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Imre J. Rudas

Advances in Electrical and Computer Engineering

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- Proceedings of the 14th International Conference on Artificial Intelligence, Knowledge Engineering and Data Bases (AIKED '15)
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Plenary Lecture 1

Overview on Some Mathematical Methods for Observing Real Sub-Systems

Professor Benabdellah Yagoubi
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Abstract: Any real system can be seen as a composite of one or more sub-systems. These can be related to each other either directly such as the sun and the earth, or indirectly as the moon and the sun in the solar system. The electrons are also an example of sub-systems that are linked indirectly through the nucleus to form the atom. But a real system can also be a sub-system that derives from a larger system, and hence more complicated tasks to reach or to get access to it. Within a real system, there should be always one or more crucial real or virtual sub-systems that constitute the central and the most dominant part of a global system. In medical treatments, for example, it is vital to determine this central sub-system (a main organ in human body) and to see how strongly is influenced by the rest of the sub-systems (other organs) in order to study it through another easy accessible sub-system or to perform the treatments without affecting it. It is, therefore, of interest to localize this central sub-system, in general, and determine how well it can be dependent on the other sub-systems in its environment using mathematical tools such as the K-means algorithm and the Bayesian theory respectively. In this lecture, we will attempt to discuss how it is possible to observe, isolate or even extract a desired sub-system and perhaps predict its behavior using the previously mentioned tools and our suggested method based on a geometric relative observation.

Brief Biography of the Speaker: Dr B. Yagoubi received the M. Sc degree in Electrical Engineering in 1985 from Bel-Abbes University, Algeria and the Ph. D degree (thin films) (1986-1989) in the Faculty of Sciences from Brunel University (UK). He was the head of the Signals and Systems Laboratory (1999-2003) and the head of the Department of Electrical Engineering (2005-2006). He is lecturing the theory of digital signal, systems modeling and identification, random processes and detection (1996-2013) at Mostaganem University, Algeria. Currently, he is involved in some national projects; forest fire detection, heart rate variability in the LF and HF bands to characterize the autonomous nervous system, and study and application of random processes. Further research interests are in real signals and models geometric representation based on Gram-Schmidt orthogonalization concept, as well as using a relative geometric space of observation.

Plenary Lecture 2

Application of Paraconsistent Annotated Logic Program EVALPSN to Intelligent Control

Professor Kazumi Nakamatsu
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Abstract: Paraconsistent logic is well known as a formal logic that can deal with contradiction in the framework of logical system consistently. One of paraconsistent logics called annotated logic has been proposed by Prof. Newton da Costa, and its logic program has also been proposed by Prof. V.S. Subrahmanian et al. later as a tool of dealing with knowledge bases. Some paraconsistent annotated logic programs with strong negation have been developed for dealing with non-monotonic reasoning such as default reasoning, defeasible reasoning, defeasible deontic reasoning, plausible reasoning, etc. by Kazumi Nakamatsu. Recently He has proposed a paraconsistent annotated logic program called Extended Vector Annotated Logic Program with Strong Negation (EVALPSN), which can deal with conflict resolving, defensible deontic reasoning, plausible reasoning, etc. The EVALPSN reasoning function has been applied to various intelligent controls and safety verification systems such as pipeline valve control, traffic signal control, railway interlocking safety verification, etc. In this lecture, an EVALPSN application to traffic signal control with some simulation systems will be introduced. Moreover, a special EVALPSN that can deal with before-after relations between processes (time intervals), which has been named bf(before-after) –EVALPSN has been developed. It has been shown that bf-EVALPSN can be applied to real-time process order control. It will also be introduced how to apply bf-EVALPSN to intelligent real-time process order control and safety verification with examples.

Brief Biography of the Speaker: Kazumi Nakamatsu received the Ms. Eng. and Dr. Sci. from Shizuoka University and Kyushu University, Japan, respectively. He is a full Professor at School of Human Science and Environment, University of Hyogo, Japan. His research interests encompass various kinds of logic and their applications to Computer Science, especially paraconsistent annotated logic programs and their applications. He has developed some paraconsistent annotated logic programs called ALPSN(Annotated Logic Program with Strong Negation), VALPSN(Vector ALPSN), EVALPSN(Extended VALPSN) and bf-EVALPSN (before-after EVALPSN) recently, and applied them to various intelligent systems such as a safety verification based railway interlocking control system and process order control. He is an author of over 150 papers and book chapters, and edited 7 books published by prominent publishers. Kazumi Nakamatsu has chaired various international conferences, workshops and invited sessions, and he has been a member of numerous international program committees of workshops and conferences in the area of Artificial Intelligence and Computer Science. He serves as Editor-in-Chief of the International Journal of Reasoning-based Intelligent Systems by Inderscience Publishers(UK) and an editorial board member of many international journals. He has contributed numerous invited lectures at international workshops, conferences, and academic organizations. He also is a recipient of some conference and paper awards. He is a member of Japan AI Society, IEEE, etc.

Plenary Lecture 3

Multimodal Control of a Robot Hand for Advanced Service Manipulation

Professor Angel P. del Pobil
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Abstract: Cognitive manipulation is one of the most important challenges in robotics. It involves three challenges: versatility, defined as the capability to adapt to different situations, instead of being limited to a particular task; autonomy, that concerns the level of independence in the robot operation, and dependability, that refers to the capability of successfully completing an action even under important modeling errors or inaccurate sensor information. A complete manipulation task involves two sequential actions: that of achieving a suitable grasp or contact configuration, and the subsequent motion required by the task. We propose a unified framework with the introduction of task-related aspects into the classical knowledge-based grasp concept, leading to task-oriented grasps. In a similar manner, grasp-related issues are also considered during the execution of a task, leading to grasp-oriented tasks. We call this unified representation physical interaction. In the talk I will first present a theoretical framework for the integrated specification of physical interaction tasks, supporting a great variety of actions. Next, the problem of autonomous planning of physical interaction tasks will be addressed. I will then focus on the dependable execution of these tasks, and adopt a sensor-based approach with three different types of sensor feedback: force, vision and tactile. The methods proposed provide important advances with respect to the state-of-the-art versatility, autonomy and dependability of cognitive robot manipulation, allowing to address a wide range of tasks. All these contributions are validated with several experiments using different real robots placed on household environments. The talk will be based on my latest book titled Robot Physical Interaction through the combination of Vision, Tactile and Force Feedback: Applications to Assistive Robotics, that has been published in the Springer Tracts in Advanced Robotics (STAR) series in 2013, co-authored by Mario Prats and Pedro J. Sanz. This research was recipient of various awards, including the Georges Giralt European Award and the Robotdalen Scientific Award Honorary Mention.

Brief Biography of the Speaker: Angel Pasqual del Pobil is Professor of Computer Science and Artificial Intelligence at Jaume I University (Spain), founder director of the UJI Robotic Intelligence Laboratory, and a Visiting Professor at Sungkyungkwan University (Korea). He holds a B.S. in Physics (Electronics, 1986) and a Ph.D. in Engineering (Robotics, 1991), both from the University of Navarra. He has been Co-Chair of two Technical Committees of the IEEE Robotics and Automation Society and is a member of the Governing Board of the Intelligent Autonomous Systems (IAS) Society and EURON. He has over 230 publications, including 11 books the last two published recently by Springer: Robot Physical Interaction through the combination of Vision, Tactile and Force Feedback (2013) and Robust Motion Detection in Real-life Scenarios (2012). Prof. del Pobil was co-organizer some 40 workshops and tutorials at ICRA, IROS, RSS, HRI and other major conferences. He was Program Co-Chair of the 11th International Conference on Industrial and Engineering Applications of Artificial Intelligence, General Chair of five editions of the International Conference on Artificial Intelligence and Soft Computing (2004-2008), Program Chair of the International Conference on Adaptive Behaviour (SAB 2014) and General Chair of the 2015 IEEE Summer School on Experimental Methodology, Performance Evaluation and Benchmarking in Robotics. He is Associate Editor for ICRA (2009-2015) and IROS (2007-2013) and has served on the program committees of over 115 international conferences, such as IJCAI, ICPR, ICRA, IROS, ICINCO, IAS, ICAR, etc. He has been involved in robotics research for the last 28 years, his past and present research interests include: humanoid robots, service robotics, internet robots, motion planning, mobile manipulation, visually-guided grasping, robot perception, multimodal sensorimotor transformations, robot physical and human interaction, visual servoing, robot learning, autonomous mental development, and the interplay between neurobiology and robotics. Professor del Pobil has been invited speaker of 56 tutorials, plenary talks, and seminars in 14 countries. He serves as associate or guest editor for eight journals, and as expert for research evaluation at the European Commission. He has been Principal Investigator of 28 research projects. Recent projects at the Robotic Intelligence Lab funded by the European Commission include: FP6 GUARDIANS (Group of Unmanned Assistant Robots Deployed In Aggregative Navigation supported by Scent detection), FP7 EYESHOTS (Heterogeneous 3-D Perception Across Visual Fragments), and FP7 GRASP (Emergence of Cognitive Grasping through Emulation, Introspection, and Surprise).

Plenary Lecture 4

Cloud Technology-Based Robotics

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Abstract: Cloud Robotics is an emerging field within robotics, currently covering various application domains and robot network paradigms. Cloud Robotics was born from the merger of cloud technologies and robotics. Cloud technology-based computing—or simply Cloud Computing—is one of the most dynamically growing areas of Info-Communication Technologies (ICT). The presentation summarizes the basics of cloud computing, namely the main idea, the definition, the cloud model composed of essential characteristics, service models and deployment models. The next part provides a structured, systematic overview of the numerous definitions, concepts and technologies linked to Cloud Robotics and cloud technologies in a broader sense. It also presents a roadmap for the near future, describing development trends and emerging application areas. Cloud Robotics may have a significant role in the future as an explicitly human-centered technology, capable of addressing the dire needs of our society. Finally some cloud robotics projects are discussed. The last part of the presentation summarizes the results and ideas of a new generation internet and Cloud Technology based Virtual Collaboration Arena (VirCA) developed in Hungary and some of its application possibilities in Cloud Robotics. VirCA provides a platform where users can build, share and manipulate 3D content, and collaboratively interact with real-time processes in a 3D context, while the participating hardware and software devices can be spatially and/or logically distributed and connected together via IP network. The 3D content and processes in VirCA can be synchronized with the real world, which allows the combination of reality and virtual world in the collaboration arena.

Brief Biography of the Speaker: Imre J. Rudas graduated from Bánki Donát Polytechnic, Budapest in 1971, received the Master Degree in Mathematics from the Eötvös Loránd University, Budapest, the Ph.D. in Robotics from the Hungarian Academy of Sciences in 1987, while the Doctor of Science degree from the Hungarian Academy of Sciences in 2004. He received his first Doctor Honoris Causa degree from the Technical University of Košice, Slovakia and the second one from “Polytechnica” University of Timisoara, Romania. He is active as a full university professor He served as the President of Budapest Tech from 2003 till 2010. He was elected in 2010 as the President of Óbuda University, the successor of Budapest Tech till April 2014. Now he is the Head of the Steering Committee of the University Research and Innovation Center. He is a Fellow of IEEE, Senior AdCom member of Industrial Electronics Society (IES), he served IES as a Vice-President in 2000-2001, he is Board of Governors member of IEE System, Man and Cybernetics Society. He is the Junior Past Chair of IEEE Hungary Section. He served IFSA (International Fuzzy System Association) as Vice-President and Treasure for a period of 7 years; he had been the President of Hungarian Fuzzy Association for ten years. He serves as an associate editor of some scientific journals, including IEEE Transactions on Industrial Electronics, member of editorial board of Journal of Advanced Computational Intelligence, member of various national and international scientific committees. He is the founder of the IES Sponsored IEEE International Conference Series on Intelligent Engineering Systems (INES), IEEE International Conference on Computational Cybernetics (ICCC), IEEE International Symposium on Computational Intelligence and Informatics (CINTI, since 2000), IEEE International Symposium on Machine Intelligence and Informatics (SAMI, since 2003), IEEE International Symposium on Intelligent Systems and Informatics (SISY, since 2003), IEEE International Symposium on Applied Computational Intelligence and Informatics (SACI, since 2004), IEEE International Symposium on Logistics and Industrial Informatics (LINDI, since 2007). He has served as General Chairman and Program Chairman of numerous scientific international conferences. His present areas of research activities are Computational Cybernetics, Robotics with special emphasis on Robot Control, Soft Computing, Fuzzy Control and Fuzzy Sets. He has published three books, more than 680 papers in international scientific journal, conference proceedings and book chapters, he has more than 1000 independent citations.

Plenary Lecture 5

Medical Big Data and Knowledge Discovery

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Abstract: With the rapid advance in clinical application of the next generation sequencer (NGS) of human genome, a great deal of interests is now being attracted in accumulation, analysis and knowledge discovery of clinical Big Data, which integrates a vast amount of molecular information such as whole genome and exome sequencing together with conventional clinic-pathological phenotypic information stored in electronic medical record (EMR). A considerable number of hospitals in US, using NGS, now try to discover the mutation of unknown disease causative genes, driver mutations of cancer, or to avoid the misuse of drug by inquiring the polymorphism of drug metabolizing gene of the paitent, in clinical routines, pursuing to realize genome/omics medicine. With this situation in mind, NIH in US started the national initiative named “Big Data to Knowledge” To explore the appropriate therapy, Big Data database with self-learning ability is crucially necessary. In this talk, I will present the international situation as well as our project to promote the data science in biomedical Big Data.

Brief Biography of the Speaker: Prof. Tanaka obtained a BS and MS degree from Mathematical Engineering, University of Tokyo (Japan), in 1974 and 1976, respectively. He got Dr. Med. from graduate school of medicine, University of Tokyo, in 1981 and Ph.D. in computer science from graduate school of engineering, University of Tokyo, in 1983. He was installed as an assistant professor of medicine, University of Tokyo in 1982. He was a visiting scientist at MIT laboratory of computer science during 1990. He was installed as a professor of bioinformatics, Medical Research Institute, Tokyo Medical and Dental University in 1991. He was the director of Information Center for Medicine in Tokyo Medical and Dental University from 1995-2010. He was Dean of School of Biomedical Science from 2006 to 2010. He worked as the president of Japan Association of Medical Informatics from 2003-2007. He is now chairman of Chem-Bioinformatics association and also that of the Japan association of Omics-based medicine, acting as one of the leaders of genomic medicine and translational bioinformatics in Japan.