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BM, biomimicry, an innovative approach that draws inspiration from nature's designs, processes, and systems to solve human problems and create sustainable solutions. Biomimicry seeks to design products, technologies, and strategies that are more efficient, resilient, and environmentally friendly, aligning human innovations with the wisdom of nature.

C-Robots, companion robots, are AI-driven machines designed to provide companionship and support to humans. These robots are programmed to engage in social interactions, offer emotional support, and assist with daily tasks, aiming to enhance the well-being and quality of life of their human users.

Co-bots, collaborative robots, a type of robot designed to work alongside humans in a shared workspace safely and efficiently. These robots are equipped with sensors and advanced programming that allow them to collaborate and cooperate with human workers, enhancing productivity and safety in various industries and tasks.

D-robots, dystopian robots, are captivating characters commonly portrayed in dystopian science fiction literature, movies, or other media. With their negative qualities and formidable capabilities, they represent a significant threat to humanity, making them compelling and cautionary figures in these narratives.

POINTERS

ROBOTS AND YOU

DOI: 10.1145/3611691

The creation of the first robot is a topic of debate, but one notable early example is the Unimate developed in the late 1950s. Over time, robots have evolved from performing repetitive tasks in manufacturing to more advanced and interactive forms. With remarkable advancements in the convergence of artificial intelligence and robotics, we have witnessed the emergence of highly capable and agile robots, including notable examples such as Spot, Atlas, and Sophia.

During the initial years of development, robots primarily served repetitive functions within the manufacturing sector and had limited engagement with humans. However, as technology progressed, the introduction of improved sensors, control systems, and safety measures gave rise to collaborative robots (cobots). Subsequently, assistive and service robots came into existence, leading eventually to the development of humanoids.

Robots offer increased productivity, efficiency, and product quality in many scenarios. They can operate in hazardous environments, don't require the same environmental conditions as humans, and possess superior sensors and actuators. However, robots have limitations. They strictly follow programmed instructions and lack the improvization and cognitive abilities of humans. They also cannot match the dexterity and understanding of human perception.

Despite advancements in AI and robotics, it is important to recognize human input remains crucial in the workplace. While automation may replace certain manual labor tasks, it cannot fully replace humans, as human interaction, problem-solving, and decision-making are indispensable in many industries.

Although integration of AI and robotics has revolutionized the capabilities of robots, enhancing productivity and efficiency, the collaboration between humans and robots is essential for leveraging the strengths of both and ensuring optimal outcomes. The future lies in finding a harmonious balance between automation and human involvement, where robots augment human abilities and contribute to a more productive and innovative workforce.

—*Jeenisha Shrungare*

RESEARCH PAPERS

"Exploring the Impact of Artificial Intelligence and Robots on Higher Education Through Literature-based Design Fictions"

By A. M. Cox

The potential long-term effects of robotics and AI on higher education are covered in this paper. It explores the use of design fictions, which are imaginative narratives depicting future scenarios involving AI and robots in learning, administration, and research. The paper offers eight design fictions that offer various viewpoints and debate angles on AI. The author highlights the need for additional research and advancement in this sector by acknowledging the shortcomings and gaps in the fictions. The paper adds

to the body of knowledge on design fictions by stressing how they can be used to spark debate and provide probing questions about the broad consequences of technologies.
https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-020-00237-8

"Design, Implementation, and Controlling of a Humanoid Robot"
By Kiran Somisetti, Khushboo Tripathi, and Jitendra Kumar Verma
Researchers from Amity University Haryana, Gurugram examine how quickly robots are becoming competitive with people in a variety of sectors. Robot diversity, kinematics, localization, mapping, control systems, actuators, sensors, and robot learning are some of the topics they address. A humanoid robot experiment is discussed, emphasizing the robot's expressive ability and interactions with its surroundings. Humanoid locomotion, reconsidering the design of robotic arms, and effective path planning for mobile robots are all ideas for future research. The paper highlights the developments in robotics and suggests areas for additional study and research.
https://ieeexplore.ieee.org/document/9200020

"Humanoid Robots Versus Humans: How is emotional valence of facial expressions recognized by individuals with schizophrenia? An Exploratory Study"
By Stéphane Raffard et. al.
The study investigates how people with schizophrenia interpret the facial expressions of a humanoid robot's emotions. Participants were shown to be faster and more accurate in identifying emotions in human faces than in robot faces. Patients with more distressing symptoms had trouble identifying distressing facial expressions in both the robot and human faces. The study emphasizes the significance of humanoid robot appearance in interactions between humans and robots. The creation of socially intelligent robots for people with social disabilities is a goal of future research. The study is a component of the AlterEgo project, which uses robotics and avatars to improve social interaction in people with social disorders.
https://www.sciencedirect.com/science/article/pii/S0920996416302687

RECOMMENDED READING

"The Rise of Artificial Intelligence: Will robots actually replace people?"
By Ashley Stahl
In this 2022 article for *Forbes*, Stahl states robots and AI are expected to be integrated into our daily lives by 2025, impacting industries like healthcare, customer service, and logistics. Research reveals conflicting views on job displacement, with

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HC-XAI, human-centered explainable AI, the design and implementation of AI systems with a strong emphasis on ensuring the explanations provided by AI are understandable, useful, and relevant to humans. HC-XAI focuses on making AI models transparent, interpretable, and user-friendly, empowering humans to have greater control and trust in the decision-making process facilitated by AI.

