then a modern control will be implemented in advance. Global positioning system module used as navigation expected to be optimized in the future by a simultaneous localization …

09:15~09:30 TA3-2

[Invited] Control of Unmanned Flying Vehicle Based on MPEG-V International Standard

Kyoungro Yoon, Doohyun Kim, Young-Guk Ha
Konkuk University, KOREA,

MPEG has been developing MPEG-V stnadard to synchronize real world and virtual world. The MPEG-V Part 5, specifically, provides standardized
interface to send commands to the actuators and to receive information from the sensors. This paper proposes interace for Global postion command, global position sensor, and altitude sensor in XML schema to control the unmanned flying vehicles. We also implemented the land station so that the position of the flying vehicle can be displayed on the screen in real time and the user can control the flying vehicle through the user interface.

09:30~09:45 TA3-3

Optical Flow Computation on a Heterogeneous Platform

Jinsoo Oh[1], Eun-Jin Im[1], Kyoungro Yoon[2]
[1]Kookmin University, KOREA, [2]Konkuk University, KOREA

Unmanned Aerial Vehicles (UAV) are finding their way to a wide range of safety-critical missions. Our collaborative research team of computer scientists and aerospace engineers has worked on developing hardware and software of UAV. One of vital components in software used in UAV is image stabilization. The constantly-shaking images taken from the UAV, resulted from the vehicle"s motion, need to be stabilized to perform its mission. In this paper, we present our implementation of image stabilization software. Our research is focused on using state-of-the-art Graphic Processing Unit …

09:45~10:00 TA3-4

Attitude Control System Design for a Quadrotor Flying Robot

Gigun Lee, Dongg Yun Jeong , Nguyen Dang Khoi, Taesam Kang
Konkuk University, KOREA

This study describes the ddevelopment of an attitude control system for a quadrotor fflying robot. In this paper, we introduces the linearized maathematical model from experimental data using systtem identification method and design of the optimal conntrol. And then we verify the control system through simulation and performing the experimental tests.

10:00~10:15 TA3-5

Fault Tolerant Controller Design for Component Faults of a Small Scale Unmanned Aerial Vehicle

Vishnu Kumar Kaliappan, Hanmaro Young, Agus Budiyono, Dugki Min
Konkuk University, KOREA

In this paper additive fault detection and isolation method coupled with fault tolerant control architecture are developed in order to deal with component faults for a rotorcraft based unmanned aerial vehicle (RUAV). The failure considered is malfunction with internal components of the helicopter which occurs during the maneuvers: rotor angular rate variations, etc. These faults lead from trivial to catastrophic damage of the system. The proposed fault detection and reconfiguration control is based on a parameter estimation approach which …

[TA4] OS: Intelligent Sensors and Actuators

Time: 09:00-10:15
Room: #111
Chair: Tao Liu, Kochi University of Tech., Japan

09:00~09:15 TA4-1

Frame Vibration Suppression for Wafer Transfer System

Yanjie Liu, Mingyue Wu, Guobao Xu, Lining Sun
Harbin Institute of Technology, CHINA

The rapid development of the Integrated Circuit (IC) manufacturing equipment industry requires greater efficiency for wafer transfer. However, the faster wafer transfer robot moves, the bigger the force applied on its support frame is. and also the bigger vibration aroused on the frame because of the low stiffness of the support frame. Meanwhile, some IC equipment are ultra-high sensitive to the vibration. So the speed of the wafer transfer robot is limited by the vibration of the frame.. In order to improve wafer transmission efficiency and synchronously reduce the vibration to the frame,…

09:15~09:30 TA4-2

Cerebral Activation Patterns of Bimanual and Unilateral-limb Trainings

Chunguang Li[1,2], Tao Liu[1,2], Lining Sun[1], Yoshio Inoue[2], Kyoko Shibata[2]
[1]Soochow University, CHINA, [2]Kochi University of Technology, JAPAN

Our previous work has introduced a new self-controlled bimanual training robot, and confirmed a positive training effect with increased brain activation amount and motion tracking precision. Even though it was confirmed that the proposed bimanual training induced greater brain activation than single-limb training, we could not assure that bimanual training induced greater cerebral activation only in the dominant hemisphere or in the both hemispheres. …

09:30~09:45 TA4-3

Design of a Sliding Wall Climbing Robot with a Novel Negative Adsorption Device

Shanqiang Wu[1], Lijun Wu[1], Tao Liu[2]
[1]China Jiliang University, CHINA, [2]Kochi University of Technology, JAPAN

Although a variety of wall climbing robots were developed, few researcher concentrated effort on adsorption procedure and negative pressure generating device of a wall climbing robot. The aim of paper is to study and develop a sliding wall climbing robot using a novel negative adsorption device that can be well adopted in small irregular places, such as brick walls, cement walls, ship hulls and oil storage tank surfaces so that the robot could be used where direct access by a human operator is very expensive or very dangerous due to the …

09:45~10:00 TA4-4

A Learning Algorithm for Model based Object Detection

Chen Guodong[1], ZeyangXia[2], Rongchuan Sun[1], Zhenhua Wang[1], Zhiwu Ren[1], Lining Sun[1]
[1]Soochow University, CHINA, [2]PurdueSchool of Engineering and Technology, USA

Detecting objects in images and videos is a difficult task that has challenged the field of computer vision. Most of the algorithms for object detection are sensitive to background clutter and occlusion, and cannot localize the edge of the object. An objects shape is typically the most discriminative cue for its recognition by humans. This paper introduces a model based object detection method which uses only shape-fragment features. The object shape model is learned …

10:00~10:15 TA4-5

[Invited] Three-dimensional Gait Analysis System with Mobile Force Plates and Motion Sensors

Tao Liu[1], Yoshio Inoue[1], Kyoko Shibata[1], Kouzou Shiojima[2]
[1]Kochi University of Technology, JAPAN, [2]TEC GIHAN Co., LTD, JAPAN

To overcome limitations of a traditional gait analysis laboratory, in which stationary force plates and camera system can not measure more than one stride, in this paper, we propose a three-dimensional gait analysis system (M3D) composed of mobile force plates and motion sensors. Coordinate transformation from local coordinate system of M3D to global coordinate system is implemented by using measurements of the mobile force plate. A stick-chain model was built to visually…

[TB1] Service Robots 1

Time: 10:30-11:45
Room: #108
Chair: Y. G. Ha, Konkuk University, Korea

10:30~10:45 TB1-1

Detection, Motion Planning and Control of Human Tracking Mobile Robots

Dong-Hyung Kim[1], Youngmyung Lee[2], Ji-Yeong Lee[3], Gyung-Jin Park[4], Chang-Soo Han[5], Sunil K. Agrawal[6]
[1]Hanyang University, KOREA, [2]University of Delaware, USA

In this paper, a method combining detection, motion planning and control of human tracking mobile robots is discussed. Using face recognition and detection of a pair of human legs via a stereo vision camera and 2D laser scanner, respectively, the human position is estimated. Based on the differential flatness property of the kinematic model of the mobile robot, the trajectory of the robot to the moving human is planned in real-time. The combined motion planning and control method is used for tracking a detected human.

10:45~11:00 TB1-2

Architecture of Kukanchi Middleware

Yuhki ISHIGURO[1], Yoshio MAEDA[1], Ngo Lam Trung[1], Takeshi SAKAMOTO[2] Makoto MIZUKAWA[1], Takashi YOSHIMI[1], Yoshinobu ANDO[1]
[1]Shibaura Institute of Technology, JAPAN, [2]Global Assist Co., Ltd.

There are some efforts for providing middleware for building robot system. However, these approaches are not adequate for service robot. In this paper, we propose Kukanchi Middleware Architecture. Our research focuses on building Kukanchi System which supports interactions between human, robots and space. The proposed architecture provides APIs for robots, sensors, and user interfaces as well as functions to convert user's command to robot command. We intend and expect to simplify Kukanchi System development by applying Kukanchi…

11:00~11:15 TB1-3

Component-based Robot Software Design for Pick-and-Place Task Described by SysML

Kenichi Ohara, Kyohei Iwane, Tomohito Takubo, Yasushi Mae, Tatsuo Arai
Osaka University, Osaka, JAPAN

Recently, many researchers have been focusing on reusable software technology for robot systems. To develop reusable software, robot system developers build module-based software on middleware platforms. However, since each module is built for a specific framework, it is difficult to apply modules to other systems. Therefore, it is of great importance to consider module design when module-based systems are developed. To design a software module, the modeling language acts as a good description and communication tool for simplification …

11:15~11:30 TB1-4

Hybrid Semantic Mapping using Door Information

Joong-Tae Park, Jae-Bok Song
Korea University, KOREA

We describe hybrid semantic mapping method with classified area information for home environments. The hybrid map contains two map types: a grid map, and a classified area information-in-grid (CAIG) map. The grid and CAIG maps can be used for intelligent navigation (e.g., localization and path planning) and motion selection, respectively. In home environments, a door can be used to divide an area into various sections such as a room or a kitchen. Therefore, we use a grid map of the home environment and door information as main clues to classify the area and to build the hybrid map. The proposed method is verified by various experiments. …

11:30~11:45 TB1-5

WINDORO : The World's First Commercialized Window Cleaning Robot for Domestic Use

Young-Ho Choi, Kwang-Mok Jung
Pohang Institute of Intelligent Robotics, KOREA

This paper describes the world's first commercialized window cleaning robot named windoro, which is a fully autonomous intelligent window cleaning robot. The windoro adheres to the surface of window glass by means of four permanent magnet pairs between an inner unit and an outer unit rather than using vacuum suckers for the energy efficiency and safety. An inner unit and an outer unit are in charge of navigation and cleaning, respectively. To do this, an inner unit has two driving wheels equipped with silicon tire with the big friction coefficient and an outer unit has four motorized rolling disks with a superfine…

[TB2] Robot Vision 1

Time: 10:30-11:45
Room: #109
Chair: Dong-il Dan Cho, Seoul Nat'l University, Korea

10:30~10:45 TB2-1

Moving Object Tracking in Driving Environment

Jae-Yeong Lee, Wonpil Yu
ETRI, KOREA

This paper present a visual tracking system developed for the tracking of pedestrians and vehicles in driving environment. The presented system applies a partition-based mean-shift for the tracking of pedestrians and a HSV template matcher for vehicles. The experiment results on real video sequences confirm the validity of our method.

10:45~11:00 TB2-2

Adding Image Information Corresponding to the Shape of the Objects' Surfaces on Environmental Maps

Shinya KAWAKAMI, Tomohito TAKUBO, Kenichi OHARA, Yasushi MAE, Tatsuo ARAI
Osaka University, JAPAN

Graduate School of Engineering Science, Osaka University, Osaka, 563, Japan
In this paper we propose adding image information to a map in order to create an intuitive interface for exploring unknown environments. On this map, a high-resolution photo is attached to each mapped object. The shooting angle and position for the picture is defined by the required resolution of the image, the camera specifications and the object's shape. The appearance from the desired direction can be confirmed …

11:00~11:15 TB2-3

A Novel Method for Vision Tracking with Line of Sight Control, Using a Fuzzy Logic Controller and Euler Angle Orientation in the Feedforward Loop

Jaehong Park[1], Wook Bahn[1], Chang-hun Lee[1], Tae-il Kim[1], Kwang-soo Kim[2], Dong-il "Dan" Cho[1]
[1]Seoul National University, KOREA, [2]Hanbat National University, KOREA

This paper presents a novel method for vision tracking with line of sight control. The line of sight control for the vision tracking is an important function for various robot applications. However, when a robot is moving fast, it is difficult to keep the camera's sight towards a specific target, using only a vision feedback controller, due to the limitation in vision processing capabilities. In the proposed method, a feedforward controller…

11:15~11:30 TB2-4

Comparison of Plane Extraction Performance using Laser Scanner and Kinect

Chan-Soo Park, Sung-Wan Kim, Doik Kim, Sang-Rok Oh
KIST, KOREA

This paper compares the performance of laser scanner and Kinect when extracting the plane from 3D depth map measured by both sensors. By tilting laser scanner, 3D depth map around robot is generated in this paper and another 3D depth map using Kinect is also generated. To compare the 3D depth map of laser scanner and Kinect, staircases are measured by both sensors and the accuracy of the extracted planes of the staircases is examined. Although laser scanner needs more time to generate 3D depth map, laser scanner-based surface extraction shows more accurate result.

11:30~11:45 TB2-5

Probabilistic Shape Vision for Embedded Systems

Sven Olufs[1], Markus Vincze[1], Paul G. Pl¨oger[2]
[1]Automation and Control Institute, AUSTRIA, [2]University of Applied Sciences GERMANY

This paper presents a robust object tracking method using a sparse shape-based object model for embedded systems with limited computational capabilities. Our approach consists of three ingredients namely shapes, a motion model and a sparse (non-binary) subsampling of colours in background and foreground parts based on the shape assumption. The tracking itself is inspired by the idea of having a short-term and a longterm memory. A lost object is "missed" by the long-term memory when it is no longer recognized by the shortterm memory. Moreover, the long-term memory allows to …

[TB3] OS: Distributed Intelligent Robot System

Time: 10:30-11:45
Room: #110
Chair: Young-Jo Cho, ETRI, Korea

10:30~10:45 TB3-1

Comparison and Analysis of Scan Matching Techniques for Cooperative-SLAM

Heon-Cheol Lee, Seung-Hee Lee, Seung-Hwan Lee, Tae-Seok Lee, Doo-Jin Kim, Kyung-Sik Park, Kong-Woo Lee, Beom-Hee Lee

A scan matching technique is a key technique to implement Cooperative-SLAM (C-SLAM). Although a variety of scan matching techniques have been developed, each of them has both merits and faults. This paper compares and analyzes three well-known scan matching techniques which are ICP (Iterative Closest Points), HSM (Hough Scan Matching), and PSM (Polar Scan Matching). The comparison and analysis are carried out in terms of error and computation time for scan pairs which consists of a reference scan and a current scan. …

10:45~11:00 TB3-2

[Invited] Task Allocation Strategy of Heterogeneous Multi-robot for Indoor Surveillance

Seohyun Jeon, Minsu Jang, Seunghwan Park, Daeha Lee, Young-Jo Cho, Jaehong Kim
ETRI, KOREA

Multi-robot cooperation promises increased performance and fault-tolerance in large-scale environments. To achieve the goal with these features, dynamic task allocation algorithm is required to adapt changing environment. Whereas previous researches mostly have been done for simplifying the mission and emphasizing the task allocation algorithm, this paper addresses the needs to analyze the mission more concretely and introduces a strategy for the task allocation problem: off-line and on-line analyses. The off-line analysis takes the …

11:00~11:15 TB3-3

Decentralized Task-Oriented Local Group Generation for Robot Swarms

Geunho Lee, Yukinori Sato, Nak Young Chong
JAIST, JAPAN

This paper addresses an adjustable group generation problem for heterogeneous robot groups performing cooperative tasks simultaneously. As its solution approach, we propose a decentralized task-oriented group generation scheme, which is composed of group consensus and self-adjustment algorithms. The group consensus algorithm enables robots to select leader robots and generate individual groups based on the leaders. Through the self-adjustment algorithm, to meet assigned task conditions, the leader attempts to recruit more members or any robots are dismissed against the group. By doing this, …

11:15~11:30 TB3-4

Collective Searching Algorithm for Multi-Robot System with Bounded Communication Range

Sang-Hoon Ji[1], Jae-Seong Han[1], Sang-Moo Lee[1], Yong-Sun Moon[2], Tae-Yong Kuc[3]
[1]KITECH, KOREA, [2]Redone Technologies Co. Lt, KOREA, [3]Sungkyunkwan University, KOREA

It is very difficult to acquire information of all robot states in real applications due to the limited range of wireless communication. Therefore, many researchers have attempted to implement collective robots without communication each other. However, there are two demerits in the collective systems; one is their poor efficiency and the other is that the systems are irresponsible to various events which may be invoked in searching applications. Therefore in this paper …

11:30~11:45 TB3-5

Network Management in Collective Intelligent Robotic Environment

Dong-Bum Kim[1,2], Chang-Eun Lee[1], Hyun-Ja Im[1], Seung-Ik Lee[1,2], Young-Jo Cho, Sung-Hoon Kim[1]
[1]ETRI, KOREA, [2]University of Science and Technology, KOREA

In collective intelligent robotic environment, robots typically behaves in communication with each other to achieve the global intelligent goal. In general, a collective intelligent robotic system works based on a backbone-less ad-hoc network. For controlling robots in that environment, several issues are raised in the system: action control, environment recognition, robot networking, and system supervisor control. The collective intelligent robot system is quite different from general multi-robot systems in the viewpoint of networking, …

11:45~12:00 TB3-6

Coverage Control of a Robotic Swarm for Pollution Monitoring

Suwantaweekul Lalitta, Geunho Lee, Nak Young Chong
JAIST, JAPAN

This paper presents a simple and easy-to-implement decentralized algorithm inspired by human move-and-see behavior for a swarm of autonomous mobile robots to achieve area coverage for environmental pollution monitoring. Specifically, robots relocate themselves independently from each other according to the pollution intensity and coveredness (or occupiedness) of an area within their limited sensing range. Simulation results show that the proposed decentralized algorithm enables a swarm of mobile robots to localize and contain the pollution sources in an efficient manner even in …

[TB4] OS: Smart Actuators and Applications

Time: 10:30-11:45
Room: #111
Chair: Nam Seo Goo, Konkuk University, Korea

10:30~10:45 TB4-1

Camber-Adjustable Flapping Wing Air Vehicles

Jun-Seong Lee[1], Jae-Hung Han[1], Dae-Kwan Kim[2]
[1]KAIST, KOREA, [2]KARI, KOREA

This paper introduces the implementation of adjustable camber of flapping wing and tail of a typical artificial flapping vehicle using a flexible piezoelectric actuator, called macro-fiber composites (MFC). When MFC is applied to the main wing of an ornithopter, the induced camber greatly affects aerodynamic characteristics such as mean lift and thrust. The tail wing actuation can be useful to reduce the pitching oscillation of an ornithopter.

