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2ND EDITION OF ROBOT INTELLIGENCE TECHNOLOGY AND APPLICATIONS

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virtual CONFERENCE

KEYNOTE PRESENTATIONS

Luiz Moutinho

University of Suffolk, England

Future Life ....A Robotic World

The presentation starts by elaborating on Systems of Intelligence and Robotic Systems. An overview of the future of robotics is then presented. A number of robot typologies will be introduced like robot concierges, Robots at Home, Assistive Robots and Humanoid Robots. Robotic Process Automation is dissected next. Soft robotics and industrial robotics are also introduced. A number of novel concepts are then explained- Human-in-Loop AI , Cobots , Cloud Robotics , 3D Mini- Robots , Cognitronics , Mind-controlled Robots, Nano Robots , Nanobots , BioRobotics and Bioethics.

Biography

Professor Luiz Moutinho is Visiting Professor of Marketing at Suffolk Business School, University of Suffolk, Ipswich, England, and at The Marketing School, Portugal, and Adjunct Professor at GSB, Faculty of Business and Economics, University of South Pacific, Suva, Fiji.

Ji Wang

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A Measurement of Thin Film Properties with the RUSpec Method from Vibrations of Covered Elastic Cuboids

In modern products from advanced manufacturing processes like semiconductor and electronic device industries, thin films are frequently utilized for essential functions such as conductive layers and functioning materials for various applications. With sophisticated processing techniques, thin films can be coated on surfaces of various substrates with relatively thin thickness and desired planner patterns to satisfy application needs. It is known that thin films are made from bulk materials by a phase transformation technology, and the large temperature variation will induce many changes related to the physical properties and material formation. As a result, concerns about property changes in thin films are justified and should be addressed to support product development efforts. In this study, we start with a cuboid sample coated with thin films on faces. The vibrations of such a coated cuboid are formulated with the Rayleigh-Ritz method as a layered structure. With one set of displacement functions in the entire structure, strain and kinetic energies are calculated separately with the consideration of different material properties and sizes, providing the basis for the determination of unknown properties of materials through the frequency solutions. By combining this analysis with the RUSpec technique, we can obtain the physical properties of the thin film layers based on the frequency variations. With the advantages of easy-use and simple sample preparation, this will be a simple and accurate method for the evaluation of the physical properties of thin films which can be found in many applications today.

Biography

Professor Ji Wang is the founding director of the Piezoelectric Device Laboratory, Ningbo University. Professor Ji Wang also held visiting positions at Chiba University, University of Nebraska-Lincoln, and Argonne National Laboratory. He received his PhD and Master's degrees from Princeton University in 1996 and 1993 and a bachelor's degree from Gansu University of Technology in 1983.

Professor Wang has been working on acoustic waves and high-frequency vibrations of elastic and piezoelectric solids for resonator design and analysis with several US and Chinese patents, over 200 journal papers, and frequent invited, keynote, and plenary presentations at major conferences around the world.

Ting Zhang

Robotics and Microsystems Center, Soochow University, Suzhou, China. E-mail id: tzhang@suda.edu.cn

Wearable Robotics to Characterize, Retrain, and Restore Human Movements

Neural disorders, amputation, and old age limit the ability of humans to perform activities of daily living. Robotics can be used to probe the human neuromuscular system and create new pathways to characterize, relearn, or restore functional movements. Prof. Zhang's group at Soochow University has designed innovative technologies and robots for this purpose. These technologies have been tested on subjects in a variety of studies to understand the human cognitive and neuro-muscular response. The talk will provide an overview of some of these technologies and scientific studies performed with them.

Biography

Prof. Ting Zhang has completed his PhD from Harbin Institute of Technology, China and postdoctoral studies from University of North Carolina at Chapel Hill, USA. Since November 2018, he is a Professor in the Robotics and Microsystems Center, Soochow University, China. He has published more than 20 SCI-indexed journal papers in mechatronics and robotic fields as the first author or corresponding author, including TMECH, TNSRE, IEEE RAM. There have two papers been selected as the journal cover.

Audrey K.C. Huong

Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia.

