SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

23 January – 19 March 2021

TOPICAL REPORT

ROBOTICS & AUTOMATION

Gain insight and keep up-to-date with the latest publications carefully selected by the library from credible sources in academic publications, industry & market research and scientific & industry news.
If you have any sources to suggest for our report please let us know.

view past reports | subscribe to others | unsubscribe

news

AUTOMATION

Will we enjoy our work more once routine tasks are automated? – Not necessarily, suggests a recent study

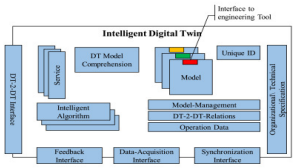
"Research conducted at Åbo Akademi University suggests that when routine work tasks are being replaced with intelligent technologies, the result may be that employees no longer experience their work as meaningful."
Source: Abo Akademi University

Recommended for You: Role, Impact of Tools Behind Automated Product Picks Explored

"As you scroll through Amazon looking for the perfect product, or flip through titles on Netflix searching for a movie to fit your mood, auto-generated recommendations can help you find exactly what you're looking for among extensive offerings. These recommender systems are used in retail, entertainment, social networking and more. In a recently published study, two researchers from The University of Texas at Dallas investigated the informative role of these systems and the economic impacts on competing sellers and consumers."
Source: The University of Texas At Dallas

academic

AUTOMATION



Realization of AI-enhanced industrial automation systems using intelligent Digital Twins

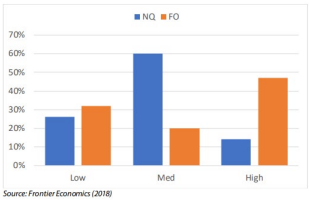
"The World Robotics report shows that Europe is the region with the highest robot density globally, with an average value of 114 units per 10,000 employees in the manufacturing industry. For more facts about robots watch IFR´s video news about Europe in one minute."
Source: Elsevier

Automation and manufacturing of smart materials in additive manufacturing technologies using Internet of Things towards the adoption of industry 4.0

"Mass customization and personalization are the significant implications of Industry 4.0. Even though additive manufacturing (AM) technologies possess the capability to personalize final products, they cannot be used for mass production of the 3D printed job on a large scale. Their inability to perform production processes for large-sized objects adds to the disadvantages. Consequently, the industries are hesitant regarding the idea of AM techniques to carry out commercial productions. Therefore, this research-based study aims to efficiently identify and utilize

reports

AUTOMATION



Digital automation and the future of work

"This report addresses the nature, scope and possible effects of digital automation. It reviews relevant literature and situate s modern debates on technological change in historical context. It identifies threats to job quality and an unequal distribution of the risks and benefits associated with digital automation. It also offers some policy options that, if implemented, would help to harness technology for positive economic and social ends."
Source: European Parliamentary Research Service

Automation Across Clouds, Networks, and Workloads Power the 5G Service Assurance Market, 2021

"5G represents a fundamental shift in communication network architectures and will accelerate revenue generation through innovative services facilitated via 5G-enabled smartphones, tablets, laptops, and Internet of Things (IoT) devices. It will provide communications service providers (CSPs) a potent combination of network capabilities and flexible network deployment options that improve their ability to deliver a

Automated Control Gives Walnut Processor Real-Time Insight Into Inventory

"Switching over from manual recordkeeping to digital tracking has provided the producer with a more accurate view of walnut quantities, qualities, and a host of other attributes that were previously difficult to monitor."
Source: Automation World

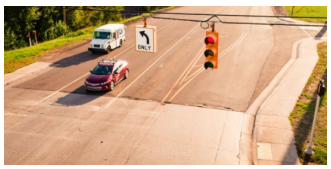
Automation Trends in Food Processing and Packaging: Remote Access

"Remote access and augmented reality are two technologies that have seen increased usage in the food industry – particularly since the start of COVID-19."
Source: Automation World

New 3D Perception: Autonomous Lift Trucks Must Never Compromise Accuracy

"Automation must never compromise accuracy particularly in fast-moving consumer goods warehouses and distribution centers. Autonomous lift trucks, also called autonomous forklifts or autonomous reach trucks, are gaining that accuracy through 3D camera technology, which gathers 20-30 times more data than 2D perception to deliver higher pick/drop accuracy (+/-10mm)."
Source: Automation.com

AUTONOMOUS VEHICLES



Cooperative Eco-driving Automation Improves Energy Efficiency, Safety on City Streets

"Cooperative driving helps cars and their drivers safely and efficiently navigate. The framework uses an eco-driving algorithm that prioritizes saving fuel and reducing emissions. The automated algorithm calculates location-based traffic control devices and roadway constraints using maps and geographic information. The research is led by Kuilin Zhang, associate professor of civil and environmental engineering and affiliated associate professor of computer science at Michigan Tech, along with Shuaidong Zhao '18, now a senior quantitative analyst at National Grid."
Source: Michigan Tech

