

TOPICAL REPORT

ROBOTICS & AUTOMATION

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AUTOMATION



Improving Automation's Energy Efficiency with Neuromorphic Sensor Technology

"While the term industrial automation typically refers to machines with the ability to perform highly structured, pre-programmed tasks in place of human labor, the term industrial autonomy describes systems that are capable of adapting independently to diverse circumstances with minimal human intervention. For instance, an autonomous robot might be capable of learning to grip an unfamiliar object or navigate a new space without assistance from a human programmer. Artificial intelligence and machine learning provide the internal processing power necessary to enable this, but powerful external sensors are also needed to help robots and other automated technologies perceive and respond to their environments."

Source: Automation World

Big food automation is making its way to Main Street's menu

"Automation and robotics are typically associated with multi-million budgets at multi-billion dollar companies. But as the cost of technology has come down, it's become more affordable to smaller companies — even small businesses.

AUTOMATION

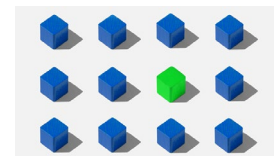


Bibliometric review of actuators: Key automation technology in a smart city framework

"Smart cities are built in diverse mechanisms and sub-systems by integrating Information and Communication Technologies (ICT). It offers inhabitants sustainable services at a lower cost and provides full connectivity. The sensors are incorporated virtually everywhere in a smart city environment. Actuators are switching technologies that enable communication in a highly heterogeneous smart city environment and perform output functions. This article focuses on the function of actuators as a vital technology to allow different smart-city services to be automated. So, the role of actuators in the smart city was inclusively scrutinized employing bibliometric review. An organized practise was utilized to accumulate journal articles on actuators in smart cities. Screening processes have been devised for citation analyses. The utmost prolific authors, journals, articles, counties, and institutions are graded based on the overall citation count. Researching hubs and patterns were established utilizing author-keywords and index-keyword scrutiny on actuators in smart cities."

Source: Science Direct

AUTOMATION



UNTANGLE BANKING OPERATIONS: Simplify the experience, simplify the work

"These should be good times for bank COOs and operations executives. Technology is abundant and customers are demanding personalized experience. At the same time, the front office is seeking leadership and innovation from the back office. Executive teams are open to radical change and willing to invest. Accenture's recent survey of operations leaders show that by 2020, up to 40 percent of their banks' spending on digital transformation will be in operations. A winning bank operations vision anchors on simplification, both on the inside and outside. Digital transformation will enable banks to both meet customers' expectations for experiences that are as simple as possible and work smarter—do more with less and focus on the right work at the right place with the best economics."

Source: Accenture

Industrial Control and Factory Automation Market Report 2022, Industry Size, Share, Growth, Latest Trend, High Emerging Factors and Forecast 2028

Outside of Atlanta in Jonesboro, Georgia, THAT Burger Spot!, a burger and wings joint with four locations, got tired of being slowed down by phone orders.

There's beef burgers, turkey, Impossible, black bean, fish, chicken and more. Then there's the matter of how many patties, sauces and other customizations. Given all the choices, a single phone order took an average of seven to eight minutes. And that's only if there was staff on hand to take those orders."

Source: CNBC

Commercial Building Automation Market to Rise at CAGR of 8.3% During Forecast Period, Observes TMR Study

"The value of global [commercial building automation market](#) stood at US\$ 32.96 Bn in 2020. The global market is predicted to rise at a CAGR of 8.3% during the forecast period, from 2021 to 2031. The global commercial building automation market is likely to surpass valuation of US\$ 76.49 Bn by 2031. The global commercial building automation market is being driven by the growing use of green buildings in developing nations to reduce their carbon impact. In order to gain a competitive advantage in the global market, firms are speeding up product development and uncovering new revenue prospects. In a bid to achieve a competitive advantage, market participants are expanding their service offerings.

Due to increasing demand from developing nations and increasing commercial building & construction projects throughout the world, the market is likely to witness steady growth. The global commercial building automation market is likely to benefit from the increase in demand for energy-efficient and environment-friendly buildings during the forecast period. Besides, the increasing adoption of IoT in building automation systems to bolster the growth of the market."

Source: PR News Wire

CIOs dish on AI and automation strategies that work

"Artificial intelligence and machine learning are already making some intriguing and potentially transformative impacts on the way healthcare is delivered, from the exam room to the diagnosis to ongoing care management and beyond.

But it's important too to keep the promise and limitations of automation and augmented intelligence in mind. At HIMSS22, three clinical and IT leaders from major health systems

Analysis of Application of Artificial Intelligence in Electrical Automation Control

"With the continuous development of China's science and technology, information technology can be seen everywhere in our lives and has become the current development trend. The continuous development of computers has expanded the scope of use in society to a certain extent. In the industrial production process, computer technology is widely used, which can make production intelligent and automated, which greatly improves production efficiency and ensures production quality. This article mainly introduces the application status of (artificial intelligence technology) AIT, discusses the application of this technology in (electrical automation control) EAC in detail, and continuously improves the awareness of AIT in electric power personnel. Through practice, it combines AIT with electrical automation technology promoting the development of electrical automation technology can effectively improve the work of electrical automation in production and operation, reduce the production input of relevant departments, and also effectively accelerate the speed of production, so that the status of enterprises in the same field is significantly improved."