Intelligence-enabled optical technology for dermatology care

Skin tissue oxygen status can serve as an important clue to one's overall skin health. This information can be important in the clinical assessment and management of individuals with anaerobic bacteria-infected skins. For this reason, we built a handheld optical device with LEDs of three distinct wavelengths of 532, 560, and 650 nm in an annular ring around a CMOS imaging camera to create a two-dimensional map of the skin oxygen saturation level (S_tO_2) from reflectance images using an optimization algorithm. A lightweight deep learning model is also incorporated into the developed system for the prediction of skin disease. Our prospective clinical, single-blind study using various skin care creams revealed a marked increase in the S_tO_2 by at least 5 % in the group receiving products with antioxidant components. Further investigations into changes in the pattern of the S_tO_2 map for inflamed skin showed a correlation between the skin oxygen level and healing episodes. This oxygen map along with the skin disease diagnosis is useful to aid in decision-making and to evaluate the effectiveness of the prescribed treatment. This system is an attractive solution for home healthcare monitoring, more specifically in dermatology. This technology also helps to enhance the living quality of the community in rural areas and reduce the gap in living standards.

Biography

Audrey Huong is an Associate Professor of Electronic Engineering at Universiti Tun Hussein Onn Malaysia, where she is actively involved in numerous innovation projects. She has received several awards and recognition for her work on home healthcare systems, both international and local. She has collaborated with the department of Orthopedic in Johor to improve patients' foot care, as well as institutions from Japan and the United States on research and innovations related to skin health. Her current research interests include deep learning and computer vision in biomedical engineering, the design of medical imaging systems, and optimization of imaging technologies.

Jörg Imberger and Clelia Marti

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Environmental Engineering, Connecting to Country with Virtual Reality

Humans are without doubt the most invasive and destructive species on earth. Now that technology has given humans global, instantaneous reach and action using the internet, humans are making non-holistic, irrational decisions that are having globally damaging impact on nature. The objective of this paper is to examine the world view of our indigenous forefathers in "connecting with country" and use this as the foundations to develop a new modern management technology for the State of Western Australia as an example of sustainable living.

Human behavioural characteristic, are hard wired into the newly discovered four dimensional cell structure, that is made up of two separate computational entities. First, a genetic component that controls hereditary continuity and second a self learning component, that determines all our behavioural characteristics. Recent research has shown the latter is formed in the first 5 to 10 years of human life, through parental mentoring and observation.

A generalisation of the observing part of the self-learning component was developed for the management of the Swan Canning Estuary. This technology consisted of 3D simulation numerical models providing both rea-time and forecast 3D output of all state variables in the domain, all embedded in an input-output data base management software that provided easy access to all stakeholders. By combining this software with modern environmental engineering keeping the environment healthy should no longer prove to be a technical challenge, only a matter if governments have the political will to make WA the sustainable example for the world.

Biography

Jörg Imberger received his PhD from UCB at 28 years of age and became Australia's youngest full professor at 35. His research interest are in environmental engineering as applied to rivers, lakes, estuaries and coastal seas. Recent foci also include strategies for sustaining functionality of aquatic systems in a changing world. He is a Fellow of 10 International Academies and the recipient of 30 major honours including the Onassis International Prize, the Stockholm Water Prize and Member of the Order of Australia. He has published 5 books, with two further in preparation, contributed to 19 books and has published 275 journals papers. Google Scholar credits him with 23,873.

Kenjijro TADAKUMA

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Homeomorphic Mechanisms: Topological Robotic Mechanism Design

Conventional omnidirectional wheel mechanisms are limited in their ability to climb steps and cross gaps. The Omni-Ball, consisting of two connected hemispherical wheels, overcomes these limitations by enabling the crossing of higher obstacles and larger gaps than previously. By elongating the Omni-Ball longitudinally into a cylinder shape, we obtained the Omni-Crawler, which enables omnidirectional mobility on rough terrain. In addition, transforming the cylinder shape into a torus with inner-outer membrane motion not only enables robotic mobility in murky water, but makes it possible to further transition from Omni-Crawler to Omni-Gripper. Conventional soft grippers are not suitable for objects with sharp sections such as broken valves and glass shards, but the torus shape solves this problem by using a three-layered variable stiffness skin-bag made of cut-resistant cloth. A similar function could also be achieved using a string of beads made of titanium which can grip objects of almost any shape, even when they are on fire. To build on these mobile mechanism and gripper mechanisms from the viewpoint of the topological robotic mechanism design, we can expand it as the fabrication tool for cell sheet and bio tubular configuration mechanism. This is the "Homeomorphic Mechanisms" to realize to invention and embodiment of the new fundamental robotic mechanisms.