People blame a vehicle's automated system more than

Industry 4.0 technologies to improve AM processes' reliability and mass 3D print smart materials for manufacturers globally."
Source: Proceedings from Materials Today

Back to the past: the historical roots of labor-saving automation

"This paper, relying on a still relatively unexplored long-term dataset on U.S. patenting activity, provides empirical evidence on the history of labor-saving innovations back to early nineteenth century. The identification of mechanization/automation heuristics, retrieved via textual content analysis on current robotic technologies by Montobbio et al. (Robots and the origin of their labour-saving impact, LEM Working Paper Series 2020/03), allows to focus on a limited set of CPC codes where mechanization and automation technologies are more prevalent."
Source: Springer Link

Transforming media agency? Approaches to automation in Finnish legacy media

"The algorithmic automation of media processes has produced machines that perform in roles that were previously occupied by human beings. Recent research has probed various theoretical approaches to the agency and ethical responsibility of machines and algorithms. However, there is no theoretical consensus concerning many key issues. Rather than setting out with fixed conceptions, this research calls for a closer look at the considerations and attitudes that motivate actual attributions of agency and responsibility."
Source: Sage Journals

Should We Just Let the Machines Do It? The Benefit and Cost of Action Recommendation and Action Implementation Automation

"Objective: To examine the effects of action recommendation and action implementation automation on performance, workload, situation awareness (SA), detection of automation failure, and return-to-manual performance in a submarine track management task."
Source: Sage Journals

Evaluating driver eye glance behavior and secondary task engagement while using driving automation systems

"The results of this study demonstrate that drivers spent more time looking away from the road while driving automation systems were active and

differentiated, customized, and scalable wireless experience. Frost & Sullivan predicts that 5G connections in the US will increase from less than 15 million in 2020 to 350 million by 2026, achieving a penetration rate of approximately 70%. Globally, 5G connections will reach 3.5 billion by 2026."
Source: Frost & Sullivan

ANALYSIS AND REPORT

Comprehensive Analysis On Service Robotics Market Research Report 2021

"Service Robotics Industry Outlook 2021
The outbreak of covid-19 in the global market has made companies uncertain about their future scenario as the prolonged lock-down finds a serious economic slump. The latest survey on COVID-19 Outbreak-Global Service Robotics Market is conducted to provide hidden gems performance analysis. Essential growth factors and study of Basis points [BPS] have been discussed in the following report. Research Report explains a detailed overview of market dynamics, segmentation, product portfolio, business plans, and the latest development in the industry."
Source: The Courier

Report on Criminal Liability, Robotics and AI Systems

"It has been said that we are at an inflection point in the development and use of Artificial Intelligence (AI). The exponential growth in data in the past decade – from 2 trillion gigabytes in 2010 to around 33 trillion at the end of 2018, and an anticipated 175 trillion by 2025 – has enabled giant datasets to be compiled and used as the basis for developing ever-more sophisticated AI systems. Those systems are in turn being used – in commercial, military, consumer and other contexts – to enhance humans' ability to carry out tasks, or to replace humans altogether. From self-driving cars and robotic carers, to autonomous weapons and automated financial trading systems, robotic and other data-driven AI systems are increasingly becoming the cornerstones of our economies and our daily lives. Increased automation promises significant societal benefits. Yet, as ever more processes are carried out without the involvement of a 'human actor', the focus turns to how those robots and other autonomous systems operate,

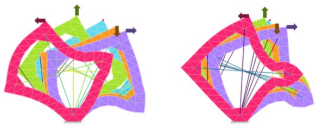
its driver when accidents happen

"Semi-autonomous vehicles (semi-AVs), which allow humans to supervise the driving and take control of the vehicle, are already on the road. For example, the 2020 Tesla Model S offers an Autopilot system, and the 2020 Cadillac CT6 has a Super Cruise system. In both, the driver must be ready to take control of the car at any moment.

However, this new study suggests that questions are likely to arise regarding blame, responsibility, and compensation when a semi-AV is involved in a collision."

Source: The Society for Risk Analysis

SOFT ROBOTICS



Helping soft robots turn rigid on demand

"The World Robotics report shows that Europe is the region with the highest robot density globally, with an average value of 114 units per 10,000 employees in the manufacturing industry. For more facts about robots watch IFR´s video news about Europe in one minute."

Source: MIT News

Soft robots use camera and shadows to sense human touch

"Cornell researchers have created a low-cost method for soft, deformable robots to detect a range of physical interactions, from pats to punches to hugs, without relying on touch at all. Instead, a USB camera located inside the robot captures the shadow movements of hand gestures on the robot's skin and classifies them with machine-learning software."