Source: Springer Link

Robot Process Automation (RPA) and Its Future

"Many software automation techniques have been developed in the last decade to cut down cost, improve customer satisfaction, and reduce errors. Robotic process automation (RPA) has become increasingly popular recently. RPA offers software robots (bots) that can mimic human behavior. Attended robots work in tandem with humans and can operate while the human agent is active on the computer. On the other hand, unattended robots operate behind locked screens and are designed to execute automations that don't require any human intervention. RPA robots are equipped with artificial intelligence engines such as computer vision and machine learning, and both robot types can learn automations by recording human actions."

Source: IGI Global

Cognitive automation

"Facilitated by AI technology, the phenomenon of cognitive automation extends the scope of deterministic business process automation (BPA) through the probabilistic automation of knowledge and service work. By

"The "Industrial Control and Factory Automation Market" report covers the global and regional market with an in-depth analysis of the overall growth prospects in the market. Industrial Control and Factory Automation Market contains a comprehensive analysis of company details, business summary, key drivers, restraints, regional opportunities, Upcoming trends, dynamics, and development opportunities. Report also analyses Industrial Control and Factory Automation market size, share and future prospects by 2028."

Source: Market Watch

AUTONOMOUS VEHICLES



Global Autonomous Vehicles Market Report 2022: U.S. Market is Estimated at 3.4 Thousand Units in 2021, While China is Forecast to Reach 17.3 Thousand Units by 2026

"Amid the COVID-19 crisis, the global market for Autonomous Vehicles estimated at 6.1 Thousand Units in the year 2020, is projected to reach a revised size of 110.1 Thousand Units by 2026, growing at a CAGR of 60.6% over the analysis period.

Transportation, one of the segments analyzed in the report, is projected to grow at a 60.2% CAGR to reach 149.4 Thousand Units by the end of the analysis period. After a thorough analysis of the business implications of the pandemic and its induced economic crisis, growth in the Defense segment is readjusted to a revised 63.7% CAGR for the next 7-year period.

This segment currently accounts for a 10.2% share of the global Autonomous Vehicles market. Autonomous vehicles (AVs) are anticipated to find increasing uptake in the military sector due to the unabated increase in global military spending over the short- to medium-term.

Rising automobile consumer focus on efficiency and connectivity is driving automakers to scale up technology adoption in line with these requirements and to stay competitive. The increasing development and adoption of new electric car models is expected to further drive gains for the automotive software market."

Source: Globe News Wire

offered some insights into how they're deploying AI and ML – from predictive analytics to EHR automation to value-based care and population health management.

Each emphasized that, despite the huge potential, it's still early days. Importantly, it's key to not get too excited about the technology itself and wishcasting about the wide array of challenges it can solve, but to focus instead on smaller, discrete, achievable use cases, said Jason Joseph, chief digital and information officer at Michigan-based BSHS System."

Source: Healthcare IT News

5 back-office pain points to automate

"For financial services firms wanting to compete against an ever-growing number of fintech players, the road to parity goes through the back office — specifically in reevaluating and upgrading technology and processes. Many banks, credit unions, wealth management firms and other financial services companies are already feeling the pain of being anchored to legacy technology that can't evolve or adapt — and won't support new digital products and services. The main thing stopping financial institutions from automating manual tasks and processes is that they don't know where to start, according to Accenture. The multitude of IT systems and products to consider combined with the challenge of identifying which internal processes to automate appears to be leading to a distinct lack of action for many. There's also the ever-present dilemma of retrofitting new technology to legacy core banking systems and related applications."

Source: Bank Automation News

AUTONOMOUS VEHICLES



Robot Truckers Could Replace 500K U.S. Jobs

"Autonomous driving engineers are squarely focused on long-haul freight, the interstate runs with almost no complexity save for a slow curve or an E-ZPass lane. As such, those routes are some of the simpler challenges on the self-driving spectrum. The biggest hurdle may be infrastructure. The short trip from a factory or distribution center to an interstate is usually far more complicated than the next several hundred miles. The same is true once the machine exits the

transforming work systems through cognitive automation, organizations are provided with vast strategic opportunities to gain business value. However, research lacks a unified conceptual lens on cognitive automation, which hinders scientific progress. Thus, based on a Systematic Literature Review, we describe the fundamentals of cognitive automation and provide an integrated conceptualization. We provide an overview of the major BPA approaches such as workflow management, robotic process automation, and Machine Learning-facilitated BPA while emphasizing their complementary relationships. Furthermore, we show how the phenomenon of cognitive automation can be instantiated by Machine Learning-facilitated BPA systems that operate along the spectrum of lightweight and heavyweight IT implementations in larger IS ecosystems."

Source: Springer Link

Automation and the jobs of young workers

"New automation technologies affect workers in a heterogeneous manner according to their demographic characteristics, skills, and the tasks they perform. In this paper we study the effects of automation on labor market outcomes in a developing country, Chile. We focus our analysis on the heterogeneous impacts of automation across cohorts. Does automation affect young workers differently than older workers? Do young workers tend to perform routine tasks? Are young workers in routine occupations more exposed to negative effects of technology? Our empirical strategy is based on exploiting differences in the routinization of tasks across districts and occupations and a change in the trend of automation technology adoption in Chile. We find that young workers are more easily displaced by automation than older workers of similar characteristics. At the same time, cohorts of young workers are more skilled and more mobile than older workers, which implies that they have good prospects of working in complement with automation technology in the near future. The young and unskilled are the most vulnerable group of workers."

Source: Latin American Economic Review

Construction Automation and Sustainable Development

"The rising concerns about the adverse consequential effects of the construction industry on the triple bottom lines of sustainability have urged a paramount demand for

Top 10 Autonomous Vehicle Companies Competing With Tesla In 2022

"Autonomous driving has moved from the realm of science fiction to a very real possibility in recent years. This is largely due to the massive advancements in radar technology and microprocessor capacity. Autonomous vehicles have been under development for quite a long time now, and several companies have emerged as the pioneers in developing new and innovative features to these autonomous vehicles that are making this class of automobiles more advanced and agile. Among all the companies, Tesla has emerged as a leader in producing electric and autonomous cars. The company has showcased record-breaking innovations in this domain and has established itself as a competitor to beat in the future. Tesla competitors are adding new features to their autonomous cars to compete with the company, and also among themselves to provide the best services to the target audience. Naturally, this means unexpected, new, explosive innovations in the domain. In this article, we have listed the top autonomous vehicle companies that are also the top Tesla competitors for 2022."

Source: Analytics Insight

ROBOTICS INDUSTRY



Top 5 Robot Trends 2022

"The operational stock of industrial robots hit a new record of about 3 million units worldwide – increasing by 13% on average each year (2015-2020). The International Federation of Robotics analyzes the top 5 trends shaping robotics and automation around the globe."

Source: International Federation of Robotics

3 trends shaping robotics demand in 2022

"With demand for robots growing as companies in multiple sectors look for new ways to enhance their productivity and competitiveness post-pandemic, ABB has compiled a set of growth predictions, looking at key trends driving demand for robots in the coming year.

"The pandemic accelerated far-reaching global mega trends – from labor shortages and supply chain uncertainty, to the individualized consumer and growing pressure to operate sustainably and resiliently – leading new businesses to look to

interstate. One solution is for trucking companies to set up transfer stations at either end, where human drivers handle the tricky first leg of the trip and then hitch their cargo up to robot rigs for the tiresome middle portion. Another station at the exit would flip the freight back to an analog truck for delivery."

Source: Bloomberg

WARNING: Objects in Driverless Car Sensors May Be Closer Than They Appear

"Researchers at Duke University have demonstrated the first attack strategy that can fool industry-standard autonomous vehicle sensors into believing nearby objects are closer (or further) than they appear without being detected. The research suggests that adding optical 3D capabilities or the ability to share data with nearby cars may be necessary to fully protect autonomous cars from attacks.

The results will be presented Aug. 10–12 at the 2022 USENIX Security Symposium, a top venue in the field. One of the biggest challenges researchers developing autonomous driving systems have to worry about is protecting against attacks. A common strategy to secure safety is to check data from separate instruments against one another to make sure their measurements make sense together.

The most common locating technology used by today's autonomous car companies combines 2D data from cameras and 3D data from LiDAR, which is essentially laser-based radar. This combination has proven very robust against a wide range of attacks that attempt to fool the visual system into seeing the world incorrectly."

Source: Duke Pratt School of Engineering

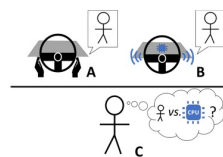
The top five best-equipped countries to support autonomous vehicles – Who's leading the self-driving revolution?

"Imagine a not so distant future where you're sitting in your electric vehicle (something truly luxurious since you're so successful in the future), and you're looking back on this list below and comparing predictions to your current world. You sip your ketone-infused coffee and take a bite of your zero-carb croissant while you answer emails using your glasses. In this future your vehicle is doing all the driving for you, so you can focus on your breakfast and the latest Electrek news. Look at you ... crushing it. This autonomous-vehicle future may not be so far away (and will likely arrive before a zero carb

automation and technology to supersede conventional methods. Considering the substantial applications of automation in the construction industry, there are conceivable potentials to strategize and formulate the capabilities of automation methods to fortify their contributions to sustainability. Such an approach requires a comprehensive understanding of what automation offers and what the construction industry proposes to become more sustainable. This chapter aims to illuminate the connection between automation and sustainable construction by shedding light on the capabilities of automation. The potential contribution of automation to construction is discussed in the bottom lines of sustainability, namely, environment, society, and economy. The chapter will ultimately examine the barriers to the application of automation in the construction industry. Additionally, it will provide some policy recommendations based on existing research on how to progress automation to create safe, productive, environmental-friendly, as well as human-friendly construction approaches."

Source: Springer Link

AUTONOMOUS VEHICLES



Do autonomous vehicles drive like humans? A Turing approach and an application to SAE automation Level 2 cars

"Fully automated vehicles (AVs) are set to become a reality in future decades and changes are to be expected in user perceptions and behavior. While AV acceptability has been widely studied, changes in human drivers' behavior and in passengers' reactions have received less attention. It is not yet possible to ascertain the risk of driver behavioral changes such as overreaction, and the corresponding safety problems, in mixed traffic with partially AVs. Nor has there been proper investigation of the potential unease of car occupants trained for human control, when exposed to automatic maneuvers. The conjecture proposed in this paper is that automation Level 2 vehicles do not induce potentially adverse effects in traditional vehicle drivers' behavior or in occupants' reactions, provided that they are indistinguishable from human-driven vehicles. To this end, the paper proposes a Turing approach to test the "humanity" of automation Level 2 vehicles."

robotic automation," said Marc Segura, ABB's newly appointed robotics division President. "As technology opens new opportunities for meeting customer demands, new trends will continue to emerge that will further drive demand in areas where robots have traditionally not been use."

Source: The Robot Report

INDUSTRIAL ROBOTICS MARKET - GROWTH, TRENDS, COVID-19 IMPACT, AND FORECASTS (2022 - 2027)

"The industrial robotics market was valued at USD 24.35 billion in 2020 and is expected to reach USD 52.85 billion by 2026, at a CAGR of 14.11% over the forecast period (2021 - 2026). Industrial robots play a crucial role in manufacturing industrial automation, with many core operations in industries being managed by robots. With economic growth across regions, the growth of e-commerce, electronics, and the automotive industry, among others has been on the rise... An industrial robot is a robot system used for manufacturing. Industrial robots are automated, programmable, and capable of movement on three or more axis. Typical applications of robots include welding, painting, assembly, pick and place for printed security boards, packing and labeling, palletizing, product inspection, and testing, all accomplished with high endurance, speed, and precision."

Source: Mordor Intelligence

Growth Opportunities In Collaborative Robots, Inkjet Printers, Additive Manufacturing, And Humanoid-Sensing Robots

"The Advanced Manufacturing Technology Opportunity Engine for March 2022 covers innovations pertaining to collaborative, inkjet printers, additive manufacturing and humanoid sensing robots among others. Some of the interesting innovations profiled include collaborative welding robots for industrial applications, shape-shifting robots for nanoscale manufacturing, innovative inkjet printers, multi-carton picking robots, metal 3D printing and 3D Bio printing among others.

The Advanced Manufacturing TOE covers global innovations and developments related to manufacturing and industrial automation on a monthly basis. Innovations are focused toward improving product traceability, energy efficiency and reducing environmental footprints, integrating product design and manufacturing aspects for reducing time-to-market.

croissant, to be honest), but which countries are making the most moves to support autonomous vehicles?"

Source: Electrek

What's the status of self-driving cars? There has been progress, but safety questions remain.

"Among the new crowd of autonomous vehicles is the 2022 Honda Civic. One of the newest settings on the standard-issue Honda Civic is it can drive itself down the road itself, then smoothly break behind a stopped car.

Honda told CBS News the system is not intended or capable of detecting the end of a road, and is not marketed or considered a [hands-free technology](#), adding that it's the driver's responsibility to maintain control at all times, CBS News' Brook Silva-Braga reports.

But researcher Kelly Funkhauser, who tests self-driving technology for Consumer Reports, worries such systems work so well most of the time that many drivers won't be ready when the inevitable exception pops up."

Source: CBS News

Consumers don't trust fully autonomous vehicle technology, new study finds

"A new study from AutoPacific released on Thursday said most drivers are not ready to fully trust autonomous vehicles yet.

The research and consulting firm surveyed 600 licensed drivers ages 18 to 80 throughout the U.S., asking their thoughts on the future of self-driving cars.

Only 29 percent of drivers said they would feel safe with their own fully autonomous vehicle, while 26 percent said they would only feel comfortable if they were a passenger in somebody else's fully autonomous car.

Currently, there are no completely automated vehicles available for public purchase.

"This is technology that most consumers are going to need to see and experience for several years before becoming comfortable," Ed Kim, president and chief analyst of AutoPacific, said in a press release. "It's different than any other automotive technology that's currently out there in that you'd be truly putting your vehicle in control of the drive 100 percent.""

Source: Automotive News

AUTONOMOUS ROBOTS

Source: Elsevier

The urban governance of autonomous vehicles – In love with AVs or critical sustainability risks to future mobility transitions

"Increasingly guided by the use of ICT, the flow of humans and materials, smart cities and autonomous mobility amalgamate into a game changer in urban planning. This paper critically explores the role of autonomous (driverless) vehicles in plans for urban futures. By looking into the urban plans of 10 European capitals, we investigate the anticipated promises and hazards of autonomous vehicles. Theoretically, the paper draws upon critical urban mobilities studies that invite interlinking carbon reduction, smart cities and mobility planning. By examining these plans, the paper critically evaluates current urban planning for autonomous vehicles by asking whether one can identify any links to the United Nations Sustainable Development Goals of sustainable cities and communities. A practice-based view on automation is then suggested as a pathway to promote a thorough sustainable mobility transition."

Source: Elsevier

Modelling the adoption of autonomous vehicle: How historical experience inform the future preference

"This study investigates individuals' preference towards autonomous vehicle (AV) as a privately-owned vehicle and as a vehicle in shared services. One of the key features of this study is to examine the effects of historical changes and experiences over the life course towards the adoption of AVs. A joint bivariate ordered probit model is developed using data from a retrospective survey conducted in the Okanagan region of British Columbia, Canada. The model captures unobserved error correlation between the response variables: preference towards AV ownership and using AV as a vehicle in shared services. The model confirms the existence of a significant error correlation between preferences for AV ownership and sharing. The model results suggest that AV adoption is significantly affected by individuals' historical experiences over the life course, such as exposure to technology, household characteristics, vehicle ownership, and accessibility and built-environment attributes of the residential location."

Source: Elsevier

Research focus areas include rapid prototyping (additive manufacturing), lightweighting (multimaterial joining, plastics and metals manufacturing, carbon fiber-based composite manufacturing), smart robotics (agile robots, consumer robots, swarm robotics, cobots), monitoring and control (wireless control networks, human machine interface), and simulation and modeling (design and simulation software)."

Source: Frost & Sullivan

Growth Opportunities in Robotic Grippers, Autonomous Mobile Robots, And 3d Printing

"The Advanced Manufacturing Technology Opportunity Engine for February 2022 covers innovations pertaining to robotic grippers, autonomous mobile robots, and 3D printing. Some of the innovations profiled include autonomous mobile robots for logistics, robotic solutions for construction, robotic grippers suitable for handling delicate objects, 3D printing with high throughput, and healthcare companion robots.

The Advanced Manufacturing TOE covers global innovations and developments related to manufacturing and industrial automation on a monthly basis. Innovations are focused toward improving product traceability, energy efficiency and reducing environmental footprints, integrating product design and manufacturing aspects for reducing time-to-market. Research focus areas include rapid prototyping (additive manufacturing), lightweighting (multimaterial joining, plastics and metals manufacturing, carbon fiber-based composite manufacturing), smart robotics (agile robots, consumer robots, swarm robotics, cobots), monitoring and control (wireless control networks, human machine interface), and simulation and modeling (design and simulation software)."

Source: Frost & Sullivan



BirdBot is energy-efficient thanks to nature as a model

"If a Tyrannosaurus Rex living 66 million years ago featured a similar leg structure as an ostrich running in the savanna today, then we can assume bird legs stood the test of time – a good example of evolutionary selection.

Graceful, elegant, powerful – flightless birds like the ostrich are a mechanical wonder. Ostriches, some of which weigh over 100kg, run through the savanna at up to 55km/h. The ostriches' outstanding locomotor performance is thought to be enabled by the animal's leg structure. Unlike humans, birds fold their feet back when pulling their legs up towards their bodies. Why do the animals do this? Why is this foot movement pattern energy-efficient for walking and running? And can the bird's leg structure with all its bones, muscles, and tendons be transferred to walking robots?"

Source: EurekAlert!

Bendy robotic arm twisted into shape with help of augmented reality

"Imperial researchers have designed a malleable robotic arm that can be guided into shape by a person using augmented reality (AR) goggles.

The flexible arm, which was designed and created at Imperial College London, can twist and turn in all directions, making it readily customisable for potential applications in manufacturing, spacecraft maintenance, and even injury rehabilitation."

Source: Imperial College London

Robot "Bugs" That Can Go Just About Anywhere

"These robots could be used to access confined areas for imaging or environmental evaluation, take water samples, or perform structural evaluations," said Junfeng Gao, who led the work as a PhD student in industrial engineering at the Swanson School of Engineering. "Anywhere you want to access confined places—where a bug could go but a person could not—these machines could be useful."

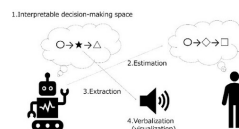
For many creatures under a certain size—like trap-jaw ants, mantis shrimp, and fleas—jumping across a surface is more energy-efficient than crawling. Those impulsive movements were replicated in the robots, which are made of a polymeric artificial muscle."

Development of a Knowledge Base for Multiyear Infrastructure Planning for Connected and Automated Vehicles

"Connected and automated vehicles (CAVs) require proper infrastructure for safer and more reliable operations. Many state and local planning agencies have developed multiyear capital programs to provide such infrastructure in a timely manner within their limited budgets. Meanwhile, the traffic environment will evolve over time as CAV technologies become available (i.e., toward the mixed environment of CAVs and human-driven vehicles), which requires infrastructure plans specific to different planning terms (i.e., short-, medium-, and long-term) to accommodate changing infrastructure needs. To develop an effective multiyear infrastructure plan, planning agencies need to understand changing infrastructure needs with time, identify alternative infrastructure options for different planning terms, and select the most appropriate ones based on their long-term vision. This study performed a systematic literature review to develop a knowledge base for multiyear infrastructure planning for CAVs."

Source: ASCE Library

AUTONOMOUS ROBOTS



Explainable autonomous robots: a survey and perspective

"Advanced communication protocols are critical for the coexistence of autonomous robots and humans. Thus, the development of explanatory capabilities in robots is an urgent first step toward realizing autonomous robots. This survey provides an overview of the various types of 'explainability' discussed in the machine learning literature. The definition of 'explainability' in the context of autonomous robots is then discussed by exploring the question: 'What is an explanation?' We further conduct a survey based on this definition and present relevant topics for future research in this paper."

Source: Taylor & Francis

Spherical Robots for Special Purposes: A Review on Current Possibilities

"The review discusses the possibilities of different driving mechanisms and

SOFT ROBOTICS



New sensor that mimics automatic human reaction to heat could pave the way for 'soft robots of the future'

"A new robotic sensor that mimics the automatic human reaction to heat is being hailed as a world first."

The device has been built by a team of experts from Liverpool Hope University, who say it's the first sensor that can trigger this "sensory impulse" that the robotics community has yet seen.

The findings have been published in IEEE Xplore last December 15, 2021 as an early-access article and published this month in the [IEEE Sensors Journal](#)."

Source: Robotics and Automation

INDUSTRIAL ROBOTS



ABB is adding two new robot ranges to its portfolio of large robots for complex manufacturing applications.

"Delivering "enhanced speed, accuracy, flexibility, and a more robust design including integrated process cabling", ABB's IRB 5710 and 5720 robots deliver increased productivity and enhanced performance with higher uptime for applications including electric vehicle (EV) manufacture, foundry, forging, rubber, plastics, and metal fabrication.

Available in eight variants, the IRB 5710 and IRB 5720 present a choice of options for payloads from 70 kg to 180 kg and reaches from 2.3 m to 3 m.

Together, the two robot families are suitable for a wide range of production tasks including material handling and machine tending and assembly, as well as specific operations in EV manufacturing such as battery module picking and placing, high precision assembly, and parts handling."

Source: Robotics and Automation

IFR predicts 'Top 5 Robot Trends of 2022' as total industrial robots sales reach a new record

sensors of spherical robots, and a special kind of mobile robots is introduced and discussed. The sensors discussed can expand robots' sensing capabilities which are typically very limited. Most spherical robots have holonomic characteristics and protect the inner environment using a shell. Today, there are a diversity of driving mechanisms. Therefore, this article provides a review of all of them and identifies their basic properties. Accordingly, many spherical robots have only inner sensors for moving, balancing, driving, etc. However, a few of them are also equipped with sensors that can measure environmental properties. Therefore, in this paper, we propose the possibility of using such sensors as cameras, LiDARs, thermocouples, and gas sensors, which can be used for special purposes underground, for example, in mines, underground tunnels, or road tunnels. After combining all components are combined, it is possible to design a special type of spherical robot designed for underground exploration, such as accidents in mines or road tunnels."

Source: MDPI

Workspace-Based Model Predictive Control for Cable-Driven Robots

"The control of cable-driven robots is challenging due to the system's nonlinearity, actuation redundancy, and the unilaterally bounded actuation constraints. To solve this problem, a workspace-based model predictive control (W-MPC) scheme is proposed, which combines the online model predictive control with offline workspace analysis. Using the workspace, a set of convex constraints can be generated for a given reference trajectory. This can then be used to formulate a convex optimization problem for the online W-MPC. Meanwhile, strict recursive feasibility and stability are obtained by taking advantage of the predictive feature of MPC. To demonstrate the effectiveness of the proposed W-MPC, simulation was performed on a 2-link planar cable-driven robot and a spatial cable-driven parallel robot for both nominal and non-nominal scenarios. Hardware experiment was also carried out using a 3 degree-of-freedom planar cable robot. The results show that the controller is efficient and effective to perform motion tracking with the cable force constraints satisfied despite the existence of various model uncertainties."

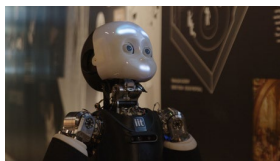
Source: IEEE Xplore

"The main theme underlying the trends will be that robots with new features and functions will capture new areas and create new markets. The operational stock of industrial robots hit a new record of about 3 million units worldwide – increasing by 13 percent on average each year (2015-2020).

Milton Guerry, president of the IFR, says: "Transformation for robotic automation is picking up speed across traditional and new industries. More and more companies are realizing the numerous advantages robotics provides for their businesses.""

Source: Robotics and Automation

HUMANOID ROBOTS



Italy makes first robot avatar for metaverse

"Italy has made the world's first robot avatar for the metaverse, an evolution of its iCub, a humanoid robot built by the Italian Institute of Technology (IIT).

Called iCub3, the avatar debuted in a remote tourism test in a 'tele-existence' experiment at a distance of 300 km, from IIT labs in Genoa to Pavilion 17 of the Venice Biennale architecture show, enabling the operator to see the works on display in an immersive way. (ANSA)."

Source: Istituto Italiano Di Tecnologia - IIT

VIRTUAL REALITY



You're Doing it Wrong: You Need to Compare Apples to Oranges

"Ben-Gurion University of the Negev researchers argue in a new paper that previous tests of virtual reality versus social robots for cognitive training compare apples to apples when they really need to be comparing apples to oranges.

"Until now, most studies compared a physical robot to a virtual reality robot, so it was no surprise that the participants overwhelmingly favored the physical robot. However, to truly assess their effectiveness, a socially adaptive robot needs to be compared to immersive virtual reality," explains lead researcher Prof. Shelly Levy-Tzedek."

Source: Ben-Gurion University of The Negev

A conceptual model for the adoption of autonomous robots in supply chain and logistics industry

"The arrival of the era of robots and autonomous machines is undisputable. It is anticipated that the future business environment will be characterized by a variety of intelligent systems and autonomous robots. In 2017, the International Federation of Robotics reported that momentum gained by robotic technologies is strong and that the sales volumes of both service and industrial robots is expected to grow. Building on this projection, the present study proposes a set of prerequisites or key determinants for the adoption of autonomous robots in the supply chain and logistics industry: technological context (i.e., relative advantage, complexity, and cost), organizational context (i.e., management support, financial support and employee competence) and environmental context (i.e., competitive pressure, customer pressure and vendor support)...The study offers some managerial advices to supply chain managers and marketers of the digital technologies and tools that can be applied in the supply chain setting."

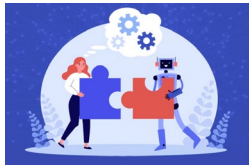
Source: Growing Science

SOFT ROBOTICS



Variable Stiffness Devices Using Fiber Jamming for Application in Soft Robotics and Wearable Haptics

"Variable stiffness actuation has applications in a wide range of fields, including wearable haptics, soft robots, and minimally invasive surgical devices. There have been numerous design approaches to control and tune stiffness and rigidity; however, most have relatively low specific load-carrying capacities (especially for flexural loads) in the most rigid state that restricts their use in small or slender devices. In this article, we present an approach to the design of slender, high flexural stiffness modules based on the principle of fiber jamming. The proposed fiber jamming modules (FJMs) consist of axially packed fibers in an airtight envelope that transition from a flexible to a rigid beam when a vacuum is created inside the envelope. This FJM can provide the flexural stiffness of up to eight times that of a particle jamming module in the rigid state. Unlike layer jamming modules, the design of FJMs



How to help humans understand robots

"Scientists who study human-robot interaction often focus on understanding human intentions from a robot's perspective, so the robot learns to cooperate with people more effectively. But human-robot interaction is a two-way street, and the human also needs to learn how the robot behaves.

Thanks to decades of cognitive science and educational psychology research, scientists have a pretty good handle on how humans learn new concepts. So, researchers at MIT and Harvard University collaborated to apply well-established theories of human concept learning to challenges in human-robot interaction."

Source: MIT

further allows them to control stiffness while bending in space. We present an analytical model to guide the parameter choices for the design of fiber jamming devices. Finally, we demonstrate applications of FJMs, including as a versatile tool, as part of a kinesthetic force feedback haptic glove and as a programmable structure."

Source: Mary Ann Liebert

Roadmap on soft robotics: multifunctionality, adaptability and growth without borders

"Soft robotics aims at creating systems with improved performance of movement and adaptability in unknown, challenging, environments and with higher level of safety during interactions with humans. This Roadmap on Soft Robotics covers selected aspects for the design of soft robots significantly linked to the area of multifunctional materials, as these are considered a fundamental component in the design of soft robots for an improvement of their peculiar abilities, such as morphing, adaptivity and growth. The roadmap includes different approaches for components and systems design, bioinspired materials, methodologies for building soft robots, strategies for the implementation and control of their functionalities and behaviour, and examples of soft-bodied systems showing abilities across different environments. For each covered topic, the author(s) describe the current status and research directions, current and future challenges, and perspective advances in science and technology to meet the challenges."

Source: IOP Science

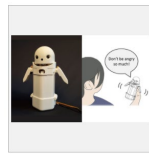
Artificial stretchable armor for skin-interfaced wearable devices and soft robotics

"Animals such as the armadillo and pangolin have natural armor as a mechanical form of protection from predators. Among the several types of armor that exist in nature, structures composed of thin elastomeric substrates with overlapping hard scales can shield underlying soft tissues from physical impacts and localized stresses while maintaining a level of mechanical compliance necessary for natural motions. Here, we design and fabricate a class of artificial armor that derives inspiration from these natural systems. The optimization process involves systematic tests of several design candidates to assess their mechanical stability against different types of mechanical stresses. The resulting platforms provide highly effective protection layers for wearable electronic devices and soft

robotic systems with little constraint on their functionality, as demonstrated with representative devices."

Source: Elsevier

SOCIAL ROBOTS

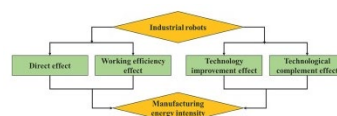


Weight Shift Movements of a Social Mediator Robot Make It Being Recognized as Serious and Suppress Anger, Revenge and Avoidance Motivation of the User

"Humans can become aggressive during text messaging. To maintain a healthy interpersonal relationship through text messaging, our negative mental states, such as anger, have to be well-controlled. This paper discusses the use of a handheld social robot deployed as a mediator in text messaging between humans. The robot is equipped with a movable weight inside its body. By controlling the movement of the internal weight during the time when the robot speaks out messages received from a human sender, we hypothesize that the psychological state of a receiver who holds the robot can be affected (for example, he/she will listen to the messages more seriously). In a controlled study ($n = 94$), in which participants were manipulated to be frustrated by using a context scenario, we studied the effect of three dialogue scripts with/without weight shifts. Results showed that introducing weight shifts together with the robot speech suppressed on average 23% of the user's anger."

Source: University of Tsukuba

INDUSTRIAL ROBOTS



Assessing the impact of industrial robots on manufacturing energy intensity in 38 countriesv

"Considering the continuing slowdown of the improvement in energy intensity around the world, it is essential to seek a more effective measure to address the dilemma of energy and sustainable development. To this end, this research attempts to provide fresh insight into the determinants of energy intensity from the perspective of industrial robots and an industry-based view. By applying the dynamic

panel GMM estimate methodology to a new data panel that includes 38 countries and 17 manufacturing sectors, this study provides the first comprehensive assessment of the use of industrial robots on manufacturing energy intensity. We found that industrial robots could significantly improve manufacturing energy intensity, and our hypotheses passed a series of robustness tests. Moreover, this improvement effect works through the technology improvement effect and technological complement effect between industrial robots and labor."

Source: Elsevier

Robust design of independent joint control of industrial robots with secondary encoders

"The independent joint control approach with motor-side velocity and position feedback still dominates most industrial robot applications. Although it is known, that the elasticity of the drivetrains has a significant influence on the achievable dynamic path accuracy. As a result, an increasing number of industrial robots are available that use secondary encoders to measure the joint position. This paper addresses the robust design of independent joint control of industrial robots with secondary encoders under explicit consideration of the drivetrain elasticity. For this purpose, the nonlinear robot dynamics are linearized and the configuration dependency of the mass matrix is treated as structured uncertainty. The trade-off between the velocity control bandwidth and the gain margin of the position control loop is solved by means of a nonsmooth optimization-based synthesis. The design method is validated for the three base joints of a KUKA KR210-2 industrial robot. Experimental results for linear Cartesian paths and a milling experiment are presented to confirm the approach."

Source: Elsevier

SERVICE ROBOTS



Step Aside! VR-Based Evaluation of Adaptive Robot Conflict Resolution Strategies for Domestic Service Robots

"As domestic service robots become more prevalent and act autonomously, conflicts of interest between humans and robots become more likely. Hereby, the

robot shall be able to negotiate with humans effectively and appropriately to fulfill its tasks. One promising approach could be the imitation of human conflict resolution behaviour and the use of persuasive requests. The presented study complements previous work by investigating combinations of assertive and polite request elements (appeal, showing benefit, command), which have been found to be effective in HRI. The conflict resolution strategies each contained two types of requests, the order of which was varied to either mimic or contradict human conflict resolution behaviour. The strategies were also adapted to the users' compliance behaviour. If the participant complied after the first request, no second request was issued. In a virtual reality experiment (N=57) with two trials, six different strategies were evaluated regarding user compliance, robot acceptance, trust, and fear and compared to a control condition featuring no request elements."

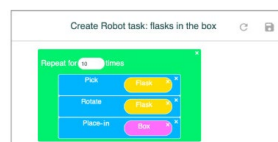
Source: Springer Link

Living and working with service robots: a TCCM analysis and considerations for future research

"Service robots are now an integral part of people's living and working environment, making service robots one of the hot topics for service researchers today. Against that background, the paper reviews the recent service robot literature following a Theory-Context-Characteristics-Methodology (TCCM) approach to capture the state of art of the field. In addition, building on qualitative input from researchers who are active in this field, the authors highlight where opportunities for further development and growth lie."

Source: Emerald Insight

COLLABORATIVE ROBOTS



A hybrid approach to user-oriented programming of collaborative robots

"The research reported in this paper proposes a new approach to collaborative robots that aims at improving the simplicity and efficiency of the programming task for non-technical users. It is grounded on three standpoints: (i) an elementary and disciplined paradigm for robot programming, called the simple programming journey, (ii) a hybrid interaction mode where robot

tasks can be programmed using a natural language chat and, if necessary, can be completed and finalized through a block-based interface, and (iii) a robust cognitive match between the mental models of the user and the programming interface. The proposed approach has been implemented and tested through the development of a prototype programming environment called CAPIRCI, which can be tailored to different application domains through the definition of objects, locations, and actions. CAPIRCI has been tested by real users with a COBOTTA robot by DENSO WAVE Ltd."

Source: Elsevier

ROBOTS AND SUSTAINABILITY

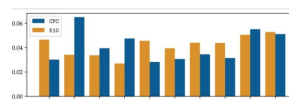


Robots and Sustainability: Robots as Persuaders to Promote Recycling

"Humans tend to interact socially with humanoid devices, such as robots. Therefore, a possible application of robotics technology is the promotion of pro-social behavior, namely recycling. To test the effectiveness of this application, an experimental setting in which participants were required to dispose of waste was created. Two types of electronic instructors, a robot and a tablet computer, were located close to the disposal area to provide instructions on appropriate waste disposal. The comparison of the effectiveness of the two types of electronic instructors found that participants exposed to the robot sorted the waste more accurately than participants exposed to the tablet computer. Scores for perceived anthropomorphism and induced empathy were higher for the robot than the tablet computer. We conclude that robots, because of their anthropomorphic features, are more likely to evoke empathy than tablet computers, and thus robots can be more effective in promoting pro-social behavior."

Source: Springer Link

ROBOTS AND LABOUR SAVING HEURISTICS



Robots and the origin of their labour-saving impact

"This paper investigates the presence of explicit labour-saving heuristics

within robotic patents. It analyses innovative actors engaged in robotic technology and their economic environment (identity, location, industry), and identifies the technological fields more exposed to labour-saving innovations. It exploits advanced natural language processing and probabilistic topic modelling techniques applied to the universe of USPTO patent applications between 2009 and 2018, matched with the ORBIS (Bureau van Dijk) firm-level dataset. The results show that labour-saving patent holders comprise not only robot producers, but mainly adopters. Consequently, labour-saving robotic patents appear along the entire supply chain. Additionally, labour-saving innovations are directed towards manual activities in services (e.g. in the logistics sector), activities entailing social intelligence (e.g. in the healthcare sector) and cognitive skills (e.g. learning and predicting)."

Source: Elsevier

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