Biography

Kenjiro Tadakuma holds an Associate Professorship at Tohoku University in the field of robotics, where he has been leading the Plus Ultra Mechanism Group since 2015. Throughout his career, he has made outstanding contributions to the design of novel robotic mechanisms. As a Ph.D. student at Tokyo Tech (2004 – 2007), he invented the first omnidirectional mechanism, known as "Omni-Ball". This brought him to MIT's Field and Space Robotics laboratory as a post-doctoral researcher (2007), where he went on to contribute to the Mars hopper project and developed a polymer-based mechanical device for medical applications. Back in Japan, he held positions at Tohoku University, the University of Electro-Communications, and Osaka University (2008 – 2015), where he expanded on the concept of omnidirectional mechanisms with successful applications in mobile robotics and gripping mechanisms, such as the "Omni-Crawler" and "Omni-Gripper".

Volodymyr Romanov[1], Vadim Tulchinsky[1], Igor Galelyuka[1], Oleksandr Voronenko[1] and Oleksadra Kovyrova[1]

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Wearable Sensors and Devices for Elderly People

Due to development of the wearable medical electronics, health care is undergoing substantial transformation not only in terms of data acquisition and diagnostics but also in terms of proposed services and provided protection. The new health care conditions are desired for elderly people patients suffering from chronic diseases associated with a risk to life. Now there are more than 815 million citizens in EU countries, and about 18% of them according to Eurostat are older than 65. The aged people are potentially at-risk but due to progress in health care and well-being, most of them continue live active and dynamic life. Thus, the number of Europeans potentially affected by the progress in first aid service caused by new wearable sensor technologies can be estimated as 200 million. In a pandemic patient at risk need to be provided with remote monitoring of their health status too.

This paper gives a short review of application of wearable sensors, and signaling on emergency conditions, of rapid therapeutic action, of implement highly service-oriented system for automated control of health risk identification. The paper gives target, service perspective, and the motivation, and main objectives. In conclusion paper gives examples of wireless sensors and the application experience of the Glushkov` Institute of Cybernetics of NAS of Ukraine.

Biography

Volodymyr Romanov Professor, PhD, is Head of Data Acquisition Systems Department, Glushkov Institute of Cybernetics, Ukrainian National Academy of Sciences, and he was Professor, National Aviation University of Ukraine (IT department) 1996 - 2004, and Professor, National Technical University of Ukraine “KPI” (Air-space Systems Department) 1994 -2002, and his Professional Memberships are 2009-onwards, Member, Academic Council of Glushkov Institute of Cybernetics, National Ukrainian Academy of Sciences, 2002-onwards Member, Council of Experts of High Attestation Commission, Ukraine, 1997-onwards Member and Scientific Secretary, Academic Council, Computer Science and IT Doctorate Dissertations Defense, 1973 - 1990 Member, Program Committee of Six All-USSR Symposiums “Problems of Designing of Data Converters” and his Honors and Awards in 2009 Inventor of the Year, National Ukrainian Academy of Sciences, in 2008 The Academician Lebedev Prize Award, in 2012 Inventor of the Year, Ukraine, in 2011 Awarded with State Prize of Ukraine in Science and Technique, in 2015 Awarded honorary degree Honoured Scientist of Ukraine, in 1986 -1990 Awarded the Best Inventor of Glushkov Institute of Cybernetics, National Ukrainian Academy of Sciences, in 1975 - 1985 Awarded with Silver and Bronze Medals of All-USSR Exhibition of Achievements of National Economy for Special-Purpose Data Converters, he published more than 200 articles, 40 patents and seven books.

Soshu Kirihara

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Stereolithographic Additive Manufacturing for Smart Structure Modulations

In stereolithographic additive manufacturing (STL-AM), 2-D cross sections were created through photo polymerization by UV laser drawing on spread resin paste including nanoparticles, and 3-D models were sterically printed by layer lamination. The lithography system has been developed to obtain bulky ceramic components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust the beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the row material of the 3-D printing, nanometer sized metal and ceramic particles were dispersed into acrylic liquid resins at about 60 % in volume fraction. These materials were mixed and deformed to obtain thixotropic slurry. The resin paste was spread on a glass substrate with 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted to 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was automatically changed for an adequate solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In recent investigations, ultraviolet laser lithographic additive manufacturing (UVL-AM) was newly developed as a direct forming process of fine metal or ceramic components. As an additive manufacturing technique, 2-D cross sections were created through dewaxing and sintering by UV laser drawing, and 3-D components were sterically printed by layer laminations with interlayer joining. Through computer-aided smart manufacturing, design, and evaluation (Smart MADE), practical material components were fabricated to modulate energy and material transfers in potential fields between human societies and natural environments as active contributions to Sustainable Development Goals (SDGs).

