SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

21 November 2020 – 22 January 2021

TOPICAL REPORT

ROBOTICS & AUTOMATION

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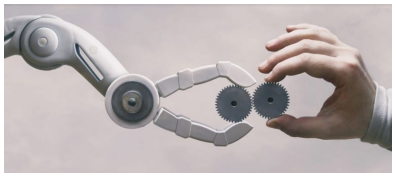
news

YEAR AHEAD



Latest trends in industrial robotics: drives innovation in 2021

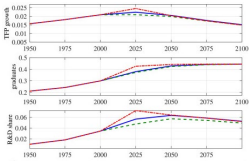
"Over the past few decades, robots have gone from incredibly expensive machines with limited functionalities to affordable robots that are flexible to do many works. Especially, industrial robots are highly adopted by people across the globe. Based on the latest trends in the robotics industry, industrial robots are increasingly leveraged in manufacturing hubs, setting continuous growth in advances, expansion and evolution at a rapid pace."
Source: Analytics Insight

Robots Ready to Grow in 2021

"A look ahead at the growing role of robotics post pandemic. As IW's 2020 Technology Survey showed robotics continue to serve as a primary area of interest for manufacturers. And for good reason – robotics and on a larger scale automation are a key avenue to recognizing the type of efficiencies organizations need to compete within today's increasingly digital workplace."
Source: Industry Week

academic

AUTOMATION



Innovation, automation, and inequality: Policy challenges in the race against the machine

"The effects of automation on economic growth, education, and inequality are analyzed using an R&D-driven growth model with endogenous education in which high-skilled workers are complements to machines and low-skilled workers are substitutes for machines. The model predicts that automation leads to an increasing share of college graduates, increasing income and wealth inequality, and a declining labor share. We show that standard policy suggestions for the age of automation can trigger unintended side effects on inequality, growth, and welfare, irrespective of whether they are financed by progressive wage taxation or by a robot tax."
Source: Elsevier

Automation in Museum Construction and Operation

"The purpose of this paper is to create a tool kit for automating the design, construction, and operation of museums while considering sustainability measures. The main methodology is research on the application of Building Information Modeling (BIM), robotics, and 3D printing during the design and construction stages, and examination

reports

YEAR AHEAD

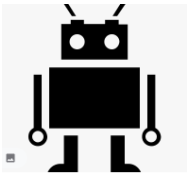
Robotics and AI trends: the 2021 edition

"Amid one of the biggest shocks to society and the economy in most of our lifetimes, the stock market has continued to rise, with each of the major indices hitting new highs late in the year. And though anyone who has been around the block a time or two (myself included) would have guessed that companies focused on robotics, automation, and AI would have suffered a blow in the face of a year-long crisis, quite the opposite has been true."
Source: Robo Global

2021 Upcoming Trends and Future of Industrial Robotics Market

"An industrial robot is a robot device that is employed in manufacturing. Industrial robots are designed, programmed such as it is free to function on three axes or more."
Source: Robotics Tomorrow

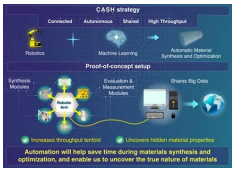
FORECAST



CES 2021: The robots are still coming. These are some of the best ones on the way

"We're still years away from the flying cars, but finding robots to help us with everyday chores, and maybe offer us a little companionship, might be closer than we think."
Source: TechXplore

AUTOMATION



Fostering creativity in researchers: How Automation Can Revolutionize Materials Research

"Scientists at Tokyo Institute of Technology (Tokyo Tech) devise a system that combines robotics and artificial intelligence to fully automate the routine aspects of synthesizing, testing, and optimizing new materials according to fabrication conditions. Their approach can produce and test compounds ten times faster than scientists doing manual work, allowing for the rapid creation of huge shared databases. In turn, the autonomous system and database will be used to discover exotic material properties and new laws of physics."
Source: Tokyo Institute of Technology

A new 'e-nose' and computer vision help researchers cook the perfect chicken

"Skoltech researchers have found a way to use chemical sensors and computer vision to determine when grilled chicken is cooked just right. These tools can help restaurants monitor and automate cooking processes in their kitchens, and perhaps one day even end up in your 'smart' oven."
Source: Phys.Org

AUTONOMOUS VEHICLES

Why Do Many Self-Driving Cars Look Like Toasters on Wheels?