Source: Cornell University

Light-Driven Thin-Film Robots Feel the Heat – Associate Professor Ho Ghim Wei

"(Nanowerk Spotlight) Living organisms have inspired research of soft robotics that mimic the complex motion of animals and plants. However, current soft robots have limited or no sensory capabilities, which hinder their development toward artificial intelligent robots that could feel.

The grand challenge lies in achieving highly integrated actuation and sensing mechanisms, which becomes even more difficult when the robot size is small-scale, down to centimeters."

that drivers were more likely to be observed browsing on their cell phones while using driving automation systems. Current driving automation features require human monitoring of automation, yet the drivers of these automation-equipped vehicles are inclined to engage in secondary tasks and take longer and more frequent glances away from the roadway."

Source: Elsevier

Preparation and control of intelligent automation systems A goal-oriented automation framework

"The volatile nature of the environment of such intelligent automation systems lead to an enormous amount of possible situations that can arise and which need to be suitably handled. This complexity makes development of control systems for intelligent automation systems difficult using traditional methods. As an alternative, this thesis presents a model-based control framework, which uses a combination of formal specification and automated planning. The proposed framework allows for defining the intentions of the automation system on a high level, which enables decisions that influence when things should occur to be modeled using logical constraints, rather than programming."

Source: Chalmers University of Technology

Automation of Target Delivery and Diagnostic Systems for High Repetition Rate Laser-Plasma Acceleration

"Fast solid target delivery and plasma-ion detection systems have been designed and developed to be used in high intensity laser-matter interaction experiments. We report on recent progress in the development and testing of automated systems to refresh solid targets at a high repetition rate during high peak power laser operation (>1 Hz), along with ion diagnostics and corresponding data collection and real-time analysis methods implemented for future use in a plasma-based ion acceleration beamline for multidisciplinary user applications."

Source: MDPI

Computerized Manufacturing Automation: Special Issue of Design and Applications in Robotics

"Robotics & Automation have made great strides in the last two decades and are being successfully deployed in Indian manufacturing Industries especially in Automobile Sector. This

how they 'learn', and the data on which they base their decisions to act."

Source: Singapore Academy of Law

Artificial Intelligence and Robotic Innovations Transforming the Global Endoscopy Devices Market

"As the need and preference for minimally invasive surgeries are rapidly rising, the demand for endoscopic procedures is also witnessing substantial growth. Since endoscopes are minimally invasive and use the natural openings of the body for insertion to aid physicians with enhanced images for the purpose of diagnosis and therapy, the need for scopes with smaller diameters and improved flexibility has been leading to the development of advanced endoscopic devices. Since modern endoscopy has few risks, is relatively quick, and delivers detailed images for diagnosis, it has proven incredibly essential across different application segments."

Source: Frost & Sullivan

Growth Opportunities In Collaborative Robots, Metal 3d Printing, And Remote Monitoring In Manufacturing

"The Advanced Manufacturing Technology Opportunity Engine for March 2021 covers innovations in collaborative robots, metal 3D printing, and remote monitoring in manufacturing. Some of the profiles include artificial intelligence-based cobots and automatic tool changer cobots, SLM and PBF advancements in metal 3D printing, remote monitoring, and maintenance in manufacturing and warehouse robots."

Source: Frost & Sullivan

Growth Opportunities In Robotic Exoskeletons, Optical Weld Seam Tracking, And Scaffolding Robots

"The Advanced Manufacturing Technology Opportunity Engine for February 2021 covers innovations in robotic exoskeletons, laser scanning for optical weld seam tracking, scaffolding robots for construction logistics, a cloud platform suitable for entire manufacturing supply chain, 3D printing, edge computing, and IoT."

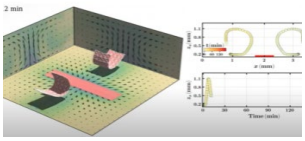
Source: Frost & Sullivan

Comprehensive Analysis On Commercial Robotics Market Research Report 2021

"he Commercial Robotics Market report makes available the current and forthcoming technical and

Source: National University of Singapore Engineering

SWARM ROBOTICS



Scientists use 'swarmalation' to design active materials for self-regulating soft robots

"In the synthetic realm there are hardly any materials systems where individual units simultaneously synchronize their spatial assembly, temporal oscillations and morphological changes.

Such highly self-organizing materials are important for creating self-propelled soft robots that come together and cooperatively alter their form to accomplish a regular, repeated function."

Source: Robotics and Automation

INDUSTRIAL ROBOTS

More flexible gear machining for industrial robots

"Today's industrial robots must fit into smaller spaces, so as much "manufacturing real estate" as possible is dedicated to production. This places pressure on manufacturers to machine smaller, tighter components for these machines. Here, Harish Maniyoor, global product manager for automotive at the machine tooling specialist Sandvik Coromant explains why power skiving is the answer."

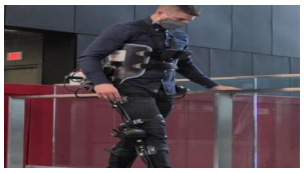
Source: Robotics and Automation

Comau launches new high-speed collaborative robot

"Comau has launched its Racer-5-0.80 collaborative robot – or Racer-5 Cobot – which it describes as "a new paradigm in collaborative robotics" that meets the growing demand for fast, cost-effective cobots that can be used in restricted spaces and in different application areas."

Source: Robotics and Automation

ARTIFICIAL INTELLIGENCE



paper tries to high light the major issues, critical to successful implementation of Automation and a few thrust areas of activities that need to be looked upon in the immediate future. The paper further lists out the various levels of automation for the efficient CAD/CAM implementation and analyses the thrust areas of Robotics and its application that utilize the manpower efficiently"

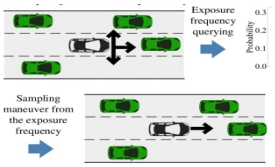
Source: Elsevier

Takeout Service Automation With Trained Robots in the Pandemic-Transformed Catering Business

"In our Mots system, we develop a bump-free schedule based on the Welsh-Powell coloring algorithm for grouping robots into several non-colliding moving batches. Simulation results show that our Mots solution can effectively improve takeout efficiency and promote service accuracy, boosting business profits up to 95.4% under simulated cases for various cafeteria scales and shop popularity differences, compared to the traditional takeout method. Our experiments suggest that Mots is also capable of accommodating a sudden surge of arriving patrons within a short period of time."

Source: IEEE Xplore

AUTONOMOUS VEHICLES



Intelligent driving intelligence test for autonomous vehicles with naturalistic and adversarial environment

"We discover that sparse but adversarial adjustments to the naturalistic driving environment, resulting in the naturalistic and adversarial driving environment, can significantly reduce the required test miles without loss of evaluation unbiasedness. By training the background vehicles to learn when to execute what adversarial maneuver, the proposed environment becomes an intelligent environment for driving intelligence testing."

Source: Nature Communications

Risk assessment based collision avoidance decision-making for autonomous vehicles in multi-scenarios

"In this paper, we proposed a new risk assessment based decision-making algorithm to guarantee collision avoidance in multi-scenarios for autonomous vehicles. A probabilistic-

financial details of the industry. It is one of the most comprehensive and important additions to the Prudent Markets archive of market research studies. It offers detailed research and analysis of key aspects of the global Commercial Robotics market. This report explores all the key factors affecting the growth of the global Commercial Robotics market, including demand-supply scenario, pricing structure, profit margins, production, and value chain analysis."

Source: The Bisouv Network

TRENDS

Top 5 Robot Trends 2021

"Annual installations of industrial robots more than tripled within ten years (2010-2019) reaching 381 thousand units in factories around the world. The International Federation of Robotics shows top 5 trends shaping industries around the globe."

Source: International Federation of Robotics

Engineers combine AI and wearable cameras in self-walking robotic exoskeletons

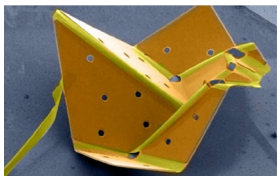
"Robotics researchers are developing exoskeleton legs capable of thinking and making control decisions on their own using sophisticated artificial intelligence technology."
Source: University of Waterloo

QUANTUM TECHNOLOGY AND ROBOTS

Robots learn faster with quantum technology

"Artificial intelligence is part of our modern life. A crucial question for practical applications is how fast such intelligent machines can learn. An experiment has answered this question, showing that quantum technology enables a speed-up in the learning process. The physicists have achieved this result by using a quantum processor for single photons as a robot."
Source: Universität Wien

ROBOT DESIGNS



Self-folding nanotech creates world's smallest origami bird

"Cornell researchers have created micron-sized shape memory actuators that enable atomically thin two-dimensional materials to fold themselves into 3D configurations. All they require is a quick jolt of voltage. And once the material is bent, it holds its shape – even after the voltage is removed."
Source: Cornell University

This Robot Doesn't Need Any Electronics

"Engineers at the University of California San Diego have created a four-legged soft robot that doesn't need any electronics to work. The robot only needs a constant source of pressurized air for all its functions, including its controls and locomotion systems."
Source: University of California San Diego

ROBOTIC GRIPPER

model based situation assessment module using conditional random field was proposed to assess the risk level of surrounding traffic participants. Based on the assessed risk from the situation assessment module, a collision avoidance strategy with driving style preferences (e.g., aggressive or conservative) was proposed to meet the demands of different drivers or passengers."
Source: Elsevier

A Survey of Autonomous Vehicles: Enabling Communication Technologies and Challenges

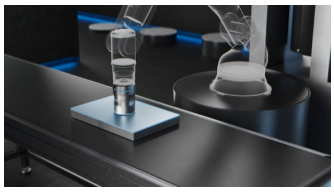
"The Department of Transport in the United Kingdom recorded 25,080 motor vehicle fatalities in 2019. This situation stresses the need for an intelligent transport system (ITS) that improves road safety and security by avoiding human errors with the use of autonomous vehicles (AVs). Therefore, this survey discusses the current development of two main components of an ITS: (1) gathering of AVs surrounding data using sensors; and (2) enabling vehicular communication technologies. First, the paper discusses various sensors and their role in AVs. Then, various communication technologies for AVs to facilitate vehicle to everything (V2X) communication are discussed."
Source: MDPI

An adaptive modified neural lateral-longitudinal control system for path following of autonomous vehicles

"A vehicle's severely nonlinear dynamics due to the forces acting between road and vehicle tires, the coupling characteristic, and the uncertainties of parameters such as wheel moment of inertia and vehicle mass have made it rather difficult to approximate a precise mathematical model of vehicle dynamics. In this paper, to overcome these challenges we propose a model-independent control method based on improved adaptive neural controllers for path tracking control of AVs."
Source: Elsevier

Transitioning to a driverless city: Evaluating a hybrid system for autonomous and non-autonomous vehicles

"Autonomous vehicles will transform urban mobility. However, before being fully implemented, autonomous vehicles will navigate cities in mixed-traffic roads, negotiating traffic with human-driven vehicles. In this work, we simulate a system of autonomous vehicles co-existing with human-driven vehicles, analyzing the consequences of



OnRobot launches advanced new magnetic gripper for robots

"OnRobot has launched the MG10, which it describes as "a versatile, high-performance, easy to use magnetic gripper" for material handling, assembly and machine tending applications in manufacturing, automotive and aerospace environments."
Source: Robotics and Automation

HEALTHCARE

The (robotic) doctor will see you now

"In the era of social distancing, using robots for some health care interactions is a promising way to reduce in-person contact between health care workers and sick patients. However, a key question that needs to be answered is how patients will react to a robot entering the exam room."
Source: MIT News

Sensing robot healthcare helpers being developed at SFU

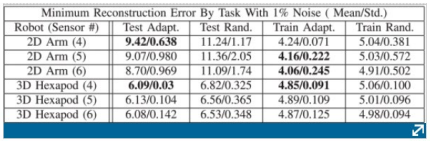
"Robots that could take on basic healthcare tasks to support the work of doctors and nurses may be the way of the future. Who knows, maybe a medical robot can prescribe your medicine someday? That's the idea behind 3D structural-sensing robots being developed and tested at Simon Fraser University by Woo Soo Kim, associate professor in the School of Mechatronic Systems Engineering."
Source: Simon Fraser University

TACTILE SENSOR

Novel soft tactile sensor with skin-comparable characteristics for robots

"A joint research team co-led by City University of Hong Kong (CityU) has developed a new soft tactile sensor system design choices. The system consists of a network of arterial roads with exclusive lanes for autonomous vehicles where they can travel in platoons. This paper presents the evaluation of this system in realistic scenarios evaluating the impacts of the system on travel time using mesoscopic traffic simulation."
Source: Elsevier

SOFT ROBOTICS



Minimum Reconstruction Error By Task With 1% Noise (Mean/Std.)

Robot (Sensor #)	Test Adapt.	Test Rand.	Train Adapt.	Train Rand.
2D Arm (4)	**9.42/0.638**	11.24/1.17	4.24/0.071	5.04/0.381
2D Arm (5)	9.07/0.980	11.36/2.05	**4.16/0.222**	5.03/0.572
2D Arm (6)	8.70/0.969	11.09/1.74	**4.06/0.245**	4.91/0.502
3D Hexapod (4)	**6.09/0.03**	6.82/0.325	**4.85/0.091**	5.06/0.100
3D Hexapod (5)	6.13/0.104	6.56/0.365	4.89/0.109	5.01/0.096
3D Hexapod (6)	6.08/0.142	6.53/0.348	4.87/0.125	4.98/0.094

Co-Learning of Task and Sensor Placement for Soft Robotics

"In this work, we present a novel representation for co-learning sensor placement and complex tasks. Specifically, we present a neural architecture which processes on-board sensor information to learn a salient and sparse selection of placements for optimal task performance. We evaluate our model and learning algorithm on six soft robot morphologies for various supervised learning tasks, including tactile sensing and proprioception."
Source: IEEE Xpore

Thermo-Mechanical Behaviour Of Sma Wire Embedded Pdms Actuator Towards Soft Robotics Applications

"The actuation behaviour of the shape memory alloy (SMA) wire-embedded polydimethylsiloxane (PDMS) based soft robotic actuator has been investigated. The fabricated soft robotic actuator has been actuated through resistive heating under varying input current. The soft actuator has showed a maximum displacement of 7.5 mm at 2 A input current. To widen the displacement capabilities of the soft actuator, the SMA wire was pre-strained in the range 1%–8% before being embedded in the soft matrix."
Source: ACTA Press

Artificial Cutaneous Sensing of Object Slippage using Soft Robotics with Closed-Loop Feedback Process

"This study proposes a soft sensor with a closed-loop feedback system for dynamic shear force detection to address object slippage in a soft robotic gripper. The sensor is made of a ferroelectric polymer with nanocarbon materials because of the resulting improved crystallinity and good sensitivity. The sensor shows high performance and high-speed response for detecting dynamic shear

with skin-comparable characteristics. A robotic gripper with the sensor mounted at the fingertip could accomplish challenging tasks such as stably grasping fragile objects and threading a needle. Their research provided new insight into tactile sensor design and could contribute to various applications in the robotics field, such as smart prosthetics and human-robot interaction."
Source: City University of Hong Kong

ROBOT-HUMAN INTERACTIONS

Robots can use eye contact to draw out reluctant participants in group

"Eye contact is a key to establishing a connection, and teachers use it often to encourage participation. But can a robot do this too? Can it draw a response simply by making "eye" contact, even with people who are less inclined to speak up. A recent study suggests that it can."
Source: KTH, Royal Institute of Technology

Foam Sword Fencing With a PR2 Is the Best Kind of Exercise

"Most of what we cover in the Human Robot Interaction (HRI) space involves collaboration, because collaborative interactions tend to be productive, positive, and happy. Yay! But sometimes, collaboration is not what you want. Sometimes, you want competition."
Source: IEEE Spectrum

HUMANOID ROBOTS

Hyundai Motor Group Introduces Two New Robots

"Over the past few weeks, we've seen a couple of new robots from Hyundai Motor Group. This is a couple more robots than I think I've seen from Hyundai Motor Group, like, ever. We're particularly interested in them right now mostly because Hyundai Motor Group are the new owners of Boston Dynamics, and so far, these robots represent one of the most explicit indications we've got about exactly what Hyundai Motor Group wants their robots to be doing."
Source: IEEE Spectrum

forces when fragile objects (e.g., vegetables) slip from the soft gripper. The artificial cutaneous sensor shows high sensitivity for grasping such objects with the gripper."
Source: Wiley Online Library

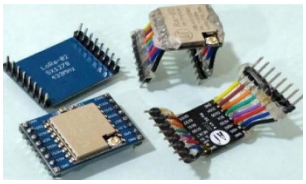
Untethered Multimode Fluidic Actuation: A New Approach to Soft and Compliant Robotics

"In this study, we report a new and effective approach to fluidic power actuation that is untethered, easy to design, fabricate, control, and allows various modes of actuation. In the proposed approach, a sealed elastic tube filled with fluid (gas or liquid) is segmented by adaptors. When twisting a segment, two major effects could be observed: (1) the twisted segment exhibits a contraction force and (2) other segments inflate or deform according to their constraint patterns. Utilizing such effects, various actuation modes could be realized. In this research, four modes of actuation are illustrated: (1) soft actuator and pump actuation, (2) serial actuation, (3) parallel actuation, and (4) agonist and antagonist actuation."
Source: Mary Ann Liebert

Safety-enhanced control strategy of a power soft robot driven by hydraulic artificial muscles

"Power soft robots—defined as novel robots driven by powerful soft actuators, achieving both powerfulness and softness—are potentially suitable for complex collaborative tasks, and an approach to actuating a power soft robot is the McKibben artificial muscle. This study aims to show the potential of hydraulic artificial muscles to be implemented in a power soft robot with high safety, including higher stability against sudden load separation or impact disturbance, and appropriate dynamic compliance."
Source: Springer Link

SWARM ROBOTICS



Swarm Robotics: A New Framework of Military Robots

"In Industries robots are programmed to perform specified tasks like and place, packaging, transporting etc. Every robots need to be programmed individually to accomplish the task given. In the proposed work one master robots is designed and programmed in such a way that can

ROBOTICS BIOMIMETRICS

Can A Robot Operate Effectively Underwater?

"USC researchers find sea stars' shape plays an important role in their ability to withstand dynamic water forces and remain attached to surfaces."
Source: USC Viterbi School of Engineering

MIT's HERMIT Crab Robots Can Do Anything You Shell Them To

"While we've written about tool using robots in the past, roboticists at the MIT Media Lab have taken inspiration from the proud and noble hermit crab to design a robot that's able to effortlessly transition from a total generalist to highly specialized and back again, simply by switching in and out of clever, custom made mechanical shells."
Source: IEEE Spectrum

A robot able to 'hear' through the ear of a locust

"Researchers at Tel Aviv University report that they have successfully connected the ear of a dead locust to a robot that receives the ear's electrical signals and responds accordingly. The result is extraordinary: When the researchers clap once, the locust's ear hears the sound and the robot moves forward; when the researchers clap twice, the robot moves backwards."
Source: Science Daily

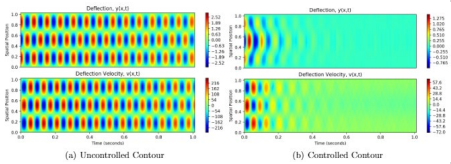
ROBOTIC SYSTEMS IN CONSTRUCTION

Emerging robotics technology may lead to better buildings in less time

"Purdue University innovators developed and are testing a novel construction robotic system that uses an innovative mechanical design with advances in computer vision sensing technology to work in a construction setting."
Source: Purdue University

train number of slave robots sequentially to perform multiple tasks at different processing lines of an industry this reduces the complexity in programming individual robots for different operations and also without programming the slave robots. This Robot plays a vital role in Industry Automation."
Source: IOP Science

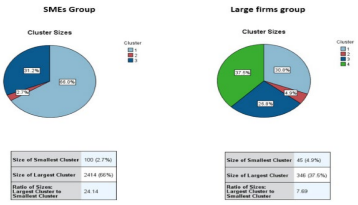
ROBOT SYSTEMS



Stochastic Spatio-Temporal Optimization for Control and Co-Design of Systems in Robotics and Applied Physics

"This manuscript provides a novel sampling-based stochastic optimization framework based entirely in Hilbert spaces suitable for the general class of \textit{semi-linear} SPDEs which describes many systems in robotics and applied physics. This framework is utilized for simultaneous policy optimization and actuator co-design optimization. The resulting algorithm is based on variational optimization, and performs joint episodic optimization of the feedback control law and the actuation design over episodes."
Source: Cornell University

MACHINE LEARNING



Impact of robotics on manufacturing: A longitudinal machine learning perspective

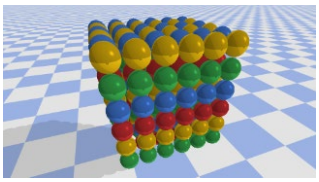
"This investigation uses an innovative machine learning model comprising an automated nested longitudinal clustering performed in two stages, and it is applied over a large sample of 4,578 companies from the Business Strategy Survey conducted by the Spanish Ministry of Finance and Public Administration.
The findings of this research are novel in this field not only because of the longitudinal modelling applied in two stages but also because of the understanding of how companies' characteristics and performance evolve over time depending on their degree of adoption of robotics."
Source: Elsevier

Machine Learning-Based Cognitive Position and Force

Controls for Power-Assisted Human–Robot Collaborative Manipulation

"Manipulation of heavy objects in industries is very necessary, but manual manipulation is tedious, adversely affects a worker's health and safety, and reduces efficiency. On the contrary, autonomous robots are not flexible to manipulate heavy objects. Hence, we proposed human–robot systems, such as power assist systems, to manipulate heavy objects in industries. Again, the selection of appropriate control methods as well as inclusion of human factors in the controls is important to make the systems human friendly."
Source: MDPI

REINFORCEMENT LEARNING



Comparing Popular Simulation Environments in the Scope of Robotics and Reinforcement Learning

"This letter compares the performance of four different, popular simulation environments for robotics and reinforcement learning (RL) through a series of benchmarks. The benchmarked scenarios are designed carefully with current industrial applications in mind. Given the need to run simulations as fast as possible to reduce the real-world training time of the RL agents, the comparison includes not only different simulation environments but also different hardware configurations, ranging from an entry-level notebook up to a dual CPU high performance server."
Source: Cornell University

Reinforcement Learning Approaches in Social Robotics

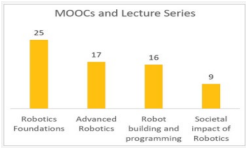
"This article surveys reinforcement learning approaches in social robotics. Reinforcement learning is a framework for decision-making problems in which an agent interacts through trial-and-error with its environment to discover an optimal behavior. Since interaction is a key component in both reinforcement learning and social robotics, it can be a well-suited approach for real-world interactions with physically embodied social robots. The scope of the paper is focused particularly on studies that include social physical robots and real-world human-robot interactions with users. We present a thorough analysis of reinforcement learning approaches in social robotics."

Source: MDPI

How to train your robot with deep reinforcement learning: lessons we have learned

"In this review article, we present a number of case studies involving robotic deep RL. Building off of these case studies, we discuss commonly perceived challenges in deep RL and how they have been addressed in these works. We also provide an overview of other outstanding challenges, many of which are unique to the real-world robotics setting and are not often the focus of mainstream RL research. Our goal is to provide a resource both for roboticists and machine learning researchers who are interested in furthering the progress of deep RL in the real world."
Source: Sage Journals

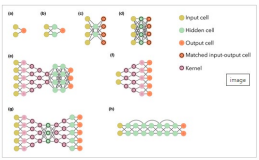
PEDAGOGY



Accessible Educational Resources for Teaching and Learning Robotics

"Robotics is now facing the challenge of deploying newly developed devices into human environments, and for this process to be successful, societal acceptance and uptake of robots are crucial. Education is already playing a key role in raising awareness and spreading knowledge about robotic systems, and there is a growing need to create highly accessible resources to teach and learn robotics. In this paper, we revise online available educational material, including videos, podcasts, and coding tools, aimed at facilitating the learning of robotics related topics at different levels. The offer of such resources was recently boosted by the higher demand of distance learning tools due to the COVID-19 pandemic."
Source: MDPI

ROBOTICS AND AI



The use of artificial intelligence and robotics in regional anaesthesia

"Robotics in anaesthesia falls into three categories. The first, used commonly, is pharmaceutical, typified by target-controlled anaesthesia using

electroencephalography within a feedback loop. Other types include mechanical robots that provide precision and dexterity better than humans, and cognitive robots that act as decision support systems. It is likely that the latter technology will expand considerably over the next decades and provide an autopilot for anaesthesia."
Source: Association of Anaesthetists

Developmental Robotics and its Role Towards Artificial General Intelligence

"In this special issue we collect and address several of the challenges that adhere to the modeling of inductive biases and developmental robots. In their review, Nguyen et al. [4] provide an overview over the state of the art in modeling the body schema and peripersonal space of robotic agents. The authors conclude by proposing a novel theoretical model to learn the peripersonal space and body schema representations."
Source: Springer Link

ROBOT MANIPULATION

Improved Learning of Robot Manipulation Tasks Via Tactile Intrinsic Motivation

"In this letter we address the challenge of exploration in deep reinforcement learning for robotic manipulation tasks. In sparse goal settings, an agent does not receive any positive feedback until randomly achieving the goal, which becomes infeasible for longer control sequences. Inspired by touch-based exploration observed in children, we formulate an intrinsic reward based on the sum of forces between a robot's force sensors and manipulation objects that encourages physical interaction. "
Source: IEEE Xplore

Asymmetric self-play for automatic goal discovery in robotic manipulation

"We train a single, goal-conditioned policy that can solve many robotic manipulation tasks, including tasks with previously unseen goals and objects. We rely on asymmetric self-play for goal discovery, where two agents, Alice and Bob, play a game. Alice is asked to propose challenging goals and Bob aims to solve them. We show that this method can discover highly diverse and complex goals without any human priors. Bob can be trained with only sparse rewards,

because the interaction between Alice and Bob results in a natural curriculum and Bob can learn from Alice's trajectory when relabeled as a goal-conditioned demonstration."
Source: Cornell University

ACTUATORS

Passive Flow Control for Series Inflatable Actuators: Application on a Wearable Soft-Robot for Posture Assistance

"This paper presents a passive control method for multiple degrees of freedom in a soft pneumatic robot through the combination of flow resistor tubes with series inflatable actuators. We designed and developed these 3D printed resistors based on the pressure drop principle of multiple capillary orifices, which allows a passive control of its sequential activation from a single source of pressure. Our design fits in standard tube connectors, making it easy to adopt it on any other type of actuator with pneumatic inlets."
Source: Cornell University

Untethered-Bioinspired Quadrupedal Robot Based on Double-Chamber Pre-charged Pneumatic Soft Actuators with Highly Flexible Trunk

"Given that mobile soft robots are adaptable to the environment, they are always tethered with slow locomotion speed. Compared with other types of mobile robots, mobile soft robots may be more suitable for rescuing tasks, accompanying elderly people, and being used as a safe toy for children... In this article, a newly designed innovative untethered-bioinspired quadrupedal robot based on double-chamber pre-charged pneumatic (DCPCP) soft actuators with highly flexible trunk is proposed."
Source: Mary Ann Liebert

Making bioinspired 3D-printed autonomic perspiring hydrogel actuators

"To mitigate the adverse effects of elevated temperatures, conventional rigid devices use bulky radiators, heat sinks and fans to dissipate heat from sensitive components. Unfortunately, these thermoregulation strategies are incompatible with soft robots, a growing field of technology that, like biology, builds compliant and highly deformable bodies from soft materials to enable functional adaptability.

Here, we design fluidic elastomer actuators that autonomically perspire at elevated temperatures. This strategy incurs operational."
Source: Nature Protocols

Feasibility Study on Botanical Robotics: Ophiocordyceps-like Biodegradable Laminated Foam-based Soft Actuators with Germination Ability

"In this study, a biodegradable laminated foam-based soft actuator with self-germination ability was developed and its feasibility to return to nature by controlling the rate of degradation was ascertained. Our results indicate that after the actuator achieved its goal, it self-destructed and self-germinated, which confirms its active biodegrading capability through actuation and germination to enter the natural cycle."
Source: IEEE Xplore