Biography

Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics as Sustainable Geoengineering” for environmental modifications and resource circulations, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Rached Dhaouadi

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Modeling and Control of a Large Solar-Powered Quadcopter using AI and Machine Learning

This presentation deals with the design challenges of large-scale quadcopters that incorporate on-board solar panels with a solar-based charging system to extend the flight time of operation. Optimal sizing is essential for selecting the quadrotor structure and solar cell arrays. The large size also leads to a flexi-structure with possible bending modes, which will be challenging for the control system design.

The project aims to strengthen the bridge between simulations and actual system design through an automated CAD based modeling system combined with AI and machine learning techniques for Neuro-flight controller design. A Neuro-flight controller is a neural-network-enabled flight controller software powered by machine learning to optimize flight performance. First, the automated CAD modeling system generates realistic mathematical and visual models for Matlab / SimMechanics Physics simulation and visualizations utilizing SolidWorks and dynamical systems analysis. Next, the Neuro-flight controller is trained in computer simulation to adapt to a wide range of different events, suppressing the natural vibrations of the quadrotor platform, and correcting the quadrotor position inside a dynamic and changing environment.

Biography

Rached Dhaouadi received the M.Sc. and Ph.D. degrees from the University of Minnesota, USA, in 1988 and 1990 respectively, in Electrical Engineering. Dr. Dhaouadi has over 30 years of industrial and academic experience in various universities. From 1990 to 1994 he worked as a Visiting Researcher with the Hitachi Research Laboratory, Hitachi, Ltd., Japan, where he was engaged in the design and development of motor drive systems for rolling mills. In 1994, he was a Visiting Researcher at the Norwegian University of Science and Technology (NTNU), Trondheim, Norway. From 1994 to 2000 he was with the Polytechnic School of Tunisia, University of Tunis.

Alma Y. Alanis
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Data-Based Neural Resilient Fault Tolerant Control for Discrete-time Unknown Nonlinear Systems

The development of resilient and fault-tolerant controllers is especially important for industrial processes, transportation systems, medical devices, robotic systems, and many other specialized applications that need to guarantee an acceptable level of operational normality despite their complexity. On the other hand, modern control systems require the availability of a mathematical model to be controlled or at least a nominal model, this type of requirement delays and complicates the design of the controller, a growing approach is the design of controllers based on data, most of the time they are designed using artificial intelligence approaches.

Furthermore, operating a complex system in different regimes requires the controller to be intelligent with adaptive and learning capabilities in the presence of unknown disturbances, unmodeled dynamics, and unstructured uncertainties. In this way, there are several published works on data-based control. Data-driven control can be considered as a recent approach to control complex systems and has a wide range of successful applications, from intelligent transportation systems to energy management and robotics.

Therefore, proposed controller deals with unknown dynamics, uncertainties, external disturbances applied to the controller and the state of the system, all of them considered by the neural model obtained. The stability analysis of the scheme is included based on the Lyapunov methodology for the entire proposed scheme.

Biography

Alma Y. Alanis, received the Ph.D. degree in electrical engineering from the Advanced Studies and Research Center of the National Polytechnic Institute (CINVESTAV-IPN), Guadalajara Campus, Mexico, in 2007. Since 2008 she has been with University of Guadalajara, where she is currently a Dean of the Technologies for Cyber-Human Interaction Division, CUCEI. She is also member of the Mexican National Research System (SNI-2) and member of the Mexican Academy of Sciences. She has published more than 200 papers in recognized International Journals and Conferences, besides eight international books. She is a Senior Member of the IEEE and Subject Editor of the Journal of Franklin Institute, Section Editor at Open Franklin, Technical editor at ASME/IEEE Transactions on Mechatronics and Associate Editor at IEEE transaction on Cybernetics, Intelligent Automation & Soft Computing and Computer Sciences PeerJ, moreover she is currently serving on a number of IEEE and IFAC Conference Organizing Committees. Her research interest centers on artificial neural networks, learning systems, intelligent control, intelligent systems.

