The 1st International Symposium on Symbiotic Intelligent Systems

Knowledge Theater in Grand Front Osaka

& AP Convention Room Chayamachi, Umeda, Osaka

23th - 25th January 2019

Abstracts

Session 1: Cognitive Robotics

Date: January 23, 2019, 10:15-11:45

Venue: Knowledge Theater in Grand Front Osaka

"Research Activities in Symbiotic Intelligent Systems Research Center"

Hiroshi Ishiguro (Osaka University)

Prof. Ishiguro, the director of Symbiotic Intelligent Systems Research Center will introduce the multi-disciplinary research approach in the center including his research activities on human-robot interaction.

"Human-Robot Symbiotic Relationship: How much Anthropomorphism?"

Giulio Sandini (Italian Institute of Technology)

In this talk I will analyse the appearance-based (bodyware) and the behaviour-based (mindware) elements of human social interaction to identify the (minimum) level of anthropomorphism necessary to establish a symbiotic relationship between humans and robots and to demonstrate how robots can be used to experimentally quantify these elements.

Session 2: Bio-Robotics

Date: January 23, 2019, 13:00-15:00
Venue: Knowledge Theater in Grand Front Osaka

"Frontiers of BioRobotics Science and Engineering"

Paolo Dario (Sant'Anna School of Advanced Studies)

Biorobotics and bionics are at the edge of biomedical engineering and robotics. Their goal is using robotic artefacts to validate scientific hypotheses, for inventing and deploying novel biomimetic machines, human-centered healthcare, limb prostheses, artificial organs, rehabilitation and assistive technologies. In this talk numerous examples of research achievements and perspectives will be illustrated.

"The Strength of Being Soft: Lessons from Nature for Soft Robots"

Cecilia Laschi (Sant'Anna School of Advanced Studies)

Inspired by the observation of the role of soft tissues in living organisms, the use of soft materials for building robots is one of the current challenges for pushing the boundaries of robotics technologies. The study of living organisms sheds light on principles that can be adopted to develop new robot abilities and applications.

"Bioinks for 3D Bioprinting of Biomimetic Tissue Models"

Matthew Mail (CELLINK)

3D Bioprinting has gained attention in tissue engineering due to its ability to spa-tially control the placement of cells, biomaterials and biological molecules. The development of new hydrogel based bioinks with high printability and bioactive properties has made it possible to 3D bioprint and accelerate the maturation of complex 3D tissue models. Bioprinting technologies developed by CELLINK, including 3D bioprinters and bioinks, are being applied to regenerative medicine to address the need for tissues and organs suitable for transplantation, cell-based sensors, drug screening models, bio-applications, and tumor models. These bio-inks are optimized for printability, cell viability, and cellular expression, and are made from a range of synthetic, natural, and ECM based biomaterials. The cur-rent design strategy for bioinks is to create environments that support specific cell types or functionalities, while mimicking natural tissues.

An example of this is the CELLINK LAMININK series, which contains five tissue-specific bioinks based on laminin proteins that mimic the basal lamina of natural tissue.

More information will be demonstrated during the presentation, including CELLINK's latest advances in bioinks and biomaterials, and data from our research collaborators.

Session 3: Technology and Society

Date: January 23, 2019, 15:15-17:30
Venue: Knowledge Theater in Grand Front Osaka

"Regulating the AI Industry through Prosecution"

Tatsuhiko Inatani (Kyoto University)

Recent development of AI technology may enable a practical use of autonomous system, including an autonomous driving car in the near future. But the criminal responsibility for an accident caused by the system remains still opaque, due to the blaming nature of criminal law theory based on the free will concept. Then I argue to adopt the alternative system that allows healthy development of the system and the cohabitation between human and machine in this talk.

"EU Data Protection Law in the Age of Digitalisation"

Ziga Skorjanc (University of Vienna)

Starting from the legal roots of data protection in Europe, we will discuss the recent developments in the European data protection law, primarily the GDPR, and their adequacy for the digital age. Additionally its interplay with Japanese data protection regime will be highlighted.

"The Driverless Human Factor: User Needs and Experience in the Design and Testing of High to Fully Autonomous Vehicle Technology"

Phillip Morgan (Cardiff University)

Transport with autonomous capabilities is not new, although highly autonomous or 'driverless' cars still are still not at a level of readiness for large-scale deployment anywhere in the world. The level of autonomy of some currently available vehicles is arguably partial at best and there are significant restrictions including technical, logistical, and legal. Also, the symbiosis between the technology and the human user is a crucial factor to consider. I will discuss whether humans and society are anywhere near ready to start handing over control to driverless cars. I will present findings from a range of studies linked to two of my IUK funded projects (Venturer, and, Flourish) with a specific focus on human behaviour, attitudes, and user experience. In one study involving a simulator and road vehicle, we measured safety when retaking control from a partially autonomous vehicle (Level 3: SAE, 2016) operating at different speeds in urban environments. In another study, also using a simulator and road vehicle, we measured trust in a highly autonomous vehicle (Levels 3-4) performing increasingly complex manoeuvres. We are also developing human-machine interfaces for fully autonomous vehicles (Level 5) that might help to improve trust, support situation awareness, and reduce cognitive load amongst individuals with high levels of mobility needs such as older adults. I will critically discuss findings from these studies and encourage more international collaboration in this area to fuel faster and more effective progress.

Session 4: Dynamical Systems

Date: January 24, 2019, 10:00-11:30

Venue: Knowledge Theater in Grand Front Osaka

"Emerging Interactions Yielding Functional Differentiation"

Ichiro Tsuda (Chubu University)

In conventional studies of self-organization, variational principles have been adopted to yield macroscopic spatio-temporal patterns via molecular interactions at microscopic levels. Such a theory successfully explains how macroscopic ordered motion could appear in far-from equilibrium systems. On the other hand, living organisms have evolved to represent functions via constraints stemming from environments. We have studied how constraints acting on a whole system yield functional differentiations at elementary levels of the system. The study suggests the construction of self-organizing machines that adopt to variable environments via functional differentiation of the elements.

"Building Neurotechnological Complexity from the Ground Up"

Emmanuelle Tognoli (Florida Atlantic University)

Knowledge of the neurobehavioral mechanisms of teamwork is important for the design of human-machine systems that augment each other's capabilities informationally and physically. I will describe efforts to discover the neurophysiological mechanisms supporting social coordination. I will also present converging paths to developing multiscale neuro-computational models for socially coordinating agents.

Session 5: Emerging Robotics

Date: January 24, 2019, 13:00-14:30
Venue: Knowledge Theater in Grand Front Osaka

"Science of Intelligence: Uniting the Study of Natural and Artificial Intelligence"

Oliver Brock (Technische Universität Berlin)

Intelligence is possibly the most important concept of our time. But do we really know what it is? In this talk, I will discuss how to best gain insights into this concept by combining analytic disciplines studying natural intelligence and synthetic disciplines producing artificial intelligence.

"New Vistas for Cognitive Interaction Science: Robotics, AI and Big Data"

Helge Ritter (Bielefeld University)

We are witnessing break-throughs in three interrelated fields: advances in mechatronics have brought robot platforms close to an affordable mass item, internet and mobile devices have led to the availability of huge data repositories about human preferences, decisions and actions, and advances in machine learning have enabled us to create intelligent solutions from data alone. We discuss some of the recent breakthroughs and their impact with regard to cognitive interaction, particularly in contexts where physical embodiment is a crucial element. We point out some new vistas for cognitive interaction science and some major challenges, particularly with regard to marrying touch and vision for intelligent perception, embodied learning in physical environments, and the shaping of the skills and capabilities of AI-driven robots such that they remain compatible with human needs, along with their embedding in human society at large.

Session 7: Self Recognition

Date: January 24, 2019, 16:00-17:30
Venue: Knowledge Theater in Grand Front Osaka

"Self-Recognition and the Brain"

Julian Paul Keenan (Montclair State University)

Investigations of consciousness pose many challanges. Self-face recognition is used as a measure as it reflects self-awareness in higher-order primates. Regions of the brain including the frontal lobes and right temporal/parietal areas are candidates for supporting higher-order consciousness.

"Narrative Structuring of Symbiotic Experience"

Peter Ford Dominey (CNRS / INSERM)

Meaning can be extracted from the sensory-motor system directly, but the richer aspects of meaning are generated through symbiotic interaction, and constructed through narrative. Through understanding human-human narrative symbiosis and its underlying neurophysiology, we can better construct artificial systems with symbiotic intelligence.

Session 8: Neurobehavioral Development

Date: January 25, 2019, 10:00-12:00
Venue: AP Convention Room Chayamachi, Umeda, Osaka

"The Neural Basis of Self-other Processing in Depressed Adolescents"

Karina Quevedo (University of Minnesota)

This presentation will cover how adolescents with different degrees of psychopathology engage neural function and networks to process self-relevant information. It will also explore networks and function engaged during voluntary modulation of self-relevant information in adolescents.

"Spatial and Temporal Cross-sensory Calibration Typical and Impaired Children and Adults"

Monica Gori (Italian Institute of Technology)

It is evident that the brain is capable of large-scale reorganization following sensory deprivation but the extent of such reorganization is not clear to date. Here I show results on blindness and deafness about the reorganization of spatial and temporal representations when the visual or audio signals are not available. I will also show new rehabilitation approaches to improve these representations.

"Development of Functional Lateralization in the Human Brain"

Tomoyo Morita (Osaka University)

One of functions assigned to the right hemisphere of the human brain is self-body recognition. However, it is still unclear when and how the right hemisphere acquire the function during development. I will present the developmental changes in brain activity during two different self-body recognition tasks, and discuss the significance of functional lateralizaiton in the human brain.

Session 9: Neuro-Robotics

Date: January 25, 2019, 13:30-14:50

Venue: AP Convention Room Chayamachi, Umeda, Osaka

"Interactive Robots as Multistable Dynamical Systems"

Bulcsú Sándor (Babes-Bolyai University)

Robotic locomotion may arise by generating attracting states in the combined phase space of the robot and environment. Interactive robots can hence make use of coexisting attractors corresponding to different motion primitives. Considering simple neuro robots we propose here a dynamical systems framework for understanding and controlling intelligent systems.

"Body-Brain Interactions for Emergent Behavior"

Yuji Kawai (Osaka University)

How do brain networks produce bodily behavior even though the neural activity and body movements have different dynamical properties? Our simulations show that the neural activity changes to be suitable for movements through body-brain interactions. Such adaptability enables the neural networks to produce diverse behavioral patterns and to facilitate behavioral learning.

Session 10: Human-Robot Interaction

Date: January 25, 2019, 15:20-16:40

Venue: AP Convention Room Chayamachi, Umeda, Osaka

"Visual Audio Attention for Human-Robot Interaction"

Francesco Rea (Italian Institute of Technology)

In our recent studies on HRI show how intelligent systems score high in agency and anthropomorphisation when attentive to the social cues of interactive partners. I present the recent result of natural interaction promoted by auditory and visual computational models of attention for humanoid robot iCub.

"Intuitive Understanding between Humans and Robots"

Alessandra Sciutti (Italian Institute of Technology)

Humans understand each other intuitively, by exchanging unconscious signals that allow for mutual comprehension and anticipation. Robots should learn to send and sense the very same signals, in order to adapt their behavior and perception to those of the human partner. To this aim, robots can be used as "interactive probes", i.e. tools to study the interaction while it unfolds without losing experimental control.