10:45~11:00 TB4-2

Design and Modeling of Spherical Joint Haptic Master for MIS Robot Using Electrorheological Fluid

Jong-Seok Oh, Seung-Bok Choi, Han-Jun Cho
Inha University, KOREA

This study presents the configuration and modeling of ER haptic mater for minimally invasive surgery (MIS) robot. The ER haptic master device that consists of spherical joint as an inner electrode and sphere housing as an outer electrode has 3-DOF rotational motion. Using ER fluid, the proposed haptic master generates a repulsive torque and provides a stimulus information to operator. The rotational motion of the haptic master is realized by slave surgery robot in MIS. To follow the motion of the haptic master, the mechanism of slave surgery robot is devised and kinematic analysis is ….

11:00~11:15 TB4-3

[Invited] Performance of a Piezo-Composite Generating Element

H. T. Luong[1], C. M. T. Tien[1], N. S. Goo[2]
[1]Konkuk University, KOREA, [2]Konkuk University, KOREA

Energy harvesting is an attractive field, has the large potential application that attracts the concern of scientists. In this paper, one method of energy harvesting is performed using Piezo-composite generating element (PCGE) [1] which can convert mechanical energy into electric energy. The experimental results were performed to show the advantage characteristics of PCGE that can be used as potential generator in collecting energy.

11:15~11:30 TB4-4

Energy-Efficient Fire Monitoring Using Ubiquitous Sensor Network

Heemin Kim, Lengieng Ing, Young-guk Ha
Konkuk University, KOREA

Department of Computer Engineering, Konkuk University, Seoul, 143-701, Korea
Natural disasters such as forest fire caused by global warming, environmental issues and abnormal climate changes are abruptly threatening the earth every day. Many countries around the globe are looking for ways to fight against the forest fire at early stage using ubiquitous sensor network together with IT technologies. Thus, this study forms multi-layer cluster hierarchy dynamically according to the direction of fire spreading on cluster-based network hierarchy …

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-01

Modified Floyd Algorithm for Intelligent Walking Frame

Hansoo Lee, Sudae Kim, Gyeongdong Baek, Sungshin Kim
Pusan National University, KOREA

Recently, the senior-friendly industry is expected to increase rapidly by population aging phenomenon. Especially, walking frame market for older people is expected to be even larger. Therefore, intelligent walking frame is proposed in this paper to guide through the shortest and comfortable path. Assuming that all the locations and its information given, the old tend to avoid difficult path such as uphill, stairs, obstacles, construction sites, etc. Consider this avoiding factors as some particular weights in Floyd algorithm will improve the performance in the desired direction. It is implemented commercially available walking frame added on guide …

TP-02

Enhanced Obstacle Recognition Method based on Complementary use ofMmultiple Sensors

Dae-Han Hong, Yoon-Gu Kim, Jeong-Hwan Kwak, Jinung An
DGIST, KOREA

Various robot platforms have been designed and developed to perform given tasks in hazardous environments for surveillance, reconnaissance, search and rescue, etc. A robot must be capable of overcoming and navigating these diverse environments. Awareness of the environment surrounding the robot so as to detect and avoid obstacles is a very important technology. For this purpose, ambient space recognition techniques are needed by complementarily using multiple distance sensors to enhance autonomous driving performance of the robot.

TP-03

Optical Sensor-based Object Detection for Autonomous Robots

Jonghwan Kim, Chung-Hee Lee, Young-Chul, Soon Kwon, Chi-Ho Park
DIST, KOREA

In this paper, we introduce objects detection optical sensors (CCD sensor : Charge Coupled Device). For autonomous robot, the location of around-object is very important because robot should avoid it for driving. In the field of computer vision research, the various object detection methods have been used by research engineers. In particular, the combination of Haar-like feature and AdaBoost classifier is a popular method for object detection. It has been used for face detection, but performs well for other object detection too. So it …

TP-04

A User Reactivity Research for Improving Performance of Service Robot

Seunghwan Park, Wonpil Yu, Jaeil Cho
ETRI, KOREA

To improve the ability of providing service of a service robot, ETRO, we did a survey targeting 85 spectators of the National Science Museum. ETRO offered the conversation service with its actions of two arms and mobile part. As a result, most visitors said that they felt familiar feeling to ETRO. Especially, the user customized service through talking and face changing was very popular. With this result, we know it is important that a service robot should offer a customized service fitted to users to get good responses.

TP-05

Fast SLAM using Polar Scan Matching and Particle Weight based Occupancy Grid Map for Mobile Robot

Hyun Chul Roh, Chang Hun Sung, Min Tae Kang Myung Jin Chung
KAIST, KOREA

Simultaneous Localization and Mapping is the one of essential techniques for mobile robot navigation. In this paper, we propose a fast SLAM method that uses particle weight based occupancy grid map, and also works well with in indoor environment. In addition, in the prediction step, our method that uses the polar scan matching and wheel odometry information improves the accuracy of prediction pose. In order to evaluate our proposed method, we use a simulation and the 2-wheeled mobile robot that is able to move in large-scale …

TP-06

Moving Object Detection and Tracking from Moving Camera

Won Jin Kim, In-So Kweon
KAIST, KOREA

In this paper, we deal multi moving object detection and tracking under moving camera. Moving objects are detected by homography-based motion detection. After moving objects are detected, we apply online-boosting trackers to track moving objects. Because each tracker and detector is measured independently, we integrate two systems into one system. Hence, our algorithm detects and tracks multi moving objects without background modeling. We show experiment results from sequences which are obtained from natural outdoor scene.

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-07

Hole Filled 3D Map Using Mobile Robots in the Urban Environment

Sang Un Park, Inwook Shim, Myung Jin Chung
KAIST, KOREA

3D mapping and expression of the environment are very important with various applications in many different fields. Among the various sensors (vision sensor, infrared sensor, and LiDAR(Light Detection and Ranging) sensor), we used the LiDAR sensor in this paper because its accuracy is good and easy to handle. There exist holes in the result of 3D reconstruction. When these holes are filled, improved results of localization, and path planning are expected. We propose a contour based sampling algorithm to fill holes. It uses the information from regions near the holes for the prediction, …

TP-08

A Multimodal Ubiquitous Interface System Using Smart Phone for Human-Robot Interaction

Young-Hoon Jeon, Hyunsik Ahn
Tongmyong University, KOREA

Smart phones have enhanced computing power and various interface modes which are able to be used as ubiquitous devices. A multimodal ubiquitous interface system using a smart phone for human-robot interaction (HRI) is proposed. In the interface system, the host computer of a robot acquires images for the front view and the state of motion and generates voice as a server, and transmits them to a smart phone. The smart phone as a client using Android as a mobile OS displays the received information on the screen and to speaker, and transfers control signals activated by button and voice events. …

TP-09

Research on a System for Collecting, Storing and Utilizing Potential Energy from Mobile Vehicle for Public Devices

Manh Tuan Ha
Hanoi University of Science and Technology, VIETNAM

School of Transportation Engineering, Hanoi University of Science and Technology, Hanoi, Vietnam
The paper presents a research on storing and utilizing energy collected from the movement of vehicles on road. This energy can be collected by a series of friction plates which are positioned on the road surface. Capacity of this potential energy is then recycled for public usage such as traffic signals, street lights, advertisement broads, etc. Energy balance of the system is also calculated to show the efficiency of the …

TP-10

Progress on Standard Development of Map Data Representation

Wonpil Yu[1], Hyungpil Moon[2], Geoffrey Biggs[3], Raj Madhavan[4]
[1]ETRI, KOREA, [2]Sungkyunkwan University, KOREA, [3]AIST, JAPAN, [4]University of Maryland, USA

This paper describes a recent progress on standard development of robot map specifications. Those specifications include robot map data representation, map data exchange scheme, and robot map structure. Currently, the activities for developing map data representation are supported by IEEE RAS (Robotics & Automation Society). A working group for robot map data representation is supposed to be established at November 2011, where activities related to developing …

TP-11

Design and Implementation of an Optimal In-pipe Navigation Mechanism for a Steel Pipe Cleaning Robot

Yoon-Gu Kim, Dong-Hwan Shin, Jeon-Il Moon, Jinung An
DIST, KOREA

This study focuses on the design and implementation of an optimal pipe navigation mechanism and a driving unit to overcome the variable situations inside steel pipes. It also offers adaptability to different pipe diameters. The important problems considered in the design and implementation are a self-sustaining property when in the center of a pipe, optimal navigation ability to adapt to in-pipe unevenness, the capability to remain stable without slipping in pipes, and the efficient operation of cleaning equipment. The robot developed …

TP-12

Experimental Results of the Teaching Force Shaping Algorithm in Case of the Impact

Chanhun Park, Jin Ho Kyung, Hyun-min Do
KIMM, KOREA

For the intuitive teaching method, a direct teaching method[1-3] can be used. Direct teaching method means that the operator pushes or pulls the end-effector of the manipulator, then the manipulator is controlled to follow the operator's teaching motion. For this purpose, the teaching force shaping algorithm was proposed by the author [4] considering the contact situation between the manipulator and the workpiece. Actually, the operator is not always good at directly teaching the manipulator, so there are some possibility of undesirable contact between the robot and the workpiece. …

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-13

The Difference between the Double Stages of Impedance and the Single Stage of the Impedance for a Direct Teaching Method in a Constraint Condition

Chanhun Park, Jin Ho Kyung, Tae-yong Choi
KIMM, KOREA

For the direct teaching in a constraint condition, two types of impedance system can be considered, a single stage of impedance and double stages of impedance. Single impedance system is simple but it cannot feel the teaching signal and the contact signal separately. Double stages of impedance system is complicated but it can feel the teaching signal and the contact signal separately. In this paper, the difference of two solutions will be summarized.

TP-14

Study on Teaching Path Reconstruction Algorithm based Direct Teaching and Playback Method

ChengJie Li[1], ChanHun Park[1], JinHo Kyung[1], GwangJo Chung[1], ChangSoo Han[2]
[1]KIMM, KOREA, [2]Hanyang University, KOREA

This paper proposes a method for realization of the direct teaching and playback method. For the purpose of reducing errors between the reference and the teaching data, the technique which is nearly not related with a time difference is introduced as a concept of updating data. Direct teaching means that the manipulator is activated by operator's intention, and the teaching data is collected during the teaching process. The collected data which contains the operator's uncertainty and disturbance is compressed by the Douglas-Peuker(DP) …

TP-15

Feature Point Recognition for the Direct Teaching Data in Industrial Robot

Taeyong Choi, Chanhun Park, Jinho Kyung
KIMM, KOREA

Direct teaching in the industrial robot are the novel technique to teach manipulator with easy usage. However, teaching data by human hand cannot help having large noise error ranged low and high frequency. To use teaching data, post processing to correct teaching trajectory are required. Here, the intuitive feature point recognition method to rebuild teaching data with curvature information is proposed.

TP-16

Hybrid Control Architecture of the Robotic Surveillance System Using Smartphones

Hui-Kyung Oh, In-Cheol Kim
Kyonggi University, KOREA

This paper presents the hybrid control of an intelligent surveillance system that enables a smartphone user to surveil or monitor home invaders, old/sick persons or little children remotely via a mobile home robot combined with his/her smartphone. In view of the mobile robot's limited cognitive and computational abilities, the surveillance system is designed to control the robot in a user-robot collaborative manner rather than rely on the robot's fully autonomous control.

TP-17

Measurement of Joint Toque and Signal Processing Using FIR Filter

Yijun Yoo, Chanhun Park, Dongil Park, Jinho Kyung, Gwangjo Chung
KIMM, KOREA

It is increasingly important for robot to capture precise senses of torque and forces to cooperate with human. The torque sensor that measures these quantities could be subject to suffer noises which can prevent from measuring signals. To overcome this problem there is a method of current-to-voltage transforming that can provide guarantee for measuring precise torque. Moreover, FIR(Finite Impulse Response) Filtering is applied to reduce back-ground noise from voltage value. It is suggested to measure precise torque and filter noise using …

TP-18

Mobile Robot Navigation Based on Interactive SLAM with an Intelligent Space

Fumitaka HASHIKAWA, Kazuyuki MORIOKA
Meiji University, JAPAN

Several methods of SLAM have been proposed. One of them is called Fast-SLAM based on Particle Filter. Especially, on the map construction based on a grid map is one of methods to improve accuracy of SLAM. However, those methods use only sensing data from the mobile robot to achieve SLAM. In this study, a new method of SLAM, which uses laser range sensors fixed in an intelligent space, is introduced. This method shares information with SLAM of mobile robot. Laser scan results by the mobile robot are compared with map built by the distributed laser scanners in the intelligent space …

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-19

Topological Map Building for Mobile Robots Based on GIS in Urban Environments

Yu-Cheol Lee, Christiand, Seung-Hwan Park, Wonpil Yu, Sung-Hoon Kim
ETRI, KOREA

This paper presents an efficient method for building a topological map for robots in urban environments based on a geographic information system (GIS) such as satellite maps. In urban space, mobile robots need a special map, such as a topological map, to generate a path toward their goal. Unlike a car map, a topological map for mobile robot navigation should include semantic data, e.g., the width and type of road. This paper divides the GIS-based topological map building process into two steps. The first step is defining the topological…

TP-20

Nonlinear Disturbance Observer Design for Euler-Lagrange Systems: An Initial Study

Min Jun Kim, Wan Kyun Chung
POSTECH, KOREA

Recently, Disturbance observer(DOB) has been investigated a lot. But it has a defect that it cannot be applied to nonlinear systems. This paper proposes a novel Nonlinear Disturbance observer(NDOB). NDOB consists of internal loop that generates an auxiliary control input that compensates external disturbances. The auxiliary input inversely satisfies nonlinear H optimality and existence of the controller guarantees input-to-state stability of internal loop. Simulation has been performed to verify proposed observer and shows an expected result.

TP-21

Dynamic Analysis of Beam Type Substrate Handling Robot in Solar Cell Manufacturing

Dong Il Park, Cheolhoon Park, Yi-Jun Yoo, Hyunmin Do, Jin-Ho Kyung
KIMM KOREA

In the thin film solar cell production system, it is a very important task to handle the large size solar cell substrate. Many handling robots have been developed and applied in the manufacturing line. As the substrate size gets larger, dynamic analysis and vibration control including flexible forks becomes very important. Precise position control including the vibration of forks and the substrate is very important because solar cell substrate is three to five times heavier than LCD glass substrate. In the paper, we analyzed dynamic motion of …

TP-22

Motion Simulation Model for Beam Type Solar Cell Substrate Transport Robot

Cheol Hoon Park[1,2], Dong Il Park[1], Hyun Min Do[1]
[1]KIMM, KOREA, [2]KAIST, KOREA

The automated solar cell process line is composed of various types of solar cell substrate handling robots such as cassette transfer robots, glass handling robots and vacuum robots. This paper is focusing on the beam type solar cell substrate transport robot and presents the design procedure for motion simulation model. The simulation model for beam type robot is constructed by using Matlab/Simulink and SimMechanics. The trajectory is generated based on the one tack time motion and the tracking performance using the simulation model is predicted as well.

TP-23

Combined Method of Weighted Least Norm and Gradient Projection for Avoiding Joint Limit

Seong Sik Park, Wan Kyun Chung
POSTECH, KOREA

This paper proposes the combined method of weighted least norm (WLN) and gradient projection (GP) for avoiding joint limit. WLN has the limitation of lower manipulability. Also GP has lack of reliability. Taking the advantages of both methods, we combined two methods and also performed numerical simulation. The simulation result shows the advantages of both methods.

TP-24

Design and Simulation of a Robot that Can Walk and Jump

Hyunsoo Seung, Sangyoon Lee
Konkuk University, KOREA

This paper presents the development of a small legged robot that can both walk and jump. The robot is designed to four legs that are actuated by two servo motors per leg. Each leg has a jumping part that consists of a gear part and a spring part. We also report the forward kinematics of robot for motion analysis. In addition, computer simulation was executed for evaluating the performance of jumping and walking. The simulation results show that the jumping part can jump as high as 140 mm and the robot can move forward 76 mm during one cycle.

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-25

Probabilistic Voxel Mapping using Stereo Matching Confidence

Sijong Kim, Seunguk Ahn, Myung Jin Chung
KAIST, KOREA

There has been meaningful research into the development of 3D world modeling techniques that are important requisite for intelligent vehicle navigation. In this paper we describe a 3D probabilistic voxel mapping process using stereo matching confidence. Proposed 3D probabilistic voxel map is more reliable representation than general voxel map that just contains the occupancy information. To get the matching confidence value, we evaluate stereo matching costs and its propagation. We test the proposed method in large-scale outdoor environment.

TP-26

3D Mapping in Urban Environment using Geometric Featured Voxel

Inwook Shim, Yungeun Choe, Myung Jin Chung
KAIST, KOREA

In recent year, much progress has been made in outdoor 3D mapping. However, 3D mapping in real time is still a daunting challenge in urban environment. This paper addresses the problem of 3D mapping from 3D laser scans in urban environments in real time. To do this, we proposed geometric featured voxel which can efficiently represent 3D urban structure without loss of geometric properties. For evaluation of the proposed voxel, we use Oakland dataset.

TP-27

Vision-based Detection and Classification of Pavement Mark using Neural Network for Autonomous Driving System

Yu-Bin Yoon, Se-Young Oh
POSTECH, KOREA

This paper proposes an algorithm for an autonomous driving system which detects a pavement mark in an image of the road in front of a vehicle and identifies the mark. The algorithm uses edge pairing to find a pavement mark then identifies the type using a neural network which uses the horizontal and vertical projection of the founded mark as input. The network successfully classified 1073 of 1088 images. The result can be used to provide the accurate position of the vehicle in in-vehicle navigation systems.

TP-28

Motion Prior Based on General Motion Statistics

RockHun Do, In So Kweon
KAIST, KOREA

Motion estimation plays an important role in scene matching, SLAM(Simultaneously Localization And Mapping) in computer vision field. In BMA(Block Matching Algorithm) for the video compression, motion estimation is also considerable. Motion prior which could be an initial guess for the next motion has an effect on how well motion is estimated. In many applications, motion model is assumed to be Gaussian model with constant velocity. In this paper, we propose a new motion model based on general motion statistics and demonstrate proposed motion model helps motion estimation become more accurate.

TP-29

Haze Removal using Visible and Infrared Image Fusion

Byungtae Ahn, Taewuk Bae, Inso Kweon
KAIST, KOREA

In order to remove haze from images, we propose an improved method for fusing a visible and a near-infrared (NIR) image of the same scene. NIR images are inherently haze-free. The NIR information allows dehazing without building and analyzing a model of haze image. We suggest a multi-resolution fusion using edge- preserving filter, bilateral filter, to reduce artifacts and computational time compared to the existing methods. Experimental results validate our approach.

TP-30

A Search and Coverage Algorithm for Mobile Robot

Seuk-Woo Ryu[1], Young-ho Lee[1], Tae-Yong Kuc[1], Sang-Hun Ji[2], Yong-Seon Moon[3]
[1]Sungkyunkwan University, KOREA, [2]KITECH, KOREA, [3]Sunchon National University, KOREA.

This paper presents a new work space modeling and search algorithm for complete coverage of robotic environment. The proposed algorithm named spatial cell diffusion (SCD) encodes the target area as groups of Gray codes for grid cells with size of instantaneous robot coverage and extends its sweep area by diffusing occupied cells outwards through continuous spiral movement. Based on the direct and rotational motions of robot, directions of search are categorized into eight ways by combining four cardinal points {N, S, W, E} …

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-31

Cell Phone Controlled Rocker-bogie Suspension Type Rover with a Scooping Arm

Suhas Divakar
Rashtreeya Vidyalaya College of Engineering Bangalore, INDIA

This paper presents a way to build a cell phone controlled rocker-bogie suspension type rover with a scooping arm. This rover can swap between autonomous and manual control states. It has a wireless camera onboard which transmits videos to a nearby laptop with a range of 100 feet. As well as an ultra-sonic sensor which is mounted on a B0 motor to help the sonar rotate in place to detect and avoid obstacles on all 3 sides. It also houses a samsung 3200 mobile phone along with the Atmega32 board with 6 onboard drivers so that …

TP-32

Analysis of Pneumatic Balloon Actuator

Dongwon Yun[1], Kyung-Soo Kim[2], Soohyun Kim[2], Heechang Park[1]
[1]KIMM, KOREA, [2]KAIST, KOREA

This paper describes the analysis of Pneumatic Balloon Actuator (PBA). To do this, Finite Element Method (FEM) is used. In this paper, no-load characteristic of PBA is studied and through this, the displacement and stress of PBA can be calculated.

TP-33

Teaching Data Extraction for the Direct Teaching in Industrial Robot

Taeyong Choi, Hyunmin Do, Dongil Park, Kwangcho Chung
KIMM, KOREA

Direct teaching in the industrial robot are the novel technique to teach manipulator with easy usage. In conventional works, teaching trajectory is identified by physical indicator like button. In this work, F/T sensor attached to the end-effector to detect the contact force is utilized. F/T sensor at the end-effector is attached to measure contact force for impedance control to make operator feel no resistance while direct teaching, not for teaching trajectory extraction. Here, exact teaching trajectory is extracted without additional physical device to manipulator.

TP-34

Simulated 3D Underwater Localization based on RF Sensor Model using EKF

Daegil Park[1], Jinhyun Kim[2], Wan Kyun Chung[1]
[1]POSTECH, KOREA, [2]SEOULTECH, KOREA

The interest about underwater localization has been increased in various fields. Among the received signal strength indication (RSSI) type radio frequency (RF) sensor is an interesting possibility as an underwater sensor. This paper describes the sensor model relation between RSSI and distance. Also the three dimensional extended kalman filter (EKF) localization was simulated using RF sensor model.

TP-35

Detection of a Human Approaching to Maintain a Safety In Human-Robot Cooperation

Hyun Min Do, Jin Ho Kyung Gwang Jo Chung
KIMM, KOREA

This paper gives a detection method of a human who approaches around a robot and thus to maintain a safety in human-robot cooperation job. Since a human and a robot share the working space in a configuration of human-robot cooperation, a safety issue should be posed as a necessity. Thus, safety actions should be taken when a human approaches in the vicinity of a robot. To do this, objects will be detected and differentiated into moving ones and not. Also humans and things will be differentiated using some properties.

TP-36

Analysis and Design of LVDT

Dongwon Yun, Sangyong Ham, Jungho Park, Sonam Yun
KIMM, KOREA

In this paper, analysis for LVDT has been performed to design and evaluate the performance of the sensor. To do this, finite element method (FEM) is used and parametric analysis is conducted. From the analysis, performance of a LVDT sensor can be investigated precisely before actual manufacturing.

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-37

A Study on Train Network and Control in Korea Tilting Train

Su-Gil Lee
KRRI, KOREA

Advanced Material Tilting Train system, Korea Railroad Research Institute, Uiwang-Si, Korea
The main transformer of the train is the equipment that receives the AC 25KV power from the trolley wire and transforms it to an adequate voltage that can be used by the traction control system of the train. The primary winding side is the trolley wire voltage; the secondary winding side is the load side that supplies power to the main motor through the traction control system (Converter/ Inverter); the third winding side is the load side that supplies power to SIV that …

TP-38

The Study of Tilting Actuator Control for Korea Tilting Train

Su-Gil Lee, Seong-Ho Han
KRRI, KOREA

Tilting trains are now an established feature of railway operations throughout the world. For intercity traffic, tilt provides operators with increasing speeds, and therefore enhanced competitiveness, on existing routes where insufficient traffic or a lack of funds precludes the construction of a dedicated new high-speed railway. Appling the tilting train, we can expect 30% of speed up on existing lines, but the stability of the electric current would be low because of tilting the train. Also, the spark between the catenary and pantagraph cause environmental problems such as noise, …

TP-39

A Study on the UUV Docking System by using Torpedo Tubes

Jinhyun Kim, GiHyeon Lee
Seoul National University of Science and Technology, KOREA

According to increasing the importance of underwater environments, the needs of UUV is growing. This paper represents the mechanism and algorithm of UUV docking system with 21-inch torpedo tubes for military submarines as a docking station. To improve the reliability of the docking, torpedo tubes launch a wired ROV and next the ROV combined with UUV is retrieved. For estimating the relative position between the ROV and UUV, in this paper, combining RF sensors and vision system is proposed. The RSSI method of RF sensors is used to estimate the distance and the …

TP-40

User-oriented Tele-presence Service Robot

Seunghwan Park, Wonpil Yu, Jaeil Cho
ETRI, KOREA

A user-oriented service robot, ETRO, is implemented. To satisfy users, it has various parts which can give humanlike services to the spectators. These parts consist of two kinds which are permanent parts and changeable parts. Also it has employed the tele-presence system to show the reactions expected by visitors and to control the robot precisely.

TP-41

Modified Mean-Shift for Head Tracking

Daeha Lee, Jaehong Kim, JooChan Sohn
ETRI, KOREA

Mean-Shift algorithm has been applied mode seeking , image segmentation and object tracking. It is famous for fast convergence within limited boundary. But once exit that boundary, it fails to find correct region and position. We applied mean-shift algorithm in object tracking, and we suggest modified mean-shift tracking method. Using this modified version, we can track object without failing.

TP-42

Design Study of Three Segment Leg with Stable Region at Low and High Speed Running

Oh-Seok Kwon, Dong-Ha Lee
DGIST, KOREA

In previous researches[2, 3] , the self-stability was studied for the spring-mass model and the two segment leg model. In these researches, it was presented that the spring-mass model has the self-stable region at relatively high speed running and the two segment leg model has the self-stable region at relatively low speed running. If the model was run in the self-stable region, the cost of transport[1] is zero ideally. That is, actually, only the energy loss is needed to compensate for running. This means that the energy efficiency is high, running in the self-stable region. We want to have high energy efficiency …

[TP] Poster Session

Time: 14:20-15:20
Room: #116+117

TP-43

Design and Analysis of a Robotic Vehicle for Entertainment Using Balancing Mechanism

Hyun Wook Kim, Seul Jung
Chungnam National University, KOREA

This paper presents the design and analysis of a robotic vehicle to carry human beings for entertainment in amusement park. The robotic vehicle called AmusTransBot has two wheels to maintain balance and navigate on the ground. The design of AmusTransBot is carried out to provide the excitement of the driver using balancing mechanism. Simulation studies are carried out to confirm the design concept.

TP-44

Implementation and Control of Balancing Line Tracer Robot Using Vision

Taehwa Jung, Hyun Wook Kim, Seul Jung
Chungnam National University, KOREA

This paper presents the implementation and control of balancing line tracer(BLT) robot which has two wheels. The goal of BLT robot is to follow the line on the floor while maintaining balance. A camera sensor detects the line by using a camera instead of UV sensors since BLT is used in outdoor environment. The trajectory is generated and the robot is controlled to follow the line. Since BLT is required to maintain balance while following the line, robust balancing control is important. Relying upon linear controllers, BLT is controlled. The BLT robot is built and experimental studies of …

TP-45

Novel Design and Control of a Home Service Mobile Robot for Korean Floor-Living Life Style: KOBOKER

Seungjun Lee, Seul Jung
Chungnam National University, KOREA

This paper presents novel design, development, and control of a mobile robot that is required to perform home service application. The robot is called KOBOKER(Korean Robot Worker) and designed for Korean home environment that requires living life on the floor. KOBOKER has been developed for Korean floor living life style with several design strategies such as balancing capability with two wheels, separable low and upper bodies, adjustable waist, stretchable waist, and lastly up and down arms to reach objects on the floor.

[TC1] Service Robots 2

Time: 15:30-16:45
Room: #108

Chair: Dong Hwan Kim, Seoul Nat'l University of Science and Tech., Korea
Su-Young Chi, ETRI, Korea

15:30~15:45 TC1-1

Implementation of Smartphone Environment Remote Control and Monitoring System for Android Operating System-based Robot Platform

Sung Wook Moon[1] ,Young Jin Kim[1], Ho Jun Myeong[1], Chang Soo Kim[2], Nam Ju Cha[2], Dong Hwan Kim[1]
[1]Seoul National University of Science and Technology, KOREA, [2]DUNET, KOREA

In this work, Android operating system based robot platform and smart phone operated control and monitoring system are introduced. To implement this work, Cortex-A8 series S5PV210 embedded processor and Android operating system are correlated. The robot has an autonomous and manual travel and is controlled by only smart phone. In the Android OS (Operating System), the camera image is compressed to …

15:45~16:00 TC1-2

Automatiic Fire Extinguisher Robot

B.Swetha Sampath
Vignana Bharathi Institute of Technology, INDIA

Automatic Fire Extinguisher Robot is a Hardware based model used to automatically extinguish the fire during fire accidents. A Robot has been developed which features to move in the direction with respect to the fire intensity. The Robot shield is coated with calcium silicate boards thaat are capable of withstanding very high temperatures. The principle used, was designed and experimented at a temperature of 300°C. The temperature sensing capability of the robot is varied by heating the Thermocouple ends to a cut-off temperature, above which the robot starts responding to the fire. The Robot finds its applications in Rescue operations during fire accidents …

16:00~16:15 TC1-3

Revised Robotic Interaction Service(RoIS) Framework

Su-Young Chi[1], Young-Jo Cho[1] , Jae-Yeon Lee[1] , Ho-Sub Yoon[1] , Do-Hyung Kim[1], Jae-Hong Kim[1], Toshio Hori[2], Miki Sato[2]
[1]ETRI, KOREA, [2]JARA, JAPAN

This paper is based on our extensive surveys on human-robot interaction function methodologies and implementations, which are currently used in robotic products and research project in Japan and Korea. This specification defines a framework that can handle messages and data exchanged between human-robot interaction service components and service applications.

[TC2] Robot Control 1

Time: 15:30-16:45
Room: #109
Chair: Alireza Alikhani, Aerospace Research Inst.,, Iran

15:30~15:45 TC2-1

Adaptive Variable Structure Position Control of Servo Systems with System Uncertainty

Kyoung Taik Park, Doo Hyung Kim, Seock Joon Kim, Han Me Kim
KIMM, KOREA

This paper deals with adaptive sliding mode control of servo systems with system uncertainty such as nonlinear friction. In the case of servo systems, friction phenomenon causes the reduction of tracking performance because friction is directly related with various internal and external environment conditions such as the level of lubricant, contamination, and temperature. Therefore, to overcome the problems with friction in servo systems, robust control scheme is required. In addition, to actively compensate system uncertainties, …

15:45~16:00 TC2-2

The Software Architecture of a Reconfigurable Real-time Onboard Control System for a Small UAV Helicopter

Yi-Rui Tang, Yangmin Li
University of Macau, CHINA

This paper details the comprehensive software architecture and implementation of an onboard control system developed for a small-scale unmanned aerial vehicle (UAV) helicopter. A PC-104 computer stack is devoted to flight control as well as the interaction with other devices in the onboard system. The consideration to construct the software system is primarily focused on its real-time runtime environment and its competence of flexible reconfiguration. As a result, the system is developed under QNX Real-time Operating System (RTOS) …

16:00~16:15 TC2-3

Joint Trajectory Generation of Humanoid Robot's Front Kick

Min-Goo Choi, Nak-Yoon Choi, Young-Lim Choi, Jong-Wook Kim
Dong-A University, KOREA

This paper proposes a new approach to generate joint trajectories of a humanoid robot for kicking forward, which is one of the basic motions in Taekwondo. This type of motion generation is regarded difficult because of high dimensional complexities under the Denavit-Hartenberg kinematic convention especially in case of the humanoid robot. However, the projection based kinematics enables us to intuitively schedule trajectories of joint motors by mimicking human's kicking motion. The forward kick is divided into three postures with corresponding joint motor angles, and the motor …

16:15~16:30 TC2-4

Modeling and Robust Control of a New Large Scale Suspended Cable-driven Robot under Input Constraint

Alireza Alikhani Mehdi Vali
ARI, IRAN

In this paper, modeling and control of a new large scale suspended cable-driven robot is presented. In this mechanism, the cable arrangement eliminates the rotational motions leaving the moving platform with three translational motions. At first, kinematic and dynamic models for the proposed suspended cable-driven architecture are derived. Moreover, robust sliding mode control is utilized in order to set-point control for the proposed suspended cable-driven robot at the presence of unknown but bounded disturbances. The asymptotic stability and robustness of the proposed control law is proved …

16:30~16:45 TC2-5

Real-time Trajectory Planning for Mobile Manipulator Using Model Predictive Control with Constraints

Satoshi Ide, Tomohito Takubo, Kenichi Ohara, Yasushi Mae, Tatsuo Arai
Osaka University, JAPAN

Real-time trajectory planning using model predictive control with constraints is proposed for mobile manipulators. The proposed method employs Quadratic Programming(QP) for optimizing control inputs. The control inputs and outputs are limited corresponding to the required motion and the hardware specifications of the mobile manipulator. The required motion is changed frequently according to the situation and the hardware limitations, concretely the torque, the angular velocity, the mobile base velocity and the acceleration, …

[TC3] Robotics for Biomedical Applications

Time: 15:30-16:45
Room: #110

Chair: Takahiro Kagawa, Nagoya University, Japan
Byung-Ju Yi, Hanyang University, Korea

15:30~15:45 TC3-1

Modularity for Modulating Exercises and Levels– Observations from Cardiac, Stroke, and COLD Patients Therapy

Henrik Hautop Lund, Camilla Balslev Nielsen
Technical University of Denmark, DENMARK

The modular interactive tiles aim at engaging anybody (elderly, carer, hospital personnel, children) in performing playful and motivating physical activities. Inspired by modular robotics, each tile is a self-contained module with processing power and communication to neighbouring modules, and a number of these can be put together in any physical shape by the user within a minute. The tiles light up in different colors and can perceive the pressure when people press them with their hands or jump on them with their feet. …

15:45~16:00 TC3-2

Posture Adjustment of Standing on a Slope with a Wearable Robot

Takahiro Kagawa, Takaaki Goto, Yoji Uno
Nagoya University, JAPAN

In this paper, we propose a sensing and control system of a wearable robot which adjusts a standing posture on a slope. We first analyzed standing posture on a slope using the statics model of human body. The results of the analysis indicate that the ankle joint angle should be adjusted so that the user maintains an upright posture. In the proposed system, angular velocity of ankle joints is determined on the basis of the user's intention which is detected by the center of pressure and vertical ground reaction force. Our experiments demonstrated that a user could adjust the ankle angle to be an upright …

16:00~16:15 TC3-3

Variable Impact Dynamics of a Finger Mechanism

Jae Yeon Choi, Hwan Taek Ryu, Byung-Ju Yi
Hanyang University, KOREA

When a robot system collides with its environment, various impacts occur under the same robot and environmental condition. In order to apprehend this phenomenon, the analysis of impact dynamics is performed using a 3DOF finger mechanism. The external impulse exerted on a wall by a finger mechanism is a function of the robot's geometry and dynamic parameters. Here, coefficient of restitution (COR) is an important parameter to calculate the impulse. Generally, COR has been assumed a constant value. However, COR varies according to the colliding condition. In this paper, we derive an analytical model of COR for the 3DOF finger model …

16:15~16:30 TC3-4

Requirements of Lower-Extremity Robotic Exercise System for Severely Disabled

Hwi-Young Lee, Kyung Kim, Jongbae Kim, Won-Kyung Song
National Rehabilitation Center, KOREA

A novel lower-extremity robotic exercise system with weight bearing and locomotion abilities has been developed for the severely disabled. The purpose of this study was to investigate the needs of users and clinical experts when using this robotic exercise system. The system consists of an exoskeleton, weight-bearing system, interface, and system platform. The results of this research are based on the opinions of focus groups and clinical experts who were interviewed after applying the robotic system. Comfort, safety, and natural appearance while wearing the system were considered. …

[TC4] OS: ROTUS (RObust navigaTion for Urban Space)

Time: 15:30-16:45
Room: #111
Chair: Wonpil Yu, ETRI, Korea

15:30~15:45 TC4-1

Autonomous Driving through Curb Detection and Tracking

Jaemin Byun[1], Junyoung Sung[2], Myung Chan Roh[1], Sung Hoon Kim[1]
[1]ETRI, KOREA, [2]NSTC, KOREA

This paper presents a strategy to detect and track the curb which means a stone separates road and non-road using a LRF(Laser Range Finder) with particle filter. Our approach to find the position of curb involves two stages In first stage, Curb detection through curb geometric shape recognize and detect the position of the curbs in laser scanner data. A second stage processes is the curb estimation and tracking using particle filter with laser scanner. Experiments are carried out at the autonomous vehicle in real structured road, and …

15:45~16:00 TC4-2

Design of Mappinng System for Unmanned Grounnd Vehicle

Dong-Jin, Yoon, Suk-Ho Jang, Jung-Ha Kim
Kookmin University, KOREA

This paper describes the 3D map generation for UGV(Unmanned Ground Vehicle) using 2D laser scanner We have developed the 3D mapping system by integrating 2D laser scanner and motor driven revolution device. This platform has advantageous that one 3D laser scanner can displace multiple 2D laser scanners; 2D laser scanner could obtain limited data from terrain. The approach presented in this paper describes the mapping of driving environments and obstacle detecting of UGV by using a 3D mapping system

16:00~16:15 TC4-3

[Invited] EKF Localization with Lateral Distance Information for Mobile Robots in Urban Environments

Christiand, Yu-Cheol Lee, Wonpil Yu
ETRI, KOREA

This paper proposes the EKF localization with lateral distance information for the mobile robots in urban environments. The mobile robot is assumed to be operated at common roads where the lane marker exists. The lateral distance information given by the lane marker detector is used to compensate the measurement of global positioning system (GPS) before the EKF update step. In addition, the proposed method also uses Mahalanobis distance approach to validate the sensors measurements. The GPS compensation and Mahalanobis distance validation effectively reduce the sensors error, …

16:00~16:15 TC4-4

[Invited] Compensating for Visually Missing Features: Scale Adaptive Recognition of Objects Using Probabilistic Voting

M. S. Ryoo[1], Ji Hoon Joung[2], Wonpil Yu[1]
[1]ETRI, KOREA, [2]Hyundai Heavy Industries Co., Ltd., KOREA

In this work-in-progress paper, we present an efficient methodology for a scale-adaptive recognition of objects. We introduce a new object recognition approach, which detects an object in a scene while probabilistically predicting visually missing features. The idea is to enable a better recognition by considering the fact that object features may not be detected depending on its situation (e.g. distance and occlusion). A probabilistic voting-based methodology is developed.

[TD1] Robot Intelligence 1

Time: 17:00-18:15
Room: #108

Chair: Henrik Hautop Lund, Center for Playware, Denmark
Guanghui Li, The University of Tokyo, Japan

17:00~17:15 TD1-1

Adaptive Modular Playware

Henrik Hautop Lund, Arnar Tumi Thorsteinsson
Technical University of Denmark, DENMARK

n this paper, we describe the concept of adaptive modular playware, where the playware adapts to the interaction of the individual user. We hypothesize that there are individual differences in user interaction capabilities and styles, and that adaptive playware may adapt to the individual user's capabilities, so that the activity automatically will match the capability of the individual user. With small test groups, we investigate how different age groups and gender groups physically interact with some specific playware games, and find indications of differences between the groups. Despite the small test set, the results are important as a proof of …

17:15~17:30 TD1-2

Real-Time Human BodyMotion Estimation Based onMulti-Layer Laser Scans

Wei Wang[1], Dražen Brščić[2], Zhiwei He[1], Sandra Hirche[1], Kolja Kühnlenz[1]
[1]Technische Universität München, GERMANY, [2]ATR, JAPAN

Real time human body motion estimation plays an important role in the perception for robotics nowadays, especially for the applications of human robot interaction and service robotics. In this paper, we propose a method for real-time 3D human body motion estimation based on 3-layer laser scans. All the useful scanned points, presenting the human body contour information, are subtracted from the learned background of the environment. For human contour feature extraction, in order to avoid the situations of …

17:30~17:45 TD1-3

A Terrain Classification Method for UGV Autonomous Navigation Based on SURF

Seung-Youn Lee, Dong-Min Kwak
ADD, KOREA

The ability to navigate autonomously in off-road terrain is critical technology needed for unmanned ground vehicle (UGV). This paper presents a vision-based off-road terrain classification method that is robust despite environmental variation caused by weather changes. In order to cope with an overall image brightness variation, we use speeded-up robust features (SURF), and neural network classifier. Experimental results for real off-road images show that proposed method has a better performance than wavelet based one especially in case of large brightness variation.

17:45~18:00 TD1-4

A Comparative Study of Dynamical Sequential and Global Optimal Task Reallocation Methodology for Distributed Multi-robot System

Guanghui Li, Yusuke Tamura, Hajime Asama
University of Tokyo,, JAPAN

We firstly consider a kind of dynamical mobile task assignment problem, which allows the condition of tasks and robots to be time dependent before assigned robots accomplish the relational tasks. For such new domain, we propose two methods, one is called dynamical sequential task allocation and reallocation, and another is global optimal task allocation and reallocation, for the distributed multi-robot coordination system. The former approach implements multi-round negotiation and body expansion behavior for mobile …

18:00~18:15 TD1-5

Impact-based Contextual Service Selection in a Ubiquitous Robotic Environment

Benjamin Cogrel, Boubaker Daachi, Yacine Amirat
University of Paris-Est Cr´eteil, France

Images, Signals and Intelligent Systems Laboratory (LiSSi), University of Paris-Est Cr´eteil, Vitry-sur-Seine, France
Context has a crucial importance in the way actions are perceived and done, especially in ubiquitous robotics where context is rich and subject to substantial variations. Given that service selection focuses on the nonfunctional performance of services, it must be tightly related to the context. Unfortunately, as far as we know, previous works have not effectively considered this relation. First, most of the existing selection models rely on Quality of Service (QoS) …

[TD2] Robot Kinematics & Dynamics 1

Time: 17:00-18:15
Room: #109
Chair: Woosoon Yim, University of Nevada, USA

17:00~17:15 TD2-1

Posture and Workspace Analysis of KU Hybrid Robotic Hand

Hyunhwan Jeong, Joono Cheong
Korea University, KOREA

In this paper, we present kinematic and posture analysis of KU hybrid hand, which allows two different operation modes. We analyze kinematic structure and workspace of the KU hybrid hand. We test the ability of KU hybrid hand in making various grasp configurations using standard grasp taxonomy. We also present in-hand motion planning with rolling contact

17:15~17:30 TD2-2

Dynamic Model of A Cylindrical Ionic Polymer-metal Composite Actuator

Shivakanth Gutta[1], Jonathan Realmuto[1], Woosoon Yim[1], Kwang J. Kim[2]
University of Nevada, U.S.A.

In this paper, a finite element based modeling approach is presented to model the dynamics of cylindrical shaped ionic polymer actuator. In this approach, the actuator is divided into finite number of elements with a local coordinate system attached to it. This coordinate system undergoes a rigid body motion together with the associated element. A large deflection beam model is used for the deflection of each element. This approach has the advantage of modeling large deformations using fewer elements and can lead to the finite dimensional …

17:30~17:45 TD2-3

A Safe Joint with a Joint Torque Sensor

Dong-Eun Choi[1], Gi-Hun Yang[2], Junho Choi[2], Woosub Lee[3], Changhyun Cho[4], Sungchul Kang[5]
[1]KIST, KOREA, [2]KITECH, KOREA, [3]KITECH, KOREA, Tokyo Institute of Technology, JAPAN, [4]Chosun University, KOREA, [5]KIST, KOREA

In this study, a safe joint with a joint torque sensor is presented. The safe joint, named “Spring-Clutch”, is a simple passive mechanism that consists of a spring, a cam, and a joint torque sensor. When the torque applied is less than a pre-set threshold, the Spring-Clutch acts as a rigid joint between the input and output. However, if the applied torque exceeds the threshold, the Spring-Clutch is released and acts as a revolute joint, which results in reduction of the collision force …

17:45~18:00 TD2-4

Planning of Kicking Motion with Via-Point Representation for Humanoid Robots

Chang Hyun SUNG, Takahiro KAGAWA, Yoji UNO
Nagoya University, JAPAN

This paper describes planning of a whole body motion, such as kicking motion, for humanoid robots. Motion planning which is generally accompanied by various constraints is a key problem to achieve the task. In these constraints, the conditions for achieving the task are the most important component in the motion planning. In this research, we propose a method for motion planning with via-point representation to deal with various conditions for achieving the task. The via-point representation plays a crucial role in the reappearance of human movements. Our method deals …

18:00~18:15 TD2-5

Adaptive Kinematic Control of Robot Tracking

Shin-Guk Kim[1], Young-Ho Lee[1], Tae-Yong Kuc[1], Sang Hoon Ji[2], Yong Sun Moon[3]
[1]Sungkyunkwan University, KOREA, [2]KITECH, KOREA, [3]Sunchon National University, KOREA.

This paper presents a distributed robust adaptive controller for multiple mobile robots engaged in cooperative tracking and capturing of moving target object. The proposed controller guarantees asymptotic convergence of distributed multi-robot locations to the desired distance enclosing the moving target object. In the distributed controller, linear and angular velocity inputs are generated by using only the local data of robot position and orientation and estimated velocity of virtual reference model for target object. The synthesized …

[TD3] Video Session: Biologically Inspired Robots (OS) and Other Robots

Time: 17:00-18:15
Room: #110
Chair: Hoon Cheol Park, Konkuk University, Korea

17:00~17:10 TD3-1

Biologically Inspired Robots using Smart Composite Microstructures

Je-sung Koh, Seung-won Kim, Min-kyun Noh, Kyu-jin Cho
Seoul National University, KOREA

Various biologically inspired small scale robots are built with endoskeleton structures. Generally, endoskeletons consist of rotational joints and rigid links. For millimeter scale robots, endoskeletons should be scalable and easy to manufacture. Layers of composite materials and polymer film can be fabricated into small scale joints and link structures as seen in fig. 1. The structures are called SCM (Smart Composite Microstructures) [1]. These structures have many advantages in small scale robot structures in aspect of friction and manufacturing simplicity. We expand the structure with SMA spring actuator for actuation of small components. In this video, we show three robot prototypes using SCM. The first robot is a fully foldable robot using torsional spring type SMA actuator. As seen in fig. 2, three segments of plate structures can be folded into a compact cube shape. The Second robot is Omegabot: Inchworm inspired robot [3]. It crawls with two anchors gripping the ground alternatively by making its body into an omega shape. This simple locomotion is a suitable moving mechanism for small scale robots. The Omegabot produces motions of crawling, climbing, and steering with tethered power and control. The third robot is a flea inspired robot. The flea can jump more than 130 times of its body length with its body length just below 1mm. The flea uses a torque reversal mechanism which enables storing large amount of energy and releasing it with a small amount of force. This mechanism is simple and efficient, which makes it a good mechanism for small jumping robots. The current prototype of the flea inspired robot jumps 64cm high, which is about 30 times of the robot body length. The SCM enabled …

17:10~17:20 TD3-2

[Invited] Improvement of Stability for Vertical Take-off of an Insect-mimicking Flapping-wing System

Hoang Vu Phan, Quoc Viet Nguyen, Hoon Cheol Park, Nam Seo Goo, Doyoung Byun
Konkuk University, KOREA

In recent years, there has been a lot of progress in developing Flapping-Wing Micro Air Vehicles (FW- MAVs) [1-2]. Most of them were designed for low Reynolds numbers environment (in the range of 5,000 to 10,000 [3]). Therefore, many researchers have been paying attention to principle of insect flight for potential application to improve FW-MAVs or to develop even smaller system, called Nano Air Vehicles (NAVs) [4]. Among many types of insects, Rhinoceros beetle, Allomyrina Dichotoma, has been chosen for our study. Its weight is about 6 gram to 10 gram and wingspan is about 130 mm. It flaps its hind-wings at 30 Hz to 40 Hz with flapping angles of 165o to 180o during forward flight and hovering flight, respectively, and rotates its hind-wings around 140o [5]. It controls attitude by changing stroke plane and differential flapping angles without any control surface at tail. In an effort to mimic flight motion of this beetle, we have been developing a beetle-mimicking flapping-wing system, which has flapping angle of 145o [5-6] and flaps at 39 Hz for 12 V application. At this flapping frequency, the flapping-wing system can produce a large enough vertical force of about 7 grams to lift its own weight [7]. The wings in the system can passively rotate 105o about the flexible hinges. This paper describes how we modified the flapping-wing system for stable take-off in the vertical direction. For the modified system, the hind wings were directly connected to the output links of the flapping mechanism without flexible hinges. Instead, the trailing edges of the hind wings near wing root connected to the body, …

17:20~17:30 TD3-3

Mobile Manipulation: Bring Back the Cereal Box Video Proceedings of the 2011 ogX Spring School

Kai Zhou, Michael Zillich, Markus Vincze
Vienna University of Technology, AUSTRIA

Automation and Control Institute, Vienna University of Technology, Vienna, 1040, Austria
This work presents the results of 5 days of project work carried out as part of the 2011 CogX Spring School. The task to be solved was to program a mobile robot to train a set of objects, locate a subset of these in a room, and to pick up and return them to a defined drop-off zone.

17:30~17:40 TD3-4

Human-Demonstration based Approach for Grasping Unknown Objects

Hyoungnyoun Kim[1,2], Inkyu Han[1,2], Shin-Jung Kim[1], Bum-Jae You[1,2], Ji-Hyung Park[1,2]
[1]KIST, KOREA, [2]University of Science and Technology, KOREA

This video presents a grasp planning of multiple robots via learning by human demonstration. In order to make a robot grasp an unknown object, the robot is required to figure out an appropriate grasping skill such as grasping points and approaching directions for the target object. After a shape of an unknown object has been reconstructed, the robot learns a natural and intuitive grasping skill by human demonstration.

17:40~17:50 TD3-5

Behavior Programming by Kinesthetic Demonstration for A Chef Robot

Jae-Pyung Hwang, Sang Hyoung Lee, Il Hong Suh
Hanyang University KOREA

The achievement of a task is required for a robot to learn several actions. Here, we refer the action is a primitive skill. Our proposed method is that the robot learns multiple primitive skills to accomplish a task by segmenting the full trajectories of the task demonstrated by human. The segmented trajectories are modeled as Hidden Markov Models (HMMs). To improve and add the existing primitive skills incrementally, a threshold model is exploited based on previously existing primitive skills. For validation of our proposed method, experimental result is presented by human-like robot achieving making rice task and cutting food task.

18:00~18:10 TD3-7

Bio-inspired Gecko-mimicking Robot: from Locomotion Behaviour and Dynamics to Robot Design

DAI ZhenDong, JI AiHong
Nanjing University of Aeronautics and Astronautics, CHINA

Gecko possesses exceptional abilities to move freely on various inclined, even inverted, substrates, no matter smooth or rough. The abilities are highly desirable for modern mobile robots to search and rescue people in the collapsed buildings, to climb on vertical surface for cleaning, et. al. thus gecko becomes a ideal biological model for developing the gecko-mimicking (GM) robots. Gecko's outstanding locomotion ability is originated from many synergetic effects. Morphology studies characterize the hairs (or setae) on toe of a gecko foot as half million self-cleaned, keratin, hierarchical structures with spatula terminal 5 to 10 nm diameter and 100 to 200 m long. Here we report our studies on the gecko's locomotion behaviour and dynamics, more exactly, reaction force measurement on freely moving gecko. The study answer the questions how do they modulate their muscle to adapt the needs to move on various directions—from climbing up and down or moving on horizontal direction on vertical surface? We use a newly developed force measuring array correspondent to measure the three-dimensional reaction forces and recorded the locomotion behaviours simultaneously. The results raise some general roles for developing gecko-mimicking robot and the role was successfully introduced to the gecko-robot design. Videos show the newly developed gecko-mimicking robot, which can climb on vertical substrate.

17:50~18:00 TD3-6

Active Morphing Robot Inspired by the Pre-strained Fiber Structure of the Venus Flytrap

Seung-Won Kim, Je-Sung-Koh, Kyu-Jin Cho
Seoul National University, KOREA

In this study, we present a novel design of an active morphing robot inspired by Venus flytrap [12-15]. The Venus flytrap has a pre-strained fiber structure which induces the bistability of the leaf that enables fast trapping motion via snap through. This fast shape changing motion can also be induced in a fiber based laminated composite products. Most composite products, i.e., tails of a helicopter, badminton racquets, are manufactured symmetrically and do not possess this kind of property. However, unsymmetrically laminated composite structures pre-strained by residual thermal stresses induced by thermo-mechanical expansion during the curing process …

[TD4] OS: Mobile Robot Navigation

Time: 17:00-18:15
Room: #111
Chair: Kyoung Taik Park, KIMM, Korea

17:00~17:15 TD4-1

Efficient Calibration of Infrared Range Finder PBS-03JN with Scan-wise Cubic Hermite Splines for Indoor Mobile Robots

Jin-Baek Kim, Byung-Kook Kim
KAIST, Daejeon, KOREA

All sensors inevitably have various errors. These errors make output data from sensor to be inaccurate and mobile robot applications that use to be unstable. For this reason, there are many calibration methods to compensate the error. We propose a new calibration method for infrared range finder PBS-03JN. This method based on error characteristic of PBS-03JN and uses Cubic hermite as a calibration function. Cubic hermite is often used for data regression because it has continuity, smoothness and monotonicity. Our method makes output …

17:15~17:30 TD4-2

[Invited] The analysis of effect of observation models and data associations on the consistency of EKF SLAM

Young Hoon Lee[1], ChangHyun Jun[2], HyungA Choi[2], Soo-Hyun Ryu[2], Nakju Lett Doh[2]
[1]*University of Southern California, USA.*,
[2]*Korea University, KOREA*

Analysis on causes of inconsistency of Extended Kalman Filter(EKF) Simultaneous Localization And Mapping(SLAM) is mentioned in this paper. The effect of noise models and observation models on the inconsistent behavior of EKF SLAM was examined. In addition, the effect of registration of the false landmarks on inconsistent behavior of the EKF SLAM is mentioned in this paper. This paper identifies …

17:30~17:45 TD4-3

Localization of Outdoor Mobile Robots Using Road Features

Donghyeon Kim, Woojin Chung
Korea University, KOREA

It is required lots of sensor systems to deal with general environmental uncertainties. However, in semi-structured outdoor environments, such as paved road, the environmental uncertainties are generally lower than that of the general environments. As a result, it can be dealt with a single Laser Range Finder by using the utilizations of curb-detection in the semi-structured environments. In this paper, we presented outdoor mobile robot localization scheme by exploiting the detected curb information. For localization, we used data of robot's odometry, DGPS, and compass was combined …

17:45~18:00 TD4-4

Human Tracking of a Mobile Robot with an onboard LRF(Laser Range Finder) using Human Walking Motion Analysis

Yoonchang Sung, Woojin Chung
Korea University, KOREA

Nowadays, human-following is becoming one of the key issues of a human-robot interaction. An LRF(Laser Range Finder) might be the appropriate sensor in dealing with a human-following since it gives accurate information on a distance. Both extracting leg images from an LRF and interpreting those images over a time period as a same person are important. In this paper, we propose how to group legs into a person from laser scanned images and how to track a target person robustly over a time period using …

18:00~18:15 TD4-5

Trajectory Generation of Wheeled Mobile Robot using Convolution Method

Junghoon Kim, Youngjin Choi
Hanyang University

This paper suggests a trajectory generation method using convolution operation for wheeled mobile robots. To be smooth (infinitely differentiable) trajectory generation for wheeled mobile robot, a curvature is utilized in this paper. It makes possible that mobile robots have arbitrary final position and heading angle. After making path to be followed, the trajectory is designed in such a way to satisfy given constraints such as maximum velocity, maximum acceleration and maximum jerk. Also, convolution method is able to guarantee the trajectory to satisfy given constraints. …

❑ Friday, November 25

[FA1] Human-Robot Interaction 2

Time: 09:00-10:15
Room: #108
Hongsheng He, Nat'l University of Singapore, Singapore

09:00~09:15 FA1-1

Feature Extraction Based on Common Spatial Analysis for Time Domain Parameters

Xinyang Li[1], Shuzhi Sam Ge[1], Yaozhang Pan[2], Keum-Shik Hong[3], Zhengchen Zhang[1], Xiaosu Hu[3]
*[1]National University of Singapore, SINGAPORE, [2]A*STAR, SINGAPORE, [3]Pusan National University, KOREA*

In this paper, an approach of feature extraction by designing common spatial filters specifically for time domain parameters (TDP) is proposed. This approach is aiming at motor imagery detection in electroencephalogram (EEG). Particularly, this method calculates the derivatives of the original signals and then applies common spatial analysis (CSP) to each order of derivatives. Variances of the spatially filtered signal …

09:15~09:30 FA1-2

Guideline for Determination of Link Mass of a Robot Arm for Collision Safety

Sang-Duck Lee, Jae-Bok Song
Korea University, KOREA

In recent years the collision safety between a human and a robot has been increasingly important because of the spread of service robots. In order to design a safe robot arm, the collision safety evaluation must be conducted prior to the construction of the robot arm to compute the necessary design parameters. Previous evaluation methods required the use of the actual robot, which are both time consuming and expensive. In this study we propose a new human-robot collision model and a collision safety evaluation method …

09:30~09:45 FA1-3

Human Motion Reconstruction Based on Inertial Motion Sensors

Kap-Ho Seo, Seungsub Oh, Yongsik Park, Sung Ho Park, Jin-Ho Suh
Pohang Institute of Intelligent Robotics San [31], KOREA

Recently, the opportunity to have a smart human motion tracking systems represents an interesting instrument in a wide range of advanced application, such as gaming, augmented reality, telemedicine, rehabilitation and human machine interaction applications. In this research, we developed a Digital Suit (DS) for a horseback riding robot system named HRB-1. It gathers human motion data during horse riding. From these data, posture of the trainee can be corrected …

09:45~10:00 FA1-4

Neural-Network-Based Human Intention Estimation for Physical Human-Robot Interaction

Shuzhi Sam Ge[1,2], Yanan Li[1], Hongsheng He[1]
[1]National University of Singapore, SINGAPORE, [2]USTC, CHINA

To realize physical human-robot interaction, it is essential for the robot to understand the motion intention of its human partner. In this paper, human motion
intention is defined as the desired trajectory in human limb model, of which the estimation is obtained based on neural network. The proposed method employs measured interaction force, position and velocity at the interaction point. The estimated human motion intention is integrated to the control design of the robot arm. The validity of the proposed method is verified through simulation.

10:00~10:15 FA1-5

A New Approach for the Two-Player Pursuit-Evasion Game

Hazem El-Alfy, Amr Kabardy
Alexandria University, Egypt

To realize physical human-robot interaction, it is essential for the robot to understand the motion intention of its human partner. In this paper, human motion
intention is defined as the desired trajectory in human limb model, of which the estimation is obtained based on neural network. The proposed method employs measured interaction force, position and velocity at the interaction point. The estimated human motion intention is integrated to the control design of the robot arm. The validity of the proposed method is verified through simulation.

[FA2] Robot Intelligence 2

Time: 09:00-10:15
Room: #109
Chair: Eiji Hayashi, Kyushu Inst. of Tech., Japan

09:00~09:15 FA2-1

Autonomous Motion Selection via Consciousness-based Architecture

Eiji Hayashi, Kei Ueyama, Motoki Yoshida
Kyushu Institute of Technology, JAPAN

We have attempted to give a robot "consciousness" and "emotion" such as that identified in humans and animals in order to enhance the affinity between humans and robots. A hierarchical structure model for such a robot has been developed to connect the robot's consciousness with the robot's behavior. However, it is difficult to autonomously control the timing and the motion that changes the consciousness and behavior of the robot. Therefore, a motivation model has been developed, and was combined with the hierarchical structure model, in order to induce …

09:15~09:30 FA2-2

Study of Classification of Failure States for Small Unmanned Ground Vehicle by Response Surface Methodology

Young Kook Kim[1], Dooyeol Koh[1], Sang Hoon Lee[2], Soohyun Kim[1]
[1]KAIST, KOREA, [2]ADD, KOREA

SUGV(Small Unmanned Ground Vehicle) used for human rescue and military operation is need to overcome the environment that tough terrains such as a hole or high obstacles. As far as the survival of the vehicle and the preserving ability of the information in the vehicle are concerned, it is essential to have an approach for recognizing unattainable driving states. However, despite the fact that the study of obstacle avoidance and stabilization of SUGV …

09:30~09:45 FA2-3

Development of Educational Material for Manufacturing Engineering Using Stereo Vision and 3D CAD/CAM

Yu Oshima, Takeshi Morishita
Toin University of Yokohama, JAPAN

This paper proposes a technical education program for engineering students; this program is based on a 3D CAD/CAM technology and a stereo vision technology, and it encourages the students to use a CAD/CAM circuit board and an image information processing system. Further, in this study, control experiments involving the use of a simple and compact robot equipped with a stereo vision system were performed. In addition, this education program that introduces students to the attractive 3D CAD/CAM technology and the stereo vision technology can expect to provide students an interesting experience on both constructing a robot and programming.

09:45~10:00 FA2-4

Advanced Community Model Using Daily Life Information Transmitter for Supporting Welfare Workers and Senior Citizens Living Alone in a Welfare Society

Akio Kumata[1], Yuya Tsuda[1], Kanagawa Pref.[2], Hideshi Suzuki[3], Emily Ra[4], Takeshi Morishita[1]
[1]Toin University of Yokohama, JAPAN, [2]Kanagawa Prefectural Government, JAPAN, [3]Kanagawa Prefectural Legislator, JAPAN, [4]McGill University, CANADA

Over the last few decades, the number of senior citizens living alone in Japan has increased rapidly, to the point of dampening economic activity, increasing the load on the social security system, and decreasing the vitality of the local society. In particular, the lack of communication between a large number of elderly people and the local community has become a social problem, and such individuals are a burden on welfare workers and volunteers. With support from Kanagawa Prefectural …

[FA3] Sensors and Actuators

Time: 09:00-10:15
Room: #110
Chair: Chul-Hee Lee, Inha University, Korea

09:00~09:15 FA3-1

Robustness Improvement by Convolving Two ZV Input Shapers

Chul-Goo Kang, Jung-Han Kwak
Konkuk University, KOREA

ZV input shaping control is simple and intuitive for reducing residual vibrations, but it is not robust to modeling errors of the plant. A few ways to increase the robustness of the ZV input shaper has been developed, which includes ZVD shapers, EI shapers, and SI shapers. As another way, the robustness of the ZV input shaper can be improved by convolving two simple ZV input shapers. In this paper, a systematic way to design a robust input shaper using two simple ZV shapers is introduced, and the resulting robust input shaper is demonstrated by simulation and experimental studies using a linear motion control device.

09:15~09:30 FA3-2

Implementation of an Inertial Measurement unit Based Motion Capture System

Iman Prayudi, Eun-Ho Seo, Doik Kim, Bum-Jae You
KIST, KOREA

Nowadays, due to its broad applications, demands on motion capture technology is increasing. Inertial Measurement Unit (IMU) is one of technology that is capable of estimating orientation of a rigid body. IMU technology uses information from three sensors, i.e. gyroscope, accelerometer and magnetometer to calculate the orientation. By using multiple IMU devices, human arm motion can be tracked. This paper presents an implementation of a real-time motion capture system. We proposed a serial-chain network to collect orientation data from the IMU devices. The proposed …

09:30~09:45 FA3-3

A Study of Inchworm Robot by Using Smart Materials

Jeong-Heon Park, Chul-Hee Lee, Min-Soo Kim
Inha University, KOREA

Recently, many researchers have been studying new class of biologically inspired robots that exhibit much greater robustness in performance on unstructured environments. Among these robots, inchworm robot can move well in many kinds of environments. Especially, the advantage of an inchworm robot imitating the locomotion of real inchworm can move well in unstructured environments where other wheel or walking robots can't move. In this study, the inchworm robots are designed and the dynamic simulations are done to validate its performance. Magneto-rheological (MR) …

09:45~10:00 FA3-4

A Method to Recognize Road Terrain with 3D Scanning

Kazuki Hayashida, Jaehoon Lee, Shingo Okamoto
Ehime University, JAPAN

This research deals with a method to recognize road terrain for a robot to navigate near building. In order to move a robot in and around buildings, it is required to recognize some structured way of both indoor and outdoor environment such as slope, steps, stairs and so on. For that, a detection technique based on 3D scan and plane geometry was proposed in this research. By adopting preprocessing to extract lines from scan points, it can make planes effectively. Experiments with the proposed method to recognize the environment near building were carried out.

[FA4] OS: Multifingered Robot Hand 1

Time: 09:00-10:15
Room: #111

Chair: Hyouk Ryeol Choi, Sungkyunkwan University, Korea
Makoto Kaneko, Osaka University, Japan

09:00~09:15 FA4-1

Compact Torque Sensor for a Robot Hand

Tetsuya Mouri[1], Haruhisa Kawasaki[1], Kazumi Koketsu[2]
[1]Gifu University, JAPAN, [2]Tec Gihan Co., Ltd., JAPAN

For a robot to grasp and manipulate an object with a multi-fingered hand, not only the fingertips but also the whole-finger links should be utilized. Sensing of joint torque is necessary for the robot hand to work correctly, and many sensors for measuring joint torque have been proposed. In this paper, a novel torque sensor that can measure strain of the elastic body is proposed for a robot hand. The torque sensor system requires the miniaturization of both the sensor and its amplifier circuit and can be built into the mechanism of the robot hand. The system has a built-in amplifier circuit on the torque sensor frame. We perform experiments designed …

09:15~09:30 FA4-2

Evaluation of Fingertip F/T Sensor for Dexterous Manipulation

Kwangmok Jung[1], Seunghoon Shin[2], Kunwook Lee[2], Suwoo Park[1], Ja Choon Koo[2], Hyouk Ryeol Choi[2], Hyungpil Moon[2]
[1]Pohang Institute of Intelligent Robotics, KOREA, [2]Sungkyunkwan University, KOREA

The miniature six-DOF force/torque sensor with CAN interface has been developed for the finger-tip of the dexterous robot hand. We designed the frame of sensor by FEM Analysis. The sensor consists of a transducer and a signal conditioning circuit. It is embedded in finger-tip sensor. We tested the performance of sensors by using a robot hand and a load cell.

09:30~09:45 FA4-3

Compliance Control of a Position Controlled Robotic Hand Using F/T Sensors

Joonhee Jo[1,2], Sung-Kyun Kim[1], Yonghwan Oh[1], Sang-Rok Oh[1]
[1]KIST, KOREA, [2]UST, KOREA

There are a variety of robotic hands with many different hardware configurations including many sensors. For a robotic hand, physical interaction between the hand and objects is an interesting point. Compliance control is of great importance in grasping arbitrary object. In this paper, compliance control of position controlled robotic hand is attempted with external sensor on the finger tip. Utilizing an F/T sensor, sensor compensation first and then gravity compensation are executed. Overall system and algorithm are analyzed with the proposed controllers. For validating the proposed …

09:45~10:00 FA4-4

[Invited] Motion Planning of Multifingered Robotic Hand for Turning the Cap

Dongmin Choi, Seunghoon Shin, Kunwook Lee, Ja Choon Koo, Hyouk Ryeol Choi, Hyungpil Moon
Sungkyunkwan University, KOREA

This paper presents a motion planning with position based impedance controller for our newly designed robotic hand. We explained the position based impedance control scheme presents equations. Also the inverse kinematics method is presented using pseudo-inverse. Finally, we proposed a motion planning to open a bottle cap and simulation result is shown to verify the effectiveness and robustness.

10:00~10:15 FA4-5

Framework of Grasping Planning for Multi-Fingered Robot Hands

Jae-Han Park, Ji-Hun Bae, Yong-Deuk Shin, Sung-Woo Park, Moon-Hong Baeg
KITECH, KOREA

In this paper, we present a framework of grasping planning for multi-fingered robot hands which is based on the planning scheme of human. Structure of the proposed grasping planner is composed of three sub planners: grasping type planner, opposition parameter planner and approach vector planner. This planner is based on the way of human's grasping plan, so it is suitable for learning of intelligences for grasping of human. Using this framework of grasping planning, we would like to utilize to study for robot's imitating of human's …

[FB1] Distributed Robotics

Time: 10:30-11:45
Room: #108
Chair: Euntai Kim, Yonsei University, Korea

10:30~10:45 FB1-1

Trajectory Planning and Control for Multiple-Vehicles Systems

Anugrah K. Pamosoaji[1], Keum-Shik Hong[1], Shuzhi Sam Ge[2]
[1]Pusan National University, KOREA, [2]USTC, CHINA and National University of Singapore, SINGAPORE

Algorithms for trajectory planning and control for a multiple-vehicles system are investigated. An issue of designing collision-free trajectories on a group of crossing paths is tackled. The trajectories are modeled as a set of via-points coupled with their associated achieving time. Furthermore, a tracking controller design dealing with actuators constraints and all via points' achieve times is proposed. By applying the controller, each vehicle is guaranteed to get closer to the desired via-points without …

10:45~11:00 FB1-2

Control of Swarming Robots in an Area with Dead-End Passage

Yasuhiro Nishimura, Geunho Lee, Nak Young Chong
JAIST, JAPAN

This paper addresses the adaptive flocking problemfor a swarm of autonomousmobile robots. From the observation of individual and emergent behaviors of fish schools, we propose an adaptive navigation algorithm, enabling large-scale robot swarms with limited sensing capabilities to navigate toward a goal. The proposed algorithm is based on our geometric local interaction which allows three neighboring robot to locally form an equilateral triangle lattice. During traveling in an unknown environment, mobile robotsmaintain the local formation. According to environmental conditions, …

11:00~11:15 FB1-3

Real Time Replanning based on A* for Collision Avoidance in Multi-Robot Systems

Fan Liu, Ajit Narayanan
Auckland University of Technology, NEW ZEALAND

This paper deals with collision avoidance for multiple robots and methods to allow robots to replan their routes in real time, taking into account a dynamic environment. A number of collision types are defined for multiple robots and, in particular, between pairs of robots that need to be handled by any real-time collision avoidance system. A novel extension to the standard A* algorithm is presented (Super A*) that solves these collision types by using dynamic real time monitoring and iterative move-evaluate-move cycles. The proposed extension to A* is capable of avoiding not just …

11:15~11:30 FB1-4

Automation of Air Data Test System

Syed Hayder Abbas[1], M. Yousaf Ali Khan[2], Imran Pervez[3]
[1]University of Engineering and Tech, PAKISTAN, [2]GC University of Faisalabad PAKISTAN, [3]NUST, PAKISTAN

In this paper we have presented an approach to automate the air data testing techniques. Traditionally the Air Data Test System (ADTS) is manually programmed with different values, using the built-in numeric keypad on the equipment, to calibrate the pressure and altitude sensors of a vehicle or aircraft. For each input the resulting output is compared with it. This manual approach is suitable for small ranges of pressure but when the sensor needs to be tested over a large range of pressure values, is time consuming and thus becomes impractical. Thus the need arises for automating the …

11:30~11:45 FB1-5

Self-Organizing Ad-Hoc Robotic Sensor Networks Based on Locally Communicative Interactions

Kazutaka Tatara, Geunho Lee, Nak Young Chong
JAIST, JAPAN

We address a self-organizing network problem for autonomous robotic sensor swarms towards various ad hoc sensor network applications. For this purpose,
a decentralized solution approach is proposed to enable individual robots to build and to maintain their network through locally communicative interactions with adjacent robots. Specifically, the communicative interaction allows robots to select specific neighbors with higher connectivity, and to adapt to network topological changes by robot movements. The proposed approach is verified to be …

[FB2] Robot Vision 2

Time: 10:30-11:45
Room: #109
Chair: Woojin Chung, Korea University, Korea

10:30~10:45 FB2-1

Range Image Analysis for Controlling an Adaptive 3D Camera

Peter Einramhof, Robert Schwarz, Markus Vincze
Vienna University of Technology, AUSTRIA

Human vision is the reference when designing perception systems for cognitive service robots, especially its ability to quickly identify task-relevant regions in a scene and to foveate on these regions. An adaptive 3D camera currently under development aims at mimicking these properties for endowing service robots with a higher level of perception and interaction capabilities with respect to everyday objects and environments. A scene is coarsely scanned and analyzed. Based on the result of analysis and the task, relevant regions within the scene are identified and data acquisition is concentrated on details …

10:45~11:00 FB2-2

Human Localization based on the Fusion of Vision and Sound System

Sung-Wan Kim[1,2], Ji-Yong Lee[1], Doik Kim[1], Bum-Jae You[1], Nakju Lett Doh[2]
[1]KIST, KOREA, [2]Korea University, KOREA

In this paper, a method for accurate human localization using a sequential fusion of sound and vision is proposed. Although the sound localization alone works well in most cases, there are situations such as noisy environment and small inter-microphone distance, which may produce wrong or poor results. A vision system also has deficiency, such as limited visual field. To solve these problems we propose a method that combines sound localization and vision in real time. Particularly, a robot finds rough location of the speaker …

11:00~11:15 FB2-3

Monocular Vision-Based Lane Detection Using Segmented Regions from Edge Information

Ji-Hun Bae, Jae-Bok Song
Korea University, KOREA

For autonomous navigation of a mobile robot in outdoor environments, the information on the lane markers on the road is useful for localization, path planning, and other navigation techniques of a mobile robot. To detect the lane markers, this paper proposes the segmentation based on the Canny edge and the inverse perspective mapping (IPM). The experimental results show that the proposed scheme successfully works in real outdoor environments.

11:15~11:30 FB2-4

People Tracking Method for a Mobile Robot with Laser Scanner and Omni Directional Camera

Hiroki UEDA[1], Jae Hoon LEE[1], Shingo OKAMOTO[1], Byung-Ju Yi[2], Shinichi YUTA[3]
[1]Ehime University, JAPAN, [2]Hanyang University, KOREA, [3]Tsukuba University, JAPAN

This paper presents a recognition method for a mobile robot to track running people in outdoor environment. Generally, after the cluttered state that a human is hidden by others and cannot be detected, it is difficult to recover only by position information with laser scanner. The problem causes an association error missing the past motion trajectory of human objects. Therefore, we investigated a method to solve the problem using the color information by an omni directional camera as an additional sensor to laser scanner. The proposed method was tested by some experiments with the developed robot.

[FB3] Robot Control 2

Time: 10:30-11:45
Room: #110
Chair: Taesam Kang, Konkuk University, Korea

10:30~10:45 FB3-1

The Method of Roll Maintain for Spherical Robot of Torque Driven Type from the External Impact

GYE-DO PARK, HYUN LEE, KYOUNG-HWAN KIM, JANG-MYUNG LEE
Pusan National University, KOREA

This paper propose a new balance control method of spherical robot. When motors generate turning force, Spherical robot can maintain the balance for roll using the moment of inertia and angular acceleration. This method which is fixed to the center axis by bearing has zero angular acceleration, so spherical robot maintains the balance from disturbance and external impact. For the measurement of roll slope, this system used the gyro and acceleration sensor and used the kalman filter because of exact measurement of gyro and acceleration sensor which have a noise.

10:45~11:00 FB3-2

Simulation of RC Helicopter Based on Dynamics of Quaternion by Using OpenGL and Simulink

Woonchul Ham, Jaebyung Park, Enkhbaatar Tumenjargal, Luubaatar Badarch, Hyeokjae Kwon
Chonbuk National University, KOREA

In this paper, we present a sliding mode control for the radio controlled helicopter based on quaternion dynamics. We also introduce the kinematics of the rotating object based on quaternion and then propose a robust sliding mode control algorithm which can guarantee the over all stability of the whole system. We will show the simulation results by using the matlab simulink software tool and then implement the computer animation by using OpenGL based on the data of the simulation results. In this paper, we introduce …

11:00~11:15 FB3-3

Fuzzy Sliding Mode Control of Unicycle Robot

Lee Jae-Oh, Han In-Woo, Lee Jang-Myung
Pusan National University, KOREA

This paper proposes a single wheel balanced robot. In this paper, unicycle robot is implemented by the mobile inverted pendulum control method for pitch axis and the reaction wheel pendulum control method for roll axis. We assumed that both Roll dynamics and Pitch dynamics are decoupled. So, we obtained, respectively, the Roll dynamics and Pitch dynamics. And we designed the controller separately. Robot's angle data is obtained by a fusion of gyro sensor and accelerometer. Experiment results show the performance of the controller.

11:15~11:30 FB3-4

Twisting Door Handle with Manipulator under Uncertainty

Peter K. Kim[1], Yisoo Lee[1], Jaeheung Park[1,2]
[1]Seoul National University, KOREA, [2]Advanced Institute of Convergence Science and Technology, KOREA

The paper presents a door opening strategy, a twisting door handle strategy, with a manipulator under uncertainty. The door opening is one of the basic yet important functions of mobile manipulators in operating in human environment. However, it can be a difficult task when the information about the door handle is not complete.
In this paper, it is proposed to use compliant motion control and the motion constraint of the door handle to overcome the limitation of uncertain information. Specifically, the center of rotation point of the door handle is estimated while compliant motion control is applied in order to complete the door handle's twisting action. The performance of the proposed strategy is demonstrated by the experimental results.

[FB4] OS: Multifingered Robot Hand 2

Time: 10:30-11:45
Room: #111

Chair: Hyouk Ryeol Choi, Sungkyunkwan University, Korea
Makoto Kaneko, Osaka University, Japan

10:30~10:45 FB4-1

Teaching System for Multifingered Robot Hands Using Kinetic Information of Manipulated Objects

Akio Namiki, Sojung Kim, Kenzo Nonami
Chiba University, JAPAN

This paper proposes a teaching system for multi-fingered robot hands by using kinetic information of target objects with visual feedback. The purpose of this system is to operate multi-fingered robot hands with high DOF mechanisms intuitively and effectively. The system calculates the appropriate trajectory of the fingers according to the kinetic information of the target object under the twist rolling contact constraint. In addition, force and visual feedback control is adopted for more accurate and stable manipulation. This paper describes the results of the experiments by using the …

10:45~11:00 FB4-2

A Design Framework for Dexterous Robotic Hand

Seunghoon Shin, Sangchul Han, Kunwook Lee, Hyungpil Moon, Hyouk Ryeol Choi, Ja Choon Koo
Sungkyunkwan University, KOREA

Our goal is to design a dexterous robot hand driven by motor. For this, we studied a human hand analysis and constructed a DH model. We verified it by using Visual tracker. Also, we calculated workspace, manipulability, Opposition Angle of a human hand DH model and made the Kapandji test. By using this human hand analysis data, we designed new robot hand and analyzed the newly designed robot hand. Also we compared with analysis data of other robot hands.

11:00~11:15 FB4-3

Performance Evaluation of Twisted Strings Driven Robotic Finger

Ivan Godler[1], Takashi Sonoda[2]
[1]Kitakyushu University, JAPAN, [2]Science & Technology Foundation, JAPAN

Actuation and control of robotic hands is one of the problems in engineering that still needs to be satisfactorily solved. In this paper we present a robotic finger actuated by twisted strings mechanism that we call Twist Drive. A principle of the proposed actuation is described and its basic characteristics are presented. The structure of a developed robotic finger with the proposed actuation method is explained. Forward kinematics of a finger with non-linearly coupled joints was solved and the obtained Jacobian was used for two …

11:15~11:30 FB4-4

Design and Experimental Analysis of Embedded Servo Motor Driver for Robot Finger Joints

Jeong-Woo Lee, Tae-Won Kim
Kangwon National University KOREA

This paper presents the development of ultra compact AC servo motor drivers, which drives humanoid robot fingers. To be embedded in robot finger or robot palm, the size(22mm x 32mm) and weight(approximately 5.2g) should be small while the performance is kept good. The developed servo motor drivers show enough performance in speed control mode and torque control mode. But, after assembled motors and reduction gear, the finger joints show some stick-slip in torque control mode at very low rotational speed. To reduce this phenomena, the external force/torque sensors are needed …

11:30~11:45 FB4-5

Parameter Study on the Grasping Characteristics of the Humanoid Robot Hand with Spherical Four Bar Linkages

Sang-Mun Lee[1], Kyoung-Don Lee[1], Heung-Ki Min[1], Tae-Sung Noh[2], Sung-Tae Kim[2], Jeong-Woo Lee[3]
[1]Institute for Advanced Engineering, KOREA, [2]Robomec, Inc., KOREA, [3]Kangwon National University, KOREA

The parameter study on the grasping characteristics of the humanoid robot hand with a spherical four bar linkage as a finger joint. The humanoid robot hand has one thumb and three fingers, each of which has two spherical four bar linkages, respectively. The humanoid robot hand is 280mm long and less than 2.5kg by weight. The robot hand totally has 13 degree of freedom: one thumb has 4 degree of freedom: each …

11:45~12:00 FB4-6

The New 2 DOF Frame Torque Sensor for the Metacarpophalangeal Joint in Robotic Hand

Dae-Ho Kim[1], Bong-Seok Kim[2], Jung-Hoon Hwang[2], Eun-Tai Kim[1]
[1]Yonsei university, KOREA, [2]KETI, KOREA

This paper presents a new type of 2 DOF frame torque sensor for replacing the pair of 1 DOF torque sensors. The 1 DOF torque sensors were used in Metacarpophalangeal(MCP) joint as well as Proximal Interphalangeal(PIP) joints of our previous version of robotic hand. However, because of the complexity in the MCP joint, the installation of the 1 DOF torque sensor was very complicated and the torques of the MCP joint were measured in combination. To overcome these, a new 2 DOF frame torque sensor was designed and verified in experiments. The developed sensor is being applied to the new version of robotic hand.

[FC1] Robot Kinematics & Dynamics 2

Time: 15:00-16:15
Room: #108
Chair: Kyu Jin Cho, Seoul Nat'l University, Korea

15:00~15:15 FC1-1

Joint Demeanors of an Anthropomorphic Robot in Designing the Novel Walking Gait

Md. Akhtaruzzaman, Amir A. Shafie
International Islamic University Malaysia MALAYSIA

Department of Mechatronics Engineering, International Islamic University Malaysia, 53100 Kuala Lumpur, Malaysia
The movement patterns of various joint actuators of the humanoid system are described in this paper to identify and understand the behavior of the biped walking motions. This paper focuses on two major parts of the study, firstly the analysis and design of human like walking gait for an anthropoid system and secondly the implementation of the designed gait to navigate the robot from a source position to a destination point. The walking strategy is demonstrated …

15:15~15:30 FC1-2

Design and Development of Nancy, a Social Robot

S.S. Ge, J.J. Cabibihan, Z. Zhang, Y. Li, C. Meng, H. He, M.R. Safizadeh, Y.B. Li, J. Yang
[1]National University of Singapore, SINGAPORE, [2]UESTC, CHINA

In this paper, we present the design of a social robot, Nancy, which is developed as a platform for engaging social interaction. Targeting for a social, safe, interactive and user-friendly robot mate, the design philosophy of Nancy is presented with mechanical, electrical, artificial skin and software specifications. In particular, there are 32 degrees of freedom (DOFs) through the whole body of Nancy, and the social intelligence is implemented based on vision, audio and control subsystems.

15:30~15:45 FC1-3

Inverse Kinematics Solution of PUMA 560 Robot Arm Using ANFIS

Mickael Aghajarian, Kourosh Kiani
Semnan University, IRAN

One of the problems in robotics field is, finding the solution of Inverse Kinematics (IK) problem. Traditional methods such as iterative, geometric and algebraic are inadequate if the joint structure of the robot is more complex. As the complexity of manipulator increases, solution of IK is difficult and computationally expensive. In this paper, using the ability of Adaptive Neuro-Fuzzy Inference System (ANFIS) to learn from training data, it is possible to create ANFIS with limited mathematical representation of the system. In the proposed method, forward kinematics relations of robot arm are …

15:45~16:00 FC1-4

Tool Handling System Using Hydraulic Actuator

Kyoung Taik Park, Doo Hyung Kim, Seock Joon Kim, Han Me Kim, Chang Don Lee
KIMM, KOREA

The scope of working motion is expressed in the angle of handling tool motion to move in required conditions with carrying a variety of tools such as hammer, grinder and roller. As this scope becomes larger and it is possible to do the handling work in complex shape and narrow block space. The driving axis of working motion is the number of axis of link type to construct the main axis of working assistant system. Generally, the working motion becomes much smoother as the number of this axis becomes larger. The kind of handling tools is generally classified into several categories to do the …

[FC2] Biomedical Robots and Biomimetics

Time: 15:00-16:15
Room: #109

Chair: Quoc-Viet Nguyen, Konkuk University, Korea
Wenwei Yu, Chiba University, Japan

15:00~15:15 FC2-1

Construction of a Suction Cup Containing Integrated Mobile Micro Robot for Surgery Support in the Abdominal Cavity

Chika Hiroki, Wenwei Yu
Chiba University, JAPAN

NOTES (Natural Orifice Translumenal Endoscopic Surgery), a recently developed form of minimally invasive surgery, has attracted attention as a new laparoscopic operation. However, manipulation of forceps throughout the surgery continues to be a burden to surgeons. Our previous research focused on designing a model that could carry forceps and a camera through the abdominal cavity. The robot moves on the abdominal wall upside down, operated with six wires which realize the relative motion of two suction cups attached…

15:15~15:30 FC2-2

Development of a locust-like jumping mechanism

Quoc-Viet Nguyen, Hoon Cheol Park, Doyoung Byun
Konkuk University

Jumping mechanism can be a very efficient mode of locomotion for small robots to overcome large obstacles on the ground and rough terrain. In this paper we present an underdevelopment of a locust-like jumping mechanism. The mechanism made of glass epoxy panel and spring mimics the locust's rear leg in terms of flexor and extensor. We use a spring for the extensor, and a string for the flexor. Experiments are conducted to measure the force of both flexor and extensor by using a load cell. Then we compare the relative ratio between these forces with the analysis result for motor selection in the final jumping mechanism later on.

15:30~15:45 FC2-3

Robotic Homing through a Noisy Potential Field Using Information Entropy

Piljae Kim, Satoru Nakamura, Daisuke Kurabayashi
Tokyo Institute of Technology, JAPAN

For a robot navigation system used in an unpredictable environment, it is generally effective to create a pathway that robots can track for carrying out a given task, such as reaching a goal. In the biological world, ants construct a foraging path using a volatile substance called pheromone, which has been widely studied and whose characteristics have been used in a transportation network model. When a navigation path is constructed by autonomous agents using this pheromone model, the created potential field can be very noisy, with many local peaks due to the unsynchronized updates of the…

15:45~16:00 FC24-

Biologically Inspired Robot Swarm Control for Subaqueous Environment

Dong-Uck Kong[1], Thomas Voegele[2], Dong Ha Leeand[1]
Frank Kirchner[2]
[1]DIST, KOREA, [2]German Research Center for Artificial Intelligence, GERMANY

The goal of this work is toconceptualize a robust and flexible behavior controller not only for basic swarming behavior of homogeneous underwater robot teams, but also for advanced missions in subaqueous environment based on robust communication. Therefore, this paper proposes a modularized control architecture that represents the imitation of dolphin's phylogenetic species intelligence such as sensing and interpreting abilities and swarming habits of dolphins, but …

16:00~16:15 FC2-5

A Hierarchical Model of Expressive Robot Motion for Effective Gesture Editing

Jaewoo Kim, Seong-Yong Koo, Dong-Soo Kwon
KAIST, KOREA

Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, Daejeon, Korea
This paper proposed a three-level hierarchical model of robot motion, which consists of a Gesture Set, a Primitive Motion Set and a Joint Motion Set. It also introduced a brief outline of the mapping functions among motion sets. The goal is to provide a more intuitive and effective way for unskilled users to edit or generate gestures for entertainment robots.

[FC3] OS: Robot and Future Information Device

Time: 15:00-16:15
Room: #110

Chair: Hyun Kim, ETRI, Korea
Junho Kim, Kookmin University, Korea

15:00~15:15 FC3-1

[Invited] Introduction to System Architecture for a Robotic Computer

Hyun Kim, Young-Ho Suh, Kangwoo Lee, Blagovest Vladimirov
ETRI, KOREA

Recently, there have been a variety of products and research prototypes to introduce a new type of computing device in our living environment. Robots have great potential to be used as a new type of devices. In this paper, we introduce our on-going development of the robotic computer that naturally interacts with users, understands the current situation of users and environments, and proactively provides users with services. The proposed robotic computer consists of a control unit and an agent unit. The control unit, which is a …

15:15~15:30 FC3-2

Robotized Products

Won-Sup Kim
Seoul National University of Science and Technology, KOREA

There is a little difference between engineers and users in their attitude towards the robot. Many service robots have been developed and designers are concerned about the appearance of the service robot. It is a similar situation in today's smart product development process. This paper introduces the design of a new type of home service robot and proposes the design approach method needed to make the service robots successful goods. The focus is on the appearance of the design to aid the ongoing relationship between the users and the product. The appropriate user stimulation will build a good relationship between users and the service robots.

15:30~15:45 FC3-3

A Behavior Model of Autonomous Mobile Projection Robot for the Visual Information

Tomoyuki Shiotani, Kosuke Maegawa, Joo-Ho Lee
Ritsumeikan University, JAPAN

This paper describes about the behavior model for a mobile-projection robot. A mobile-projection robot which is named as Ubiquitous Display (UD) has been developed. UD is visual informative presentation device which is able to support interaction between a projected image and users. In this paper, a behavior model, which is based on parameters of user, obstacles and projected im-age with dynamic environment for UD is implemented. To verify the validity of the proposed behavior model, expe-riments were conducted.

15:45~16:00 FC3-4

A Note on Hybrid Control of Robotic Spatial Augmented Reality

Joo-Haeng Lee[1], Junho Kim[2], Hyun Kim[1]
[1]ETRI, KOREA, [2]Kookmin University, KOREA

A robotic spatial augmented reality (RSAR) system combines robotics with spatial augmented reality (SAR) where cameras are used to recognize real objects, and projectors augment information aand user interface directly on the surface of the real obbects, rather than relying on mobile or wearable display devices. Hence, the control of a RSAR system requires handling of different types of control schemes at once such as classical inverse kinematics of simply linked bodies, inverse projections to find appropriate internal/external parameters of a projector, and geometric manipulation of a projection …

16:00~16:15 FC3-5

Plane-dominant Object Reconstruction for Robotic Spatial Augmented Reality

Changwoo Nam[1], Min-Hyuk Sung[2], Joo-Haeng Lee[3], Junho Kim[1]
[1]Kookmin University, KOREA, [2]KIST, KOREA, [3]ETRI, KOREA

We present a simple reconstruction algorithm of a plane-dominant 3D environment for the robotic spatial augmented reality (RSAR). In spatial augmented reality, a projector renders virtual objects onto 3D objects in the real space. To watch the augmented virtual objects from a viewpoint without distortions, the final image should be pre-distorted based on the geometry information of the 3D objects in the real world. In our RSAR setting, we assume that a robot is equipped with the devices such as a projector, low-cost depth cameras, and the sensor of capturing 3D position of the viewpoint. …

[FC4] OS: OFTDPR (Original Fusion Technology Development Program for Robot) 1

Time: 15:00-16:15
Room: #111
Chair: Sanghoon Ji, KITECH, Korea

15:00~15:15 FC4-1

Building a Hierarchical Robot Task from Multiple Task Procedures

Hyuk Tae Kwon[1], Wan Chul Yoon[1], Rockwon Kim[2], Sunghoon Kim[2]
[1]KAIST, KOREA, [2]ETRI, KOREA

To make better use of a service robot, which interacts with users during the task performance in everyday life, developers and/or users may frequently want to change action sequences so that a robot behaves in a natural manner. Emphasizing the procedural aspects of human task knowledge, we propose a method to generate a FSM-based robot task model from task procedures in possible scenarios. Proposed method consists of description of task procedures, conceptual definition of actions and states, and transformation from task procedures to a …

15:15~15:30 FC4-2

A Study on 13bit Rotary Encoder of Serial Communication Output Using Single Bipolar Magnet and Detecting a Displacement of Singleturn and Multiturn

Hyun-Bae Lee[1], Jae-Hee Lee[1], Sang-Joon Lee[1], Jin-Sung Kim[2]
[1]LS Mecapion, KOREA, [2]Exact TRON, KOREA

In this paper, a multiturn absolute serial encoder is designed for a space limited application such as robots using magnetic sensor instead of optical encoder. It is developed by integrating the ultra small magnetic detecting technique, interpolation technique, and serial communication technique so that the sensor can have mimimum size. The usefulness of the sensor is verified with various tests.