Vinayak Elangovan

Computer Science program, Division of Science and Engineering, Penn State Abington University, Abington, Pennsylvania, USA.

Surface Defects Detection and Classification on Metallic Parts

Inspection of metallic parts is a challenging task in manufacturing industries. The massive repetition nature of Quality Inspection (QI) arises a demand for development of auto inspection system. While QI of most manufacturing products has a clear standard, it is possible to train robots and develop algorithms to autom-automate the process of detecting defects and classifying objects as accepted or rejected products. Computer visions are typically used for the purpose of inspection, detection, recognition, and classification of surface features representing manufacturing imperfections. This talk primarily focuses on 1. programming a robotic arm to pick and drop objects of interest and capturing multiple images of the object using an imagery acquisition system; and 2. developing computer vision and machine learning algorithms for detection, extraction, and assessment of surface conditions.

Biography

Abington. He earned his Ph.D. in Computer Information Systems Engineering at Tennessee State University. His research interest includes computer vision, machine vision, robotics, multi-sensor data fusion and activity sequence analysis. He has published more than 20 peer-reviewed scientific articles in field of Artificial Intelligence (AI). He is active in the scientific community as a peer reviewer for highly acclaimed journals. He also served as a review board member, editorial board member, program committee member for number of AI journals and conferences.

Eduard Babulak

Liberty University, United States.

Smart Heath via Humanoid Robotics

Given the current dynamic developments in the field of Smart Medicine, Humanoid Robotics and AI, with the ubiquitous access to high-speed Internet 24/7, the Ultra-smart Cyberspace is becoming reality. The Smart Computational Systems are collecting, processing and analyzing a real-time medical data utilizing the Electronic Health Record (EHR) to fast treatment, prevention and healing of the wave of new viruses and diseases and ultimately safe human lives.

The areas of research in the field of AI & Humanoid Robotics create a new platform for tele-Medicine utilizing new biomechanical humanoid devices. In light of currently ongoing developments of Covid-19 crisis, having effective real-time application of Ultra-smart Cyberspace, with applied AI & Robotics and Big Data will support critical live saving surgeries in Next generation tele-Medicine [6].

Due to Covid-19, the humanity lives in the most dramatic times, yet despite of its most negative impact it does also inspire dynamic innovation, research and developments in the world of health, business, government, industry, plus., while promoting seamless creation of multidisciplinary teams of experts in the nation and worldwide.

The author discuss the current and future dynamic trends in research, innovation and developments of cutting-edge Humanoid Robotics that would provide support to save lives and to make best real-time decisions worldwide.

Keywords:
Smart Cyberspace, Humanoid Robotics, Future Heath, AI.

Biography

Professor Dr. Eduard Babulak is accomplished international scholar, researcher, consultant, educator, professional engineer and polyglot, with more than thirty years of experience. He served as successfully published and his research was cited by scholars all over the world. He serves as Chair of the IEEE Vancouver Ethics, Professional and Conference Committee.

INVITED PRESENTATIONS

Imen Masmoudi

AI, ENIT, Tunis, Manar, Tunisia.

The Evolution of AI:

The evolution of Artificial Intelligence enabled us to recognize pattern in the data, to predict accurately the future data and to recognize features in the images. We now can do so much more with the help of the power of AI. In this session, we will explore the evolution of AI and the innovation of it with an introduction to its basics and how far they can take you.

Biography

Imen Masmoudi, an Industrial Engineering Student from the National Engineering School of Tunis, ENIT, Tunisia. She is the founder of Google Developer Student Club ENIT under the Google Developer Student Clubs Program by Google. She is now a Google Developer Student Clubs' Mentor, mentoring five clubs in Tunisia. She is also a Google Women Techmakers Ambassador and Tunis Toastmasters' Elected President and one of its co-founders, which is a nonprofit educational organization that teaches public speaking and leadership skills.

Yigit Cagatay KUYU

[1]R&D department, Karsan Automotive, Bursa.

Computational Intelligence Techniques in Transportation: Vehicle Routing

The rapid and recent developments in computer technology and scientific activities have created synergy to enable many of the operations in transportation quickly and effectively. The vehicle routing problem (VRP) has received great attention in recent years since it includes the processes of systematically making decisions as efficient as possible through a set of constraints, which can be modeled as a real-world application associated with problems of road transportation. An optimized routes result in less distance, which means decreasing delivery costs. Since the optimal way decisions can be expressed in a variety of routes with some specific rules, this makes VRP a challenging problem. This study presents a variety of contemporary computational intelligence methods to paint a complete picture of the techniques found in the literature and to highlight recent trends in the solution approaches to the routing problems.

Biography

Yigit Çagatay KUYU received BSc and MSc degrees in Electronics Engineering from the Bursa Uludağ University, Bursa, Turkey, in 2013 and in 2016. He is currently a PhD candidate at the Bursa Uludağ University, Engineering Faculty, Electrical-Electronics Engineering Department. In the past, he has been a researcher at the University of Eastern Finland and at the University of Deusto. He has more than 30 scientific articles and has been reviewed many research papers of journals and conferences. Currently, he is working for KARSAN Automotive, which has developed the first autonomous bus, as an autonomous software engineer. His interests include evolutionary computation, algorithm development, and artificial intelligence.

Imad EL MALLAHI[1*], Nabil ALAMI[2], Jamal RIFFI[1], Hamid TAIRI[1], and Mohamed Adnane Mahraz[1]

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An intelligent transportation system of traffic accident severity prediction using convolutional neural network

In this paper, we propose a new method for smart transportation system focus on severity prediction for traffic accidents, which is a huge step in transportation and health management. This issue provides impo-rtant information for emergency logis-tical, and transportation. To evaluate the severity of road accidents, we evaluate the potential impact of the accident, and realize effective accident management proce-dures. In this context, we propose a new convolutional neural network model to pro-mote the accuracy of traffic accident severity prediction for traffic accident gravity that takes into account the fusion between traffic accident characteristics. In order to substitute the traffic accident features with a database of level-degree images, we implemented a script that converts the features into a set of level-degree objects in order to make a parallel correlation for the neural network input, in order to show the robustness of the prediction to the comparison by other models. To validate this experimentation, the Morocco data base from department Transport to classify the Severity prediction for Traffic accidents into three classes: severe, less severe, and worse

Biography

Imad EL MALLAHI has PhD from Faculty of sciences Dhar el Mahraz, Sidi Mohammed ben abdellah University, Morocco. He is the Engineering of Computer sciences. He has published more than 2 papers in reputed conference and has been serving as an editorial board member of repute.

E-POSTER PRESENTATIONS

Magda Tsolaki[1], Vassilis G. Kaburlasos[2], Chris Lytridis[2], Christos Bazinas[2] and Giorgios Siavalas[2]

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Social Robots for Pedagogical Rehabilitation in Special Education for the Elderly

Numerous studies have reported social robot applications for children including both typical and special education. Similar applications for the elderly are underplayed. However, children grow to adults and, ultimately, to elderly. This preliminary work, based on our expertise with social robot NAO in special education applications for children, reports an approach for engaging social robots for elderly with Alzheimer's disease. In particular, a social robot, equipped with a variety of electronic sensors and supported by suitable mathematical models implemented in software, is engaged as a Cyber Physical System (CPS) with a reasoning capacity toward an interpretable interaction with humans. Following confirmation of eligibility and informed consent for elderly with Alzheimer's disease, two sets of interventions have been designed as follows. In the first set, the participants are randomly partitioned in two groups: a) the "treatment group", where the intervention will be delivered by the humanoid robot Pepper with the support of a special education teacher, and b) the "control group", where the intervention will be delivered by a special education teacher exclusively. Furthermore, since a social robot can be employed as a companion to the elderly, in the second set, the participants are randomly partitioned in two groups: a) the "treatment group", where a person with cognitive problems will be accompanied by the humanoid robot Pepper and b) the "control group", where a person with cognitive impairment will not be accompanied. In both sets of interventions, all participants will be examined with an extended neuropsychological examination pre- and post- intervention.

Acknowledgment

This work has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 777720.

Biography

Vassilis G. Kaburlasos has received the Diploma degree from the National Technical University of Athens, Greece, in 1986, and the M.Sc. and Ph.D. degrees from the University of Nevada, Reno, NV, USA, in 1989 and 1992, respectively, all in electrical engineering.

He currently serves as a Tenured Full Professor in the Department of Computer Science at the International Hellenic University (IHU), Greece; since 2019 he also serves as an elected member of IHU's Research Committee. He is founder and director since 2016 of the HUman-MAchines INteraction (HUMAIN) research Lab (http://humain-lab.cs.ihu.gr/?lang=en) at IHU having accessed projects of total budget over 5M EUR.