PD, participatory design, is a collaborative approach to designing products, systems, or services where end-users, stakeholders, and designers work together in the design process. The goal of participatory design is to ensure the final product meets the needs, preferences, and expectations of the people who will be using it, resulting in more user-centric and effective solutions.

RL, reinforcement learning, a machine learning technique where an artificial agent learns to optimize its decision-making and actions to achieve specific goals by trial and error, maximizing its performance over time without the need for explicit supervision or pre-labeled data.

S-Robots, social robots, specialized robots designed to interact and engage with humans in a social and empathetic manner. They are equipped with advanced AI and sensors, enabling them to perceive and respond to human emotions, facilitating meaningful and lifelike interactions in various social settings.

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around half of experts anticipating a rise in income disparity as a result of the automation of numerous jobs. The other half believes, like the Industrial Revolution, robotics and AI will spur the development of new industries and jobs. People and robots are considered to have a mutually beneficial partnership in which robots handle physically difficult activities and people concentrate on those tasks requiring dexterity and judgment. Overall, it is anticipated that rather than entirely replacing most vocations, AI will enhance and complement them.
https://www.forbes.com/sites/ashleystahl/2022/05/03/the-rise-of-artificial-intelligence-will-robots-actually-replace-people/?sh=134d52693299

"Of Robots and Humans"
By Vanessa Evers
Writing for *The UNESCO Courier*, Evers asserts robots and AI will have a significant impact on our daily lives in the near future. Numerous facets of our lives already use these cutting-edge technologies. But looking forward, Evers points out even more amazing possibilities. From an engineering standpoint, there are still considerable obstacles to be solved. Robots' dependency on electricity makes it difficult to integrate them with human tissue, and human communication itself is complicated. Since a seamless integration of artificial agents and people involves more than just mimicking particular aspects of human intellect, Evers concludes by saying: "It won't happen tomorrow."
https://en.unesco.org/courier/2018-3/robots-and-humans

"Robots With a Human Touch? Yes, Please"
By Ken Washington
In this forecast for 2023, Washington predicts robots will play a more human-like function, conversing with people, entertaining people, and even providing companionship to their owners. Despite little success in the past, new developments in AI and machine learning have significantly increased robots' capacity to understand language and social contexts. Home robots are expected to develop into emotional allies who provide comfort and guidance in addition to performing practical tasks. Although emotional integration may seem improbable, the appeal of machines offering fact-based answers resides therein. In time, as technology develops and becomes more widely available, robots may prove to be useful and enjoyable housemates.
https://www.wired.com/story/robots-design

BOOKS

Consciousness in Humanoid Robots
By Antonio Chella, Angelo Cangelosi, Giorgio Metta, and Selmer Bringsjord
This book explores the idea of consciousness and how it relates to human-like robots. It looks at a number of cognitive, perceptual, learning, and self-awareness issues in the context of creating robots

with consciousness akin to that of humans. The ramifications of conscious robots in fields, like artificial intelligence and robotics, are explored, along with the difficulties and potentialities of building machines with a sense of self. The authors present a thorough examination of this fascinating area by providing insights, speculations, and discussions on the nature of consciousness and how it might appear in humanoid robots.

Human-Robot Interaction in Social Robotics
By Takayuki Kanda and Hiroshi Ishiguro
Published in 2013, this book explores human-robot interaction in the field of social robotics. It delves into numerous areas of human-robot interaction, such as communication, behavior, emotions, and social relationships. Kanda and Ishiguro examine the problems and prospects in building robots that can interact socially and meaningfully with people. They discuss robot appearance, gesture recognition, verbal and nonverbal communication, and the ethical implications of human-robot interactions. The book provides significant insights into the burgeoning topic of social robotics and its impact on society through a combination of theoretical talks, practical examples, and case studies.

Trends in Control and Decision-Making for Human–Robot Collaboration Systems
By Yue Wang and Fumin Zhang
The book investigates advances and trends in the control and decision-making aspects of human-robot collaboration systems. The authors investigate the problems and opportunities associated with constructing intelligent and collaborative robots capable of working effectively alongside humans. Robot perception, task allocation, motion planning, learning algorithms, and human-robot interaction are all covered in the book. The authors explore the use of AI and control approaches to improve robot decision-making in collaborative contexts. The book gives significant insights into state-of-the-art methodologies and future prospects in control and decision-making for human-robot cooperation systems.

WEBSITES

Roboschool
Released in 2017, Roboschool is an open-source software designed for simulating robots and is integrated with OpenAI Gym. It introduces two additional environments featuring 3D humanoid models; these environments require interactive control, where the robots are tasked with running toward a flag that continuously changes its position randomly. This dynamic element enhances the robustness and responsiveness of the control system. Furthermore, Roboschool supports multiplayer functionality, allowing users to run and train multiple agents simultaneously within a shared environment.
https://openai.com/research/roboschool

SOLIDWORKS
SOLIDWORKS is a CAD and CAE application developed by Dassault Systèmes, which is utilized for the comprehensive development of mechatronics systems, including robots. It offers user-friendly 2D and 3D product development solutions that are both robust and efficient. During the initial stages of the development process, the software is employed for tasks such as planning, visualizing ideas, creating models, assessing feasibility, prototyping, and managing projects. