Abstract book

Program overview

10:00 – 10:20 [Opening]

- **Greetings from Waseda University**
  Prof. Atsushi Ishiyama, Vice President for Research Promotion, Waseda University
- **Greetings from Ministry of Education, Culture, Sports, Science and Technology (MEXT)**
  Ms. Kumiko Kikuchi, Higher Education Bureau, University Promotion Division, MEXT
  文部科学省高等教育局大学振興課 大学改革推進室大学院係長 菊池久美子様
- **Introduction of the Graduate Program for Embodiment Informatics**
  Prof. Shigeki Sugano and Prof. Testunori Kobayashi, Program coordinators, Waseda University

10:20 – 11:00 [Report on Students' Activities]

Novel Social Innovation Concept Based on the Viewpoint of the Infrastructure User

Gonzalo Aguirre Dominguez (L4 student)

Abstract: We propose a novel approach for infrastructure development in emerging countries. The concept was inspired on social innovation, centered around the social viewpoint achieved by conducting a field study in Vietnam. The concept consists of a system for the successful implementation, and sustainable development of new infrastructure projects in Vietnam, and the ASEAN region. The study was evaluated through rounds of discussion with experts from the Vietnamese and Japanese governments, academia and industry. It was concluded that the concept was perceived to have great potential for the region, and it is regarded with high esteem by all stakeholders.

How to Develop a New Product for Developing Countries as a Student Project ~Ankle--Foot Coupling with Rubber Cushion for Walking on Uneven Terrain~

Ryosuke Tsumura (L2 student)

Abstract: This project is addressing problems of lower limb prosthesis for developing countries. We have proposed a design for the ankle-foot coupling that can adapt the ankle joint angle to the ground surface while walking on an uneven terrain like a farm ground. We will talk about the challenges to enter the new field and to make the impact for prosthetic field by doing some discussion with professionals of the field.

Interacting with the voices of the mountains ~"Musasabi" Project~

Takuya Kato (L2 student)

Abstract: We have been working on a project to support forestry of Japan, the island country of mountains and forests. We will be giving a short talk on how we have approached to the problem and gave a solution through Embodiment Informatics. Our solution will give a great example of how unique our approach towards the problem is as well as the possibilities of the Embodiment Informatics.

11:00 – 12:00 [Invited Lecture #1]

Trends in robotics - the next generation of intelligent machines

Rolf Pfeifer (Professor em. University of Zurich, Switzerland)

Abstract: Currently, the field of robotics is experiencing rapid changes: Robots are moving out of the factory halls into our own living space and as a result, the quickly growing area of "Service Robotics" has been created. Ideas from biology are increasingly exploited for their design, which implies that the focus is moving away from pure algorithms towards brain (or control)- body-environment interaction. And progressively, soft materials are incorporated into robot construction, which has led to the emergence of "Soft Robotics" over the last decade or so.

The term "Soft Robotics" designates a new generation of robots capable of functioning in the real world by capitalizing on "soft" designs at various levels: surface (skin), movement mechanisms (muscles, tendons), and interaction with other agents (smooth, friendly interaction). Industrial robots, in contrast, operate in highly controlled environments with no or very little uncertainty. By "outsourcing" functionality to the "embodiment", i.e. to the morphological and material characteristics - e.g. to the elasticity of the muscle-tendon system - the distinction between control and controlled, which is at the heart of manufacturing and control theory, breaks down and entirely new concepts will be required. In this lecture I will argue that the next generation of intelligent machines – robots – will be of the "soft" kind and I will explore the theoretical and practical implications, whose importance can hardly be overestimated. I will be showing many examples and case studies from biology and engineering. In particular I will be introducing the tendon-driven "soft" robot "Roboy" and conclude with some "lessons learned" and an overview of the most important trends in robotics. Finally, I will present a vision of the future, the ROBOLOUNGE project.

Biography: Rolf Pfeifer, Prof. em. University of Zurich, Switzerland, is currently a "Specially Appointed Professor" at the Institute for Academic Initiatives, Osaka University, Japan, and a visiting professor, at Shanghai Jiao Tong University, China. He is a member of the board of several Artificial Intelligence and Robotics companies and co-founder of the National Competence Center Robotics, Switzerland.

He has a master's degree in physics and mathematics and a Ph.D. in computer science (1979) from the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland. From 1987-2014 he was professor of computer science at the University of Zurich and director of the Artificial Intelligence Laboratory. He was a visiting professor and research fellow at the Free University of Brussels, the MIT Artificial Intelligence Laboratory in Cambridge, Mass. (US), the Neurosciences Institute (NSI) in San Diego, the Beijing Open Laboratory for Cognitive Science, the Ludwig-Maximilians-University, Munich, the University of São Paolo, Brazil, and the Sony Computer Science Laboratory in Paris. In 2004 he was elected "21st Century COE Professor, Information Science and Technology, Strategic Core" at the University of Tokyo. In 2009 he was a visiting professor at the Scuola Superiore Sant'Anna in Pisa, and at Shanghai Jiao Tong University in China and was appointed "Fellow of the School of Engineering" at the University of Tokyo.

He is a pioneer of the fields of "embodied intelligence" and "soft robotics" which are now rapidly gaining importance and have already had a decisive impact on the field of artificial intelligence and robotics. His book "How the body shapes the way we think" has been published in English, Japanese, Chinese, Arabic, and French. He developed the humanoid Roboy, which has attracted world-wide media attention, and he is currently pursuing the "Robolounge" project, where robots will take care of the well-being of the customers, to be launched in an Asian metropolis in 2016/2017.

13:30 – 15:00 [Poster session by leading program students] Note: First half: poster As; Second half: poster Bs

#	Name	Grade	Title
A01	Akira Kato	L2	Feasibility Study on Joint Angle Estimation by Means of Muscle Bulge Movement Longitudinally along the Forearm
A02	Ryuya Sato	L1	Visual Attention to Appropriate Monitors and Parts Using Augmented Reality for Decreasing Cognitive Load in Unmanned Construction
A03	Taro Kanal	L2	Structural and Fluid Mechanics Analysis of a Disk-Gap-Band Parachute at Mach 2
A04	Shoma Fujii	L1	Feasibility study of chemical heat storage and transport system
A05	Susumu Saito	L1	Design for a Framework of Participatory Video Surveillance System Using Crowdsourcing
A06	Naoki Nozawa	L1	3D Reconstruction from a Single non-frontal Face Image
A07	Tamon Miyake	L1	Study of Relationship between Input angle in Pre Swing Phase and Gait Change for Prevention of Falls in Elderly People
A08	Shihao Wang	L4	Inter prediction architecture for 8k UHDTV HEVC decoder
A09	Tingsong Chen	L1	Deep Learning based Object Recognition with Sensor Fusion (ORSF)
A10	Ryuichi Nakajo	L1	Acquisition of Viewpoint Representation in Imitative Learning from Own Sensory-Motor Experiences
A11	Li Guo	L3	A lossless embedded compression scheme for HEVC-like video codec
A12	Takuto Takahashi	L1	Design of Bodily Expression Media by Integration of Skeletal Information and Shadow
A13	Jianbin Zhou	L4	Efficient VLSI architecture of SAO for 8K H.265 video encoding
B01	Masato Adachi	L4	Sampling of Regolith on Asteroids Utilizing Electrostatic Force
B02	Naomi Okamura	L2	Evaluation Model for Muscle Hardness Using Wearable Indentation Tester
B03	Heming Sun	L4	Hardware-oriented rate-distortion optimization algorithm for HEVC intra-frame encoder
B04	Kazuma Sasaki	L3	Visual Motor Integration of Robot's Drawing Behavior
B05	Ryo Suzuki	L2	Siv3D: A C++ Library for Games and Interactive Media
B06	Nelson Enrique Yalta Soplin	L1	Robot Audition using deep neural networks
B07	Yang Cao	L4	Endoscopic Manipulator Control System Based on Pupil's Movement
B08	Ryosuke Tsumura	L2	Development of CT guided needle insertion robot in abdomen
B09	Takuya Kato	L2	Quantifying the artistry for blending
B10	Gonzalo Aguirre Dominguez	L4	Design, Modelling and Simulation of a Novel Toroidal Shaped Magnetorheological Piston
B11	Tito Pradhono Tomo	L3	Design and Characterization of a 3-axis Hall-Effect Based Skin Sensor
B12	Shuping Zhang	L4	4K motion estimation with 3D stacked memory
B13	Satoshi Funabashi	L1	Feature Extraction by Deep Learning with the Aim of Improved In-Hand Manipulation

Absent students (all on abroad): Weisheng Kong, Tomoya Koshi, Takafumi Sasaki, Yukitoshi Minami Sshiguematsu and Kuniyuki Takahashi

15:20 – 16:20 [Invited Lecture #2]

Making Robotic Characters Look Alive

Katsu Yamane (Senior Research Scientist at Disney Research)

Abstract: At Disney, the goal of robotics research is to make robots move and interact like living characters. In this talk, I will discuss three important elements for realizing this goal: motion, reaction, and safety. The first part of the talk introduces various human-to-robot motion retargeting techniques for creating expressive motions for both humanoid and non-humanoid characters. In the second part, I will demonstrate that remote human-robot interaction such as playing catch and object hand-over can be engaging and entertaining by adding simple and quick reactions to human actions and events. Finally, I will introduce a few hardware prototypes of soft robots developed with the goal of realizing safe direct physical interactions including hand-shaking and hugging.

Biography: Profile: Dr. Katsu Yamane received his B.S., M.S., and Ph.D. degrees in Mechanical Engineering in 1997, 1999, and 2002 respectively from the University of Tokyo, Japan. He is currently a Senior Research Scientist at Disney Research, Pittsburgh and an Adjunct Associate Professor at the Robotics Institute, Carnegie Mellon University. Prior to joining Disney, he was an Associate Professor at the University of Tokyo. Dr. Yamane is a recipient of numerous awards including King-Sun Fu Best Transactions Paper Award and Early Academic Career Award from IEEE Robotics and Automation Society, and Young Scientist Award from Ministry of Education, Japan. His research interests include humanoid robot control and motion synthesis, physical human-robot interaction, character animation, and human motion simulation.

16:20 – 17:20 [Invited Lecture #3]

The Fourth Industrial Revolution based on Cyber-Physical Production Systems

Wolfgang Wahlster (CEO of the German Research Center for Artificial Intelligence (DFKI))

Abstract: The Internet of Things is the basis for smart factories of the next generation. Semantic machine-to-machine communication revolutionizes factories by decentralized control. Embedded digital product memories guide the flexible work piece flow through smart factories, so that low-volume, high-mix production and mass customization is realized in a cost-efficient way. A new generation of industrial assistant systems using augmented reality and multimodal interaction will help factory workers to deal with the complexity of cyber-physical production and enable new forms of collaboration by digital social media. Since on-demand production of highly individualized products like cars, kitchens, and sport shoes requires short logistic chains in the markets where they are used, production is guaranteed to remain the backbone of Germany's economic performance. INDUSTRIE 4.0 is the German strategic initiative to take up a pioneering role in industrial IT which is currently revolutionizing the manufacturing engineering sector. Cyber-physical systems (CPS) improve resource productivity and efficiency and enable more flexible models of work organization. Companies that use CPS will have a clear advantage when it comes to recruiting the best employees, since they can offer a better work-life balance. Semantic product memories will play a key role in the upcoming fourth industrial revolution based on cyber-physical production systems. Low-cost and compact digital storage, sensors and radio modules make it possible to embed a digital memory into a product for recording all relevant events throughout the entire lifecycle of the artifact. By capturing and interpreting ambient conditions and user actions, such computationally enhanced products have a data shadow and are able to perceive and control their environment, to analyze their observations and to communicate with other smart objects and human users about their lifelog data. Cyber-physical systems and the Internet of Things lead to a disruptive change in the production architecture: the workpiece navigates through a highly instrumented smart factory and tries to find the production services that it needs in order to meet its individual product specifications stored on the product memory. A semantic service architecture based on a production ontology and ubiquitous microweb servers realizes intelligent matchmaking processes between emerging products, production tools and factory workers. In contrast to the classical centralized production planning and manufacturing execution systems, this leads to decentralized production logic, where the emerging product with its object memory is not only a central information container, but also an observer, a negotiator and an agent in the production process. We illustrate this revolutionary production architecture for mass customization with examples from DFKI's fully operational Smart Factory and various new INDUSTRIE 4.0 enabled factories all over Germany. We will present smart automation lines in Germany that are based on the migration of legacy factories to the new generation of INDUSTRIE 4.0 production facilities.

Biography: Wolfgang Wahlster is the Director and CEO of the German Research Center for Artificial Intelligence (DFKI) and a Professor of Computer Science at Saarland University. He has published more than 200 technical papers and 14 books on human-computer interaction, cyber-physical production systems, instrumented environments, the semantic web, as well as the internet of things and services. He is an AAAI Fellow, an ECCAI Fellow, and a GI Fellow. In 2001, the President of Germany presented the German Future Prize to Professor Wahlster for his work on intelligent user interfaces, the highest personal scientific award in Germany. He was elected Foreign Member of the Royal Swedish Nobel Prize Academy of Sciences in Stockholm and Full Member of the German National Academy of Sciences

Leopoldina that was founded in 1652. He has been awarded the Federal Cross of Merit, First Class of Germany. Prof. Wahlster has also been appointed member of the Research Union "Business - Science" as Chief Scientific Advisor for ICT research of the German government. He coined the term “Industrie 4.0” and shaped the research agenda for the 4th industrial revolution. He is a member of the Executive Steering Board of the EIT Digital and serves on the Executive Board of the International Computer Science Institute (ICSI) at UC Berkeley. He serves as the Chairman of the international advisory boards of NII and NICT in Japan. He is the editor of Springer’s LNAI series and on the editorial board of various top international CS journals.

17:20 [Closing]

17:30 – 19:00 [Reception]

- Venue: Rohm Square, 1F, Building No.63 (63 号館 1F)

Lunch Map