15:30~15:45 FC4-3

Real-time Supporting of OPRoS Component Platform

Choulsoo Jang, Byoungyoul Song, Seungwoog Jung, Kyeong-Ho Lee, Sunghoon Kim
ETRI, KOREA

The Open Platform for Robotic Services (OPRoS) supports the full life cycle for robot software development and execution by providing the robot software component model, component execution engine, various middleware services, development tools, and simulation environment. This paper describes real-time supporting of OPRoS component execution engine which is responsible for management and execution of components.

15:45~16:00 FC4-4

Implementation of Reactive Behaviors for an Industrial Manipulator based on OPRoS

Sang-Hoon Ji, Tae-Dong Park, Sang-Moo Lee, Eun-Cheol Shin, Byung-Wook Choi
KITECH, KOREA

It is important that robots in a factory execute its mission exactly in a structured environment and handle many types of events in dynamic real world. The former is related to punctuality and the latter is related to reactivity or dependability. But it is very difficult to prepare robot S/W with dependability and punctuality at the same time for the industrial manipulators because general S/W fails to meet real-time requirements. Therefore, we suggest a method how to make industrial robot software have reactive semantics. …

16:00~16:15 FC4-5

RPIST: Required and Provided Interface Specification-based Test Case Generation and Execution Methodology for Robot Software Component

Jeong-Seok Kang, Hong-Seong Park
Kangwon National University, KOREA

This paper proposes required and provided interface specification-based testing method for robot software component (RPIST). The proposed method provides two main algorithms for interface testing. First, it provides algorithm for generation of test case by considering a dependency of provided and required interface. Second, it provides architecture of test execution with the generated test cases. We have evaluated RPIST on OPRoS Navigation component.

[FD1] Robot Intelligence 3

Time: 16:30-18:00
Room: #108

Chair: Hye Kyung Cho, Hansung University, Korea
Dugki Min, Konkuk University, Korea

16:30~16:45 FD1-1

Behavioral Synchronization of Human and Humanoid Robot

Rustam Rakhimov Igorevich, Eldor Primov Ismoilovich, Dugki Min
Konkuk University, KOREA

This paper explores interaction design and real time implementation of behavioral synchronization of Human and Humanoid robot. Human postures are captured into a 3D skeleton using Kinect sensor. Single 3D coordinates of joints can be derived from the skeleton. For the behavioral synchronization primitive humanoid robot with 16 servo motors are used. Human's joint coordinates are extracted from the standing posture. Using mechanism suggested in this paper, the joints information converted and mapped to the …

16:45~17:00 FD1-2

Development of Teaching & Learning Method for Application of User Created Robot in Digital Textbook

Young Ae Kim, Kyoung Hwa Chae
KERIS, KOREA

Recent development of user-created robots in the educational domain has enabled children to develop logical thinking and problem-solving abilities for various subjects. But a new analysis of subjects for elementary schools, especially in digital learning environment, is needed for application of educational robots with digital devices to South Korea's elementary school curriculum. Therefore, this study analyzed elementary school subjects to develop teaching & learning methods and design strategies for user-created robots in …

17:00~17:15 FD1-3

S!Ci: a New Approach to User Created Robot Contents

Deukwoo Lee, Jinsung Kim, Hye-Kyung Cho
Hansung University, KOREA

In this paper, we introduce a structure of a software platform in which robots and multimedia can be programmed together to make a new type of convergent contents. To encourage people's participation who are not familiar with programming languages, and to allow them to focus on creating new ideas, we employ a two-stage based programming scheme. At the high-level description stage, users can assign the interactions among physical robots and multimedia characters with very intuitive user interfaces, whereas in the low-level description stage, very detailed events and behaviors of each object…

17:15~17:30 FD1-4

A Robot Museum "ROSIEUM"

Joongsun Yoon[1], Hyeongsun Yoon[2]
[1]Pusan National University, KOREA, [2]Wisebo-X, KOREA

We propose a robot museum, "ROSIEUM," based on a new concept of museum. Roles of a new concept based museum are being investigated. Key concepts of a proposed robot museum are smart museum, interactive museum, general museum, universal museum, flexible museum and open museum. We also propose a classification scheme for robot contents as museum's collections. This scheme for collecting and displaying robot contents includes the first robots, the delegate robots, the robots with special meanings, the robot experiences and the robot events. Also, types of robot contents are described. Key ideas and scenario for "ROSIEUM" …

17:30~17:45 FD1-5

Temperature-Aided Fingerprinting for Localization in Wireless Local Area Networks

Kave Aryanpoo, Hadi Moradi
University of Tehran, IRAN

Wireless signal fingerprints have been used to localize mobile devices in recent years. Especially, WLAN signals are of great importance, because of the ubiquity of WLAN infrastructure. In this paper, the possibility of correlation between temperature and signal strength is investigated to improve the traditional fingerprinting method by incorporating the temperature into the process. The new approach is called the Temperature-Aided Fingerprinting (TAF) and even with current WLAN-enabled devices, which usually do not have a thermometer, TAF achieves a better performance than the traditional …

17:45~18:00 FD1-6

Integration of Two Opto-Electronic Devices for Data Acquisition reducing External Influences

Jung-Han Kwak, Chul-Goo Kang
Konkuk University, KOREA

External influences are generated when data are taken due to the surrounding environment. Much efforts have been made to remove or reduce the external influence in order to take more accurate data. In this paper, it has been confirmed that the design to reduce the external influence by the process of integration of two sets of data utilizing two opto-electronic devices in the effort of reducing external environment and by the vertical driving system.

[FD2] OS: Roll-to-roll Printed Electronics Process and System

Time: 16:30-18:00
Room: #109
Chair: Sangyoon Lee, Konkuk University, Korea

16:30~16:45 FD2-1

[Invited] Improvement of Surface Roughness and Conductivity by Calendering Process for Printed Electronics

Ho-anh-duc Nguyen, Nguyen Hoang, Kee-Hyun Shin, Sangyoon Lee
Konkuk University, KOREA

A mass production technique of roll-to-roll (R2R) gravure printing system with high resolution and pattern fidelity has been tested for manufacturing electronic products. Performance of printed electronics depends greatly upon the surface geometry of printed pattern such as thickness and roughness. We applied a calendering process to control the surface geometry and the resistivity of printed pattern. We also investigated the effect of process parameters …

16:45~17:00 FD2-2

Investigation of Micro Fine Line Pattern Using Single Layer Gravure Printer

Huu Phuong Hoang, Kyung Joon Han, Sung Lim Ko
Konkuk University, KOREA

The need of micro precision in printing electronic technology is a new challenge for micro pattern, printed electronic devices and application which use thin film substrate. Gravure roll to roll is considered as a well known thin film technology for printed electronics besides other printing methods such as inkjet, pad printing. However, it needs to be studied more in achieving the micro scale accuracy printing. In this paper, micro pattern gravure printing and analyzing are introduced and discussed as a part of the research process which help to reach the accuracy in gravure R2R printing.

17:00~17:15 FD2-3

Design of Multi-Purposed Roll-to-Roll Printing System for Printed Electronics

Chung Hwan Kim[1], Ha-Il You[2], Seung-Hyun Lee[3], Jeongdai Jo[3]
[1]Chungnam National University, KOREA, [2]LG Electronics, KOREA, [3]KIMM, KOREA

Compact-sized printing machine with the capability of various printing methods in one printing unit is proposed. The printing method is changeable to gravure, gravure-offset, or flexo by alternating the web path and printing rollers. The machine also has multiple printing units with register control for the multilayer printings. The developed machine is used for the fabrication of printed electronics devices by using the several printing methods, and for the optimization and evaluation …

17:15~17:30 FD2-4

A Study on the Decision of Operating Tension by Analysis of Friction Coefficient Change in Rewinding Process

Jong Su Lee, Jin Woo Seong, Kee Hyun Shin
Konkuk University, KOREA

Rewinding process is used for storing complete products in R2R process. For some wound roll defect from slip and air entrainment is frequently generated in low tension, determining adequate operating tension is importa nt in rewinding process. In this study, air layer thickness change according to radius ratio variance in two kinds of tension profile is analyzed. Also, minimum operating tension change according to taper value variance is analyz ed. Results are shown that air layer thickness increases as radius ratio increases, and minimum …

17:30~17:45 FD2-5

A Study on Model Development of the Slot-die Coating Process through the Statistical Analysis

Janghoon Park, Jinwoo Seong, Hyunkyoo Kang, Keehyun Shin
Konkuk University, KOREA

In roll-to-roll slot-die coating process, the characteristics such as coated layer thickness or roughness which determines the performance of the devices such as OPV, OLED are important. And it is determined by the interaction of coating variables which are coating gap, operating velocity, flow rate. In this study, sensitivity analysis for each variable was conducted by using D.O.E methodology. As a result, some dominant factors affecting output were revealed and a mathematical model was derived as a meta model.

[FD3] OS: Robot-based Learning

Time: 16:30-18:00
Room: #110
Chair: Ji-Hyun Jung, Kyungsung University, Korea

16:30~16:45 FD3-1

A Basic Study for the Development of R-learning Curriculums in the Early Childhood School System

Lee, Yeon Seung[1], Seo, Hyun[2]
[1]Kyungsung University, KOREA, [2]Chosun University, KOREA

The objective of this study was to provide basic materials to plan effective development of curriculums for the integration of R-learning education in the early childhood school system. In order to investigate the perception and demand of R-learning, we conducted a questionnaire survey of 30 professors and 482 pre-service teachers at the Department of Early Childhood Education in colleges throughout Korea. Moreover, in order to survey the operation and current state of curriculums related to R-learning at the Department of Early Childhood Education, we analyzed the homepages of …

16:45~17:00 FD3-2

Influence of R-learning Based Education on Kindergarten and Kindergarten Teacher

Jeong-Wook Lee[1] , Minjung Lee[2], Kyung-Sook Ahn[3], Soo-Jin Lim[4]
[1]Duksung Womne's University, KOREA, [2]DongEui University, KOREA, [3]HoWon University, KOREA, [4]DongShin University, KOREA

This study examines the influence of R-Learning based education on a kindergarten classroom and kindergarten teacher. It was conducted from December 1st, 2010 to April 30rd, 2011 by adopting survey and qualitative method. The researcher distributed two hundreds seventy one electronic questionnaires from samples of three hundreds ten kindergarten selected by R-Learning Development, Promotion, & Support to the kindergartens and kindergarten teachers who agreed to the participation for this study. Collected data …

17:00~17:15 FD3-3

The Directions of the Universal Contents Development for R-Learning at Kindergarten

Bookyung Cho[1], Sunghee Lee[2], Jeongsun Park[3], Youngmi Go[4]
[1]Korea National University of Education, KOREA, [2]Paichai University, KOREA, [3]Myongji College, KOREA, [4]Soonchunhyang University, KOREA

The purpose of this study was to explore the directions of content development for R-Learning which is based on intelligent robots distributed to Kindergartens. For this, the researchers examined and analyzed studies about R-Learning content, teachers' expectations, distribution of current R-Learning content, and the details. The findings of this study showed that it is inevitable to develop the contents matching with kindergartens' curricula, ensuring the mobility, …

17:15~17:30 FD3-4

A Study of the Use of R-learning Content in Kindergartens

Ji-Hyun Jung[1], Yoo-Seon Bang[2]
[1]Kyungsung University, KOREA, [2]Konkuk University, KOREA

As a part of the national policy which aimed at advancing early childhood education, two types of intelligent robot platforms authenticated by KIST (Korea Institute of Science and Technology) have been disseminated to kindergarten classes all over the country. The effectiveness, the usability and capabilities of the R-learning content should be reviewed and verified throughout the practices held in the classroom. It is also very important to check if those authenticated robots have been playing the adequate roles using high quality of educational contents. The purpose of this study is to demonstrate the best R-learning practices from …

[FD4] OS: OFTDPR (Original Fusion Technology Development Program for Robot) 2

Time: 16:30-18:00
Room: #111
Chair: Yongkwun Lee, KIST, Korea

16:30~16:45 FD4-1

Development of a Robot Behavior Controller for an r-Learning System using OPRoS

Sang-Hoon Ji, Jae-Seong Han, Sang-Moo Lee, Byung-Wook Choi
KITECH, KOREA

Department of Applied Robot Technology, Korea Institute of Industrial Technology, Ansan, 426-791, Korea
In this paper, we suggest an r-learning (robot-learning) system for children who are unfamiliar with educational tools. Our system is characterized with the following features. Firstly, the system provides children with personalized educational instructions considering their learning ability. In our system, learning contents for them are selected according to their learning history extracted from human-robot interaction …

16:45~17:00 FD4-2

A Design of Slotless BLDC Motor for Robot Using Equivalent Magnetic Circuit Model

Jung-Moo Seo[1,2], Young-Kyun Kim[1], Se-Hyun Rhyu[1], In-Soung Jung[1], Hyun-Kyo Jung[2]
[1]KETI, KOREA, [2]Seoul National University, KOREA

An analytical model for slotless brushless DC motors having four poles and twelve single coils is presented. To determine a back EMF constant of motor with hexagonal windings, winding forming factor taking into account winding shapes is introduced. The calculated results are verified with FE analysis and manufacturing through an example model, and electromagnetic parameters, such as EMF, motor constant with respect to the winding angles are analyzed.

17:00~17:15 FD4-3

Anti-Vibration PID Control for a Robot Manipulator Experiments

Dong-Won Lim, Eun-Hye Kim, Yong-Kwun Lee
KIST, KOREA

Vibration becomes a major control issue as industrial robots get lighter and slimmer. Proportional- Integral-Derivative (PID) control is simple and easy to regulate the motion of robots. If gains of PID can be tuned precisely for the given purpose, it will be more beneficial than heavy and complicated control algorithm. The paper introduces the feasibility of PID tip position control to suppress oscillation at the end of the effecter (EOF) by experiments and leads to controller synthesis and design for better performance.

17:15~17:30 FD4-4

Periodic Task Scheduling Algorithm under Precedence Constraint based on Topological Sort

Si Wan Kim, Hong Seong Park
Kangwon National UniversityKOREA

Almost real-time systems are constructed by periodic tasks that have precedence. In this paper, we propose scheduling method and validation algorithm. This method allocate periodic task that have precedence relations for fixed priority using topological sort algorithm. And we validation this algorithm using simple example.

17:30~16:45 FD4-5

Development of Direct Teaching Robot System

Chanhun Park, Jin Ho Kyung, Hyun Min Do, Taeyong Choi
KIMM, KOREA

The operator has to teach the reference trajectory for the manipulator to be operated automatically. But it is not easy to teach manipulator. Direct teaching is one of alternatives for the easy and intuitive teaching method. In this reason, a direct teaching robot system has been developed. The operator can easily and intuitively teach the developed manipulator. It has safe joint mechanisms which are composed of torque sensors and mechanical spring and cams. This robot shares the workspace with the human operator and it is safe. In this paper, the research results will be introduced

17:45~18:00 FD4-6

EtherCAT based Multi-Model Robot Controller

Il-Kyun Jung, Sun Lim
KETI, KOREA

In this paper, we propose an EtherCAT based Multi-model robot controller. The controller engages EtherCAT as high speed industrial motion network to enable both force based robot motion control in real-time and digital interface of various sensor data for multi-model robot control. The controller is composed of PC-based Master Controller and Slave Interface Module, which makes it capable to easily interface different types of sensors. For robot control, real-time force interaction is essential to apply for various applications (ex. direct robot teaching, etc.). For the real time control, The PC-based Master Controller is designed using RTOS …

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