"On Monday, the autonomous vehicle company Zoox—acquired by Amazon over the summer for a reported $1.2 billion—rolled out its robotaxi. The design, which has been in development for six years, may look familiar. Almost every autonomous vehicle concept revealed over the

of the integration of the Internet of Things (IOT) and indoor air quality management into the operation stage."
Source: Springer Link

Symptoms of convergence and accommodative insufficiency predict engagement and cognitive fatigue during complex task performance with and without automation

"The purpose of this study was to determine if symptoms of accommodative-vergence deficits predict an individual's level of task engagement and cognitive fatigue while performing a flight simulation task with or without automation. Eighty-four participants performed a flight simulation task with or without automation."
Source: Elsevier

Automation and the imbrication of human and material agency: A sociomaterial perspective

"Automation is projected to transform many industries and work domains and enable both increased levels of safety and efficiency by reallocating many of the functions traditionally performed by operators. However, research on the relation between automation and work practice is lagging and needs to be further explored in order to ground the debate and design of automated work on a sound empirical basis reflecting work in actual organizational settings."
Source: Elsevier

The views of health guideline developers on the use of automation in health evidence synthesis

"The increasingly rapid rate of evidence publication has made it difficult for evidence synthesis—systematic reviews and health guidelines—to be continually kept up to date. One proposed solution for this is the use of automation in health evidence synthesis. Guideline developers are key gatekeepers in the acceptance and use of evidence, and therefore, their opinions on the potential use of automation are crucial."
Source: Springer Link

A multi-time scale management structure for airport ground handling automation

"The sustainability of air travel relies on proper and timely aircraft ground

Warehouse Robotics Market 2021-2024 Covid 19 Impact on Top countries data,Industry Trends, Growth, Size, Segmentation, Future Demands, Latest Innovation, Sales Revenue by Regional Forecast

"COVID-19 can affect the global economy in three main ways: by directly affecting production and demand, by creating supply chain and market disruption, and by its financial impact on firms and financial markets. The Warehouse Robotics Market is expected to register a CAGR of 12.09%, during 2020-2024."
Source: Market Watch

Intelligent Robotics Market Size 2021 Global Industry Key Strategies, Historical Analysis, Segmentation, Application, Technology, Trends and Opportunities Forecasts to 2026

""Intelligent Robotics Market" Report 2021 covers strong research on global industry size, share and growth which enables the customer to look at the possible requirement as well as prediction. The opportunities and drivers are assembled after a profound study by global Intelligent Robotics market's expertise. Intelligent Robotics Market report delivers future development strategies, key companies, possibility of competition, major challenges analysis in the industry."
Source: Fox 40

Industrial Robotics Market Size 2021 Industry Overview, Shares, Growing Demand, Growth, Production, Types, Applications and 2026 Forecast Report by Industry Research Biz

"Industrial Robotics Industry 2021 Global Market Research report presents an in-depth analysis of the Industrial Robotics market size, growth, share, segments, manufacturers, and technologies, key trends, market drivers, challenges, standardization, deployment models, opportunities, future roadmap, and 2026 forecast."
Source: Industry Research Biz

Growth Opportunities In Autonomous Mobile Robots, Robotic Grippers, Surgical Robots, And Digital Manufacturing

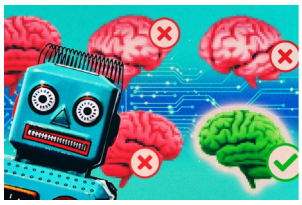
"The Advanced Manufacturing Technology Opportunity Engine for

past few years—by carmakers, engineers, ride-hailers, and startups—has been a neat, rectangular box."
Source: WIRED

This Year, Autonomous Trucks Will Take to the Road With No One on Board

"The startup TuSimple is deploying tractor-trailers that drive themselves from pickup to delivery."
Source: IEEE Spectrum

ROBOT DESIGNS



Designing customized "brains" for robots

"A new system devises hardware architectures to hasten robots' response time."
Source: MIT

Computer-aided creativity in robot design

"So, you need a robot that climbs stairs. What shape should that robot be? Should it have two legs, like a person? Or six, like an ant? Choosing the right shape will be vital for your robot's ability to traverse a particular terrain."
Source: MIT

How Boston Dynamics Taught Its Robots to Dance

"A week ago, Boston Dynamics posted a video of Atlas, Spot, and Handle dancing to "Do You Love Me." It was, according to the video description, a way "to celebrate the start of what we hope will be a happier year." As of today the video has been viewed nearly 24 million times, and the popularity is no surprise, considering the compelling mix of technical prowess and creativity on display."
Source: IEEE Spectrum

Robots Made of Ice Could Build and Repair Themselves on Other Planets

"Ice is all over the solar system, and exploration robots could use it as a structural material"
Source: IEEE Spectrum

'Chaotic' Way to Create Insectlike Gaits for Robots

"Researchers in Japan and Italy are embracing chaos and nonlinear physics to create insectlike gaits for tiny robots — complete with a locomotion controller to provide a brain-machine interface."

handling at airports. This research proposes a ground handling management structure which allows the automation of operations to face the growing demand for this service. It is shown how at operations level, information exchange with the airport collaborative decision-making system turns possible on-line fleet assignment to ground handling tasks."
Source: Elsevier

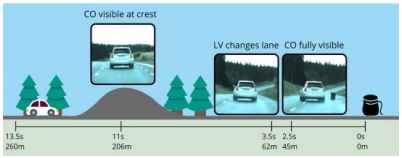
Leveraging Graphical User Interface Automation for Generic Robot Programming

"A novel approach to generic (or generalized) robot programming and a novel simplified, block-based programming environment, called "Assembly", are introduced. The approach leverages the newest graphical user interface automation tools and techniques to generate programs in various proprietary robot programming environments by emulating user interactions in those environments. The "Assembly" tool is used to generate robot-independent intermediary program models, which are translated into robot-specific programs using a graphical user interface automation toolchain."
Source: MDPI

Automation in Structural Health Monitoring of Transport Infrastructure

"This chapter discusses a variety of advanced automation techniques in structural health monitoring of road structures, such as data acquisition, data processing, and life-cycle assessment. It demonstrates that the implementation of automation in road asset management can increase the productivity and extend the service life of road structures, and enhance the durability of crucial road structures and increase transport infrastructure sustainability."
Source: Springer Link

AUTONOMOUS VEHICLES



Driver conflict response during supervised automation: Do hands on wheel matter?

"The first aim of this study was to investigate how driver conflict response while using highly reliable (but not perfect) supervised automation differ for drivers that (a) crash or avoid a conflict object and (b) report high trust or low trust in automation to avoid the conflict object. The second aim was to understand the influence on the

January 2021 covers innovations in autonomous mobile robots, robotic gripper, surgical robots and digital manufacturing. Some of the innovations profiled include AI-based autonomous mobile robots for material handling applications, omnidirectional autonomous mobile robots for logistics, pinch gripper and vacuum grippers, digital manufacturing platform for supply chain management, and surgical robots for laparoscopic treatment, cardiovascular treatment, and microsurgery."
Source: Frost & Sullivan

Cobots Transforming the Global Industrial Robotics Market—Opportunities Forecast

"The COVID-19 pandemic outbreak has resulted in a global economic downturn, as countries imposed movement control orders and shut down businesses. Similar to most other markets worldwide, the demand for industrial robots is forecast to plummet in 2020. The high initial costs and lack of supportive infrastructure are likely to impede market growth in the forecast period. But the market is expected to rebound from the economic crisis by mid to end of 2021."
Source: Frost & Sullivan

Growth Opportunities In Dextrous Robotic Hands, Electric Power Steering Motor Control Unit, And Cloud Infrastructure

"This Advanced Manufacturing Technology Opportunity Engine (TOE) for December 2020 covers innovations in dextrous robotic hands, electric power steering motor control, cloud infrastructure for digital manufacturing and industry efforts for digitization in manufacturing and reduction of energy consumption in advanced manufacturing."
Source: Frost & Sullivan

Increased Adoption of High-speed Automated Inspection Systems Powering the Global In-line Dimensional Metrology Equipment Market, 2025

"This Frost & Sullivan research service analyzes the global in-line dimensional metrology equipment market in detail for the period from 2019 to 2025, with 2020 as the base year. The study covers key advanced technologies including coordinate measuring machines (CMM), vision measuring machines (VMM), and optical digitizers and scanners (ODS), as well as metrology software."
Source: Frost & Sullivan

Source: AIP Publishing

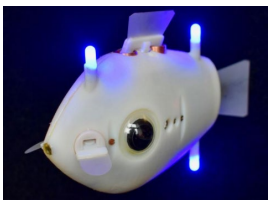
A technique that allows robots to estimate the pose of objects by touching them

"Researchers at Massachusetts Institute of Technology (MIT) have recently carried out a study aimed at replicating this human capability in robots, allowing them to understand where objects are located simply by touching them. Their paper, pre-published on arXiv, highlights the advantages of developing robots that can interact with their surrounding environment through touch rather than merely through vision and audio processing."
Source: TechXplore

Shape-Changing Robots that Adapt to Their Environments

"When danger approaches, the Moroccan flic-flac spider takes the shape of a ball and rolls away to safety. Just as the trick of shape-shifting to one's environment has proved invaluable for many creatures, Yale researchers say it could be equally useful for robots."
Source: Yale University

ROBOTICS BIOMIMETRICS



Robotic swarm swims like a school of fish

"Now, a team of researchers at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) and the Wyss Institute for Biologically Inspired Engineering have developed fish-inspired robots that can synchronize their movements like a real school of fish, without any external control. It is the first time researchers have demonstrated complex 3D collective behaviors with implicit coordination in underwater robots."
Source: Harvard School of Engineering

Bio-inspired robotics: learning from dragonflies

"Now, for the first time, scientists at Kiel University (CAU) have completely decrypted the biomechanical functional principle of what is known as the labial mask of dragonfly larvae. A vital contribution to this discovery was made by the team led by Dr Sebastian Büsse of the Zoological Institute in its development of a bio-inspired robot with the operating principle of the complex mouthparts adapted to test its own hypothesis – the technology used here could lead

driver conflict response of two specific factors: a hands-on-wheel requirement (with vs. without), and the conflict object type (garbage bag vs. stationary vehicle)."
Source: Elsevier

A Vehicle Guidance Model with a Close-to-Reality Driver Model and Different Levels of Vehicle Automation

"This paper presents a microscopic vehicle guidance model which adapts to different levels of vehicle automation. Independent of the vehicle, the driver model built is different from the common microscopic simulation models that regard the driver and the vehicle as a unit. The term "Vehicle Guidance Model" covers, here, both the human driver as well as a combination of human driver and driver assistance system up to fully autonomously operated vehicles without a (human) driver. Therefore, the vehicle guidance model can be combined with different kinds of vehicle models."
Source: MDPI

Effect of automation transparency in the management of multiple unmanned vehicles

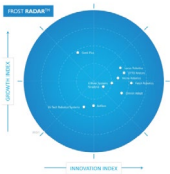
"This paper examined the extent to which increased automation transparency could improve the accuracy of automation use in a simulation of unmanned vehicle control. Participants were required to assign the best unmanned vehicle to complete missions. An automated recommender system provided advice but was not always reliable. Three levels of automation transparency were manipulated between-participants."
Source: Elsevier

Human-Centered AI to Support an Adaptive Management of Human-Machine Transitions with Vehicle Automation

"This article is about the Human-Centered Design (HCD), development and evaluation of an Artificial Intelligence (AI) algorithm aiming to support an adaptive management of Human-Machine Transition (HMT) between car drivers and vehicle automation. The general principle of this algorithm is to monitor (1) the drivers' behaviors and (2) the situational criticality to manage in real time the Human-Machine Interactions (HMI)."
Source: MDPI

PEDAGOGY

REVIEW



Frost Radar™: Global Autonomous Mobile Robot Market, 2020

"Lockdowns in the early months of the COVID-19 pandemic in 2020, ongoing social distancing practices, and recurring stay-at-home orders and restrictions on business capacity to prevent the virus's spread have accelerated the shift from brick-and-mortar store visits to online purchases. COVID-19 also is driving the use of AMRs in healthcare settings. Autonomous service robots in hospitals reduce the number of human interactions and boost efficiency."
Source: Frost & Sullivan

to a significant enhancement of agile robot systems."
Source: Kiel University

Squid-inspired robot swims with nature's most efficient marine animals

"Scientists at the University of Southampton and University of Edinburgh have developed a flexible underwater robot that can propel itself through water in the same style as nature's most efficient swimmer – the Aurelia aurita jellyfish."
Source: University of Southhampton

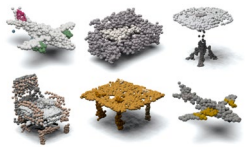
Aquatic robot inspired by sea creatures walks, rolls, transports cargo

"Northwestern University researchers have developed a first-of-its-kind life-like material that acts as a soft robot. It can walk at human speed, pick up and transport cargo to a new location, climb up hills and even break-dance to release a particle."
Source: Northwestern University

Robots that mimic the natural world

"Mosquitoes on Mars, metal birds flocking like pigeons and hoverflies with your lunch. Robots are copying nature."
Source: TechXplore

ARTIFICIAL INTELLIGENCE



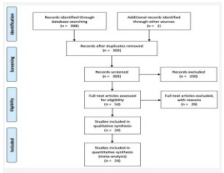
How to train a robot (using ai and supercomputers)

"UT Arlington computer scientists use TACC systems to generate synthetic objects for robot training"
Source: Texas Advanced Computing Center

RealAnt: A low-cost quadruped robot that can learn via reinforcement learning

"Researchers at Aalto University and Ote Robotics have recently created RealAnt, a low-cost, four-legged robot that can effectively be used to test and implement RL algorithms. The new robotics platform, presented in a paper pre-published on arXiv, is a minimalistic and affordable real-world version of the 'Ant' robot simulation environment, which is often used in RL research."
Source: TechXplore

Robot hands one step closer to human thanks to WMG AI algorithms



Systematic Review on Which Analytics and Learning Methodologies Are Applied in Primary and Secondary Education in the Learning of Robotics Sensors

"Robotics technology has become increasingly common both for businesses and for private citizens. Primary and secondary schools, as a mirror of societal evolution, have increasingly integrated science, technology, engineering and math concepts into their curricula. Our research questions are: "In teaching robotics to primary and secondary school students, which pedagogical-methodological interventions result in better understanding and knowledge in the use of sensors in educational robotics?", and "In teaching robotics to primary and secondary school students, which analytical methods related to Learning Analytics processes are proposed to analyze and reflect on students' behavior in their learning of concepts and skills of sensors in educational robotics?"."
Source: MDPI

A Robotics Course during COVID-19: Lessons Learned and Best Practices for Online Teaching beyond the Pandemic

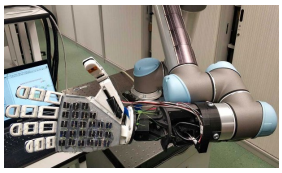
"The article describes observations from the online teaching of a robotics class during the COVID-19 pandemic caused by SARS-CoV-2, also known as the coronavirus. The changes in the course structure and in the provided material lead to an unexpected increase in the grade performance of the students. The article provides a description and an analysis of the effects and their possible causes. In addition to a grade-performance analysis, further data from a university-wide and from a course-specific survey are used."
Source: MDPI

Lesson Learned from Semester of Online Teaching of Automation Using Simulators

"The year 2020 has taught us a very important lesson about communication between university lecturers and students in laboratories. This paper is showing conclusions after a semester of remote personal contact with students and laboratory equipment. In normal cases authors of this paper providing their lessons in a laboratory equipped with industry

"The Shadow Robot Dexterous Hand is a robot hand, with size, shape and movement capabilities similar to those of a human hand. To give the robotic hand the ability to learn how to manipulate objects researchers from WMG, University of Warwick, have developed new AI algorithms."
Source: University of Warwick

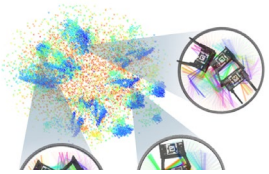
ENERGY REGENERATION



Solar-based Electronic Skin Generates Its Own Power

"Scientists demonstrate an innovative e-skin with touch and proximity-sensing capabilities without using dedicated touch sensors."
Source: IEEE Spectrum

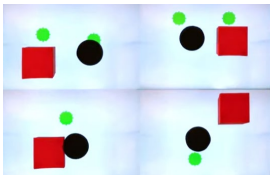
SWARM ROBOTICS



Spontaneous Robot Dances Highlight a New Kind of Order in Active Matter

"Predicting when and how collections of particles, robots, or animals become orderly remains a challenge across science and engineering."
Source: Georgia Institute of Technology

ROBOT-ROBOT INTERACTIONS



Robot Displays a Glimmer of Empathy to a Partner Robot

"Columbia engineers create a robot that learns to visually predict how its partner robot will behave, displaying a glimmer of empathy. This "Robot Theory of Mind" could help robots get along with other robots—and humans—more intuitively."
Source: Columbia University in the City of New York

MINIATURE ROBOTS

effectors, Robots, Pneumatic equipment, and PLC's."
Source: IOP Science

School Activities With Educational Robot to Facilitate Student Learning

"Educational robotics is now recognized as a powerful tool to promote learning, acquiring social skills and students' engagement with STEM and CT education. STEM is an abbreviation that stands for science, technology, engineering, and mathematics (Study.com, n.d.). Students apply science, technology, engineering, and mathematics in contexts that make connections between the classroom and the world around them… In this paper, ER activities performed at a special needs school for students with intellectual disabilities and physically handicapped are described in addition to those in art and craft classes at a public elementary school."
Source: IGI Global

Simulators in Educational Robotics: A Review

"Educational robotics (ER) seems to have a positive effect on students and, in many cases, might help them to successfully assimilate knowledge and skills. Thus, this paper focuses on ER and carries out a literature review on educational robotics simulators with Graphical User Interfaces (GUIs). The review searches for relevant papers which were published in the period 2013–2020 and extracted the characteristics of the simulators used. The simulators that we describe in this article cover various robotic technologies, offering students an easy way to engage with virtual robots and robotics mechanisms, such as wheeled robots or drones. Using these simulators, students might cover their educational needs or prepare themselves for educational robotic competitions by working in as realistic as possible conditions without hardware restrictions."
Source: MDPI

INDUSTRY 4.0

5G Swarm Production: Advanced Industrial Manufacturing Concepts enabled by Wireless Automation

"This paper presents an overview of current Industry 4.0 applied research

Lasers create miniature robots from bubbles (video)

"Researchers reporting in ACS Applied Materials & Interfaces have used lasers to create miniature robots from bubbles that lift, drop and manipulate small pieces into interconnected structures."
Source: American Chemical Society

ROBOTIC GRIPPER

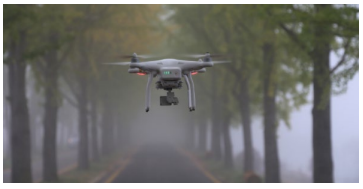
UGA engineers develop soft robotic gripper

"Scientists often look to nature for cues when designing robots – some robots mimic human hands while others simulate the actions of octopus arms or inchworms. Now, researchers in the University of Georgia College of Engineering have designed a new soft robotic gripper that draws inspiration from an unusual source: pole beans."
Source: University of Georgia

Getting the Right Grip: Designing Soft and Sensitive Robotic Fingers

"To develop a more human-like robotic gripper, it is necessary to provide sensing capabilities to the fingers. However, conventional sensors compromise the mechanical properties of soft robots. Now, scientists at Ritsumeikan University, Japan, design a 3D printable soft robotic finger containing a built-in sensor with adjustable stiffness."
Source: Ritsumeikan University

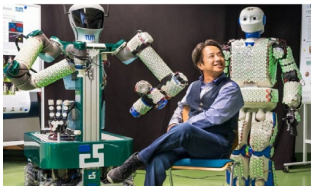
ROBOTS AND THE ENVIRONMENT



A robotic revolution for urban nature

"Drones, robots and autonomous systems can transform the natural world in and around cities for people and wildlife."
Source: University of Leeds

ROBOTS AND HUMAN



topics, addressed from both an industrial production and a wireless communication points of view. A roadmap towards achieving the more advanced industrial manufacturing visions and concepts, such as the "swarm production" (non-linear and fully de-centralized production), is defined, highlighting relevant industrial use cases, their associated communication requirements, as well as the integrated technological wireless solutions applicable to each of them."
Source: Aalborg University

Levering Task Modularity in Reinforcement Learning for Adaptable Industry 4.0 Automation

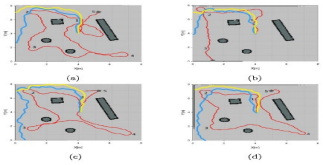
"This article is motivated by the lack of formal methods for efficient transfer of knowledge across different yet interrelated tasks, with special reference to collaborative robotic operations such as material handling, machine tending, assembly, and inspection. We propose a meta reinforcement learning framework to enhance the adaptability of collaborative robots to new tasks through task modularization and efficient transfer of policies from previously learned task modules."
Source: The American Society of Mechanical Engineers

ROBOTICS AND AI

Robotics Use Case Scenarios

"Artificial Intelligence (AI) is widely used to accelerate state-of-the-art vision algorithms used in different domains including navigational algorithms, image segmentation, object classification…The Sundance's VCS-1 system, formerly Tulipp Agri Starter Kit, is the ideal platform to run the state-of-the-art AI algorithms. In this chapter, three use-cases are presented where the TAK and the Tulipp toolchain is being used to accelerate vision algorithms."
Source: Springer Link

REINFORCEMENT LEARNING



Incremental Learning for Autonomous Navigation of

"The machine as an extension of the body"

"Combining neuroscience and robotic research has gained impressive results in the rehabilitation of paraplegic patients. A research team led by Prof. Gordon Cheng from the Technical University of Munich (TUM) was able to show that exoskeleton training not only helped patients to walk, but also stimulated their healing process."
Source: Technical University of Munich

"The Robot made me do it": Robots encourage risk-taking behaviour in humans

"New research has shown robots can encourage humans to take greater risks in a simulated gambling scenario than they would if there was nothing to influence their behaviours."
Source: University of Southhampton

A study predicts smooth interaction between humans and robots

"According to a new study by Tampere University in Finland, making eye contact with a robot may have the same effect on people as eye contact with another person. The results predict that interaction between humans and humanoid robots will be surprisingly smooth."
Source: Tampere University

An algorithm for optimizing the cost and efficiency of human-robot collaborative assembly lines

"Researchers at Wuhan University of Science and Technology and University of Leicester have recently developed an optimization technique that could help to optimize the cost and efficiency of multiple robots set to operate in assembly lines."
Source: TechXplore

ROBOTIC ANIMALS

Robots could replace real therapy dogs

"A new paper, published today, has found that robotic animals may be a better alternative to real-life therapy dogs"
Source: University of Portsmouth

REMOTE CONTROL OF ROBOT

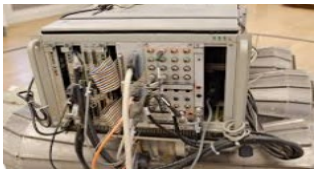
Mobile Robots based on Deep Reinforcement Learning

"This paper presents an incremental learning method and system for autonomous robot navigation. The range finder laser sensor and online deep reinforcement learning are utilized for generating the navigation policy, which is effective for avoiding obstacles along the robot's trajectories as well as for robot's reaching the destination."
Source: Springer Link

Reinforcement Learning Based Adaptive Optimal Strategy in Robotic Control Systems

"This paper considers the application of online adaptive dynamic programming for robotic systems including manipulators and wheeled inverted pendulum (WIP) systems. The sliding mode control technique enable us to implement the control design for reduced order systems and combine with Neural Networks."
Source: Springer Link

ROBOT SYSTEMS



A Teleoperated Surgical Robot System

"This chapter reviews a teleoperated surgical robotic system that we have developed over the past several years at Vanderbilt University. It delivers needle-sized instruments into the human body that are able to move in a tentacle-like manner in the sense that they can controllably bend and elongate. Preclinical studies on this class of robots (by both our group and others) have investigated the feasibility of using them for intracerebral hemorrhage aspiration, thermal ablation to treat epilepsy, endoscopic third ventriculostomy, endoscopic colloid cyst removal, and endonasal pituitary surgery."
Source: Springer Link

ROBOT DEVELOPMENT

Precision Tip Positioning Control of a Single-Link Flexible Robot Using Fractional Order Sliding Mode Controller

"In this paper, an efficient scheme is presented based on fractional order sliding mode control (FOSMC)

Improved remote control of robots

"Sometimes you need to get human knowledge and skills to places that are hazardous or difficult to access for people. The project entitled Predictive Avatar Control and Feedback (PACOF) is creating a robotic system that allows the robot operator to experience the location just as the robot does. Three researchers representing the three different disciplines of the University of Twente's EEMCS faculty are working together in this project."
Source: University of Twente

HIGHLIGHTS

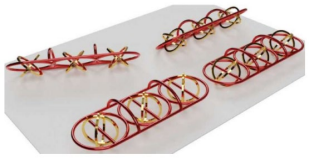
Pandemic's robot 'heroes' highlight their value at tech show

"Robots that helped people survive and stay safe over the past year are touting their value at the tech industry's annual extravaganza amid a pandemic which has given fresh momentum to the robotics sector."
Source: TechXplore

Why We Need a Robot Registry

"Spot robots now patrol public parks in Singapore to enforce social distancing during the pandemic. They meet with COVID-19 patients at Boston's Brigham and Women's Hospital so that doctors can conduct remote consultations. Imagine coming across Spot while walking in the park or returning to your car in a parking garage. Wouldn't you want to know why this hunk of metal is there and who's operating it? Or at least whom to call to report a malfunction?"
Source: IEEE Spectrum

HEALTHCARE



Miniscule robots of metal and plastic may revolutionize the field of medicine

"Researchers at ETH Zurich have developed a technique for method for tip position control of a single link flexible robot manipulator. The proposed control strategy is robust against the system parameters variations such as payload and viscous friction variations in the presence of the unknown Coulomb friction disturbances. The main objective of the proposed control scheme is to reduce the deflection due to the flexibility of the link and the precise tip positioning control of the single-link flexible manipulator."
Source: University of Tabriz

Learning compliant robotic movements based on biomimetic motor adaptation

"It is one of the great challenges for a robot to learn compliant movements in interaction tasks. The robot can easily acquire motion skills from a human tutor by kinematics demonstration, however, this becomes much more difficult when it comes to the compliant skills. This paper aims to provide a possible solution to address this problem by proposing a two-stage approach."
Source: Elsevier

Visual behavior modelling for robotic theory of mind

"Behavior modeling is an essential cognitive ability that underlies many aspects of human and animal social behavior (Watson in Psychol Rev 20:158, 1913), and an ability we would like to endow robots. Most studies of machine behavior modelling, however, rely on symbolic or selected parametric sensory inputs and built-in knowledge relevant to a given task. Here, we propose that an observer can model the behavior of an actor through visual processing alone, without any prior symbolic information and assumptions about relevant inputs."
Source: Nature Scientific Reports

SWARM ROBOTICS

Past, Present, and Future of Swarm Robotics

"Swarm robotics has a wide range of application fields, from simple household tasks to military missions. This paper reviews the swarm robotics approach from its history to its future. It discusses the basic idea of swarm robotics, its important features, simulators, projects, real life applications and some future ideas."
Source: Cornell University

manufacturing micrometer-long machines by interlocking multiple materials in a complex way. Such microrobots will one day revolutionize the field of medicine."
Source: TechXplore

Robotic Exoskeleton Training Improves Walking in Adolescents with Acquired Brain Injury

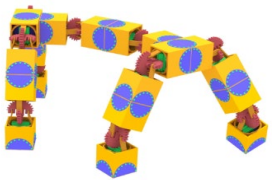
"Acquired brain injury often results in hemiparesis, causing significant deficits in balance and gait that adversely affect functional ambulation and participation in activities of daily living. Gait training using robotic exoskeletons offers an option for motor rehabilitation in individuals with hemiparesis, but few studies have been conducted in adolescents and young adults. Findings from a preliminary study in this age group show promise for this intervention"
Source: Kessler Foundation

SMALL SCALE ROBOTS

Robotic Small Sat Servicing: A Next Generation Servicing Architecture Incorporating Advanced Robotics

"Maxar is working in partnership with the National Aeronautics and Space Administration (NASA) Space Technology Mission Directorate (STMD) to develop a new class of small scale robotics, called the Lunar Under-Actuated (LUnA) Robotic Arm. This robotic manipulator will be designed to minimize mass and manufacturing cost by implementing a new physical architecture that puts a single motor driven actuator at the robot base, which transmits torque to the joints via a cable drive system."
Source: Aerospace Research Central

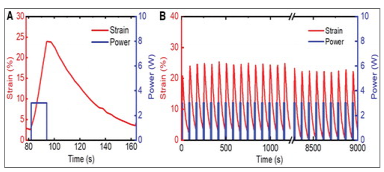
MODULAR ROBOT



2DxoPod - A Modular Robot for Mimicking Locomotion in Vertebrates

"The paper describes characteristics of the 2DxoPod module and it's advantages with respect to modular robots developed in the field of robotics. Simulations are performed on navigation capabilities of the snake and quadruped robotic coordinated structures assembled using 2DxoPod robotic modules using centralized pattern generator and the results of the same are also provided in the paper."
Source: Springer Link

SOFT ROBOT



An Untethered Soft Robot Based on Liquid Crystal Elastomers

"An untethered, soft robot using liquid crystal elastomer (LCE) actuators, onboard power, and wireless Bluetooth control was developed. LCE actuators were thermally triggered using Joule heating and demonstrated an ~5 N force pull

capacity per LCE. A >20% repeatable strain was demonstrated over >100 cycles with minimal loss of strain at high cycle numbers. The LCE actuators were horizontally oriented to maximize conversion of LCE contraction to overall robot movement."
Source: Mary Ann Liebert

Pneumatically Actuated Soft Gripper with Bistable Structures

"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: Mary Ann Liebert

All-soft multiaxial force sensor based on liquid metal for electronic skin

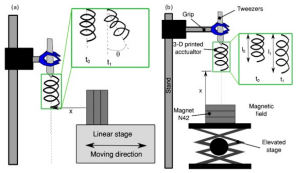
"As a demonstration of multiaxial force sensing, we were able to monitor the direction of multidirectional forces using a finger by the response of liquid metal microchannel arrays. This research could be applied to various fields including soft robotics, wearable devices, and smart prosthetics for artificial intelligent skin applications."
Source: Springer Open

A soft robot that adapts to environments through shape change

"To begin addressing these questions, here we simulate, design and build a soft robot that utilizes shape change to achieve locomotion over both a flat and inclined surface. Modelling this robot in simulation, we explore its capabilities in two environments and demonstrate the automated discovery of environment-specific shapes and gaits that successfully transfer to the physical hardware."
Source: Nature Machine Intelligence

Design and testing of a soft parallel robot based on pneumatic artificial muscles for wrist rehabilitation

"The proposed soft wrist-rehabilitation robot is driven by six evenly distributed linear actuators using pneumatic artificial muscles and one central linear electric motor. The introduced parallel-kinematic mechanism design enables the enhancement of the output stiffness of the soft robot for practical use."
Source: Nature Scientific Reports



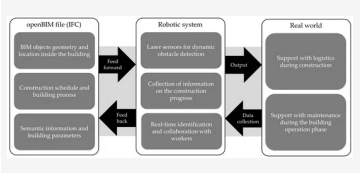
3-D printed soft magnetic helical coil actuators of iron oxide embedded polydimethylsiloxane

"Soft actuators have grown to be a topic of great scientific interest. As the fabrication of soft actuators with conventional microfabrication methods are tedious, expensive, and time consuming, employment of 3-D printing fabrication methods appears promising as they can simplify fabrication and reduce the production cost."
Source: Elsevier

High-bandwidth nonlinear control for soft actuators with recursive network models

"We present a high-bandwidth, lightweight, and nonlinear output tracking technique for soft actuators that combines parsimonious recursive layers for forward output predictions and online optimization using Newton-Raphson. This technique allows for reduced model sizes and increased control loop frequencies when compared with conventional RNN models. Experimental results of this controller prototype on a single soft actuator with soft positional sensors indicate effective tracking of referenced spatial trajectories and rejection of mechanical and electromagnetic disturbances."
Source: Cornell University

ROBOTICS IN CONSTRUCTION

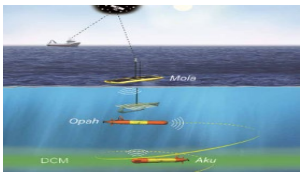


BIM-Integrated Collaborative Robotics for Application in Building Construction and Maintenance

"We propose a method to leverage BIM for simple yet efficient deployment of robotic systems for construction and operation of buildings. With our proposed approach, BIM is used to provide the robot with a priori geometric and semantic information on the environment and to store information on the operation progress. We present two applications that verify the effectiveness of our proposed method. This system represents a step

forward towards an easier application of robots in construction."
Source: MDPI

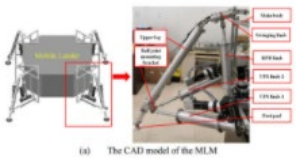
ROBOTS IN THE OCEAN



A system of coordinated autonomous robots for Lagrangian studies of microbes in the oceanic deep chlorophyll maximum

"Here, we report the development and application of a system of coordinated robots for studying planktonic biological communities drifting within the ocean. The presented Lagrangian system uses three coordinated autonomous robotic platforms."
Source: Science Robotics

MOBILE LANDING MECHANISM SYSTEMS



Motion and trajectory planning modeling for mobile landing mechanism systems based on improved genetic algorithm

"In many traditional soft-landing missions, researchers design the lander and the rover as two separate individuals, which has its limitations. At present, research on landers mainly focuses on the performance analysis of those who cannot move, and the motion of legged mobile lander has not yet been studied. In this paper, a novel Mobile Landing Mechanism (MLM) is proposed."
Source: AIMS Press

ANALYSIS

What Is Robotics? Why Do We Need It and How Can We Get It?

"Robotics is an emerging synthetic science concerned with programming work. Robot technologies are quickly advancing beyond the insights of the existing science… The new discipline needs a departmental home in the universities, which it can justify both

intellectually and by its capacity to attract new diverse populations inspired by the age-old human fascination with robots."
Source: Annual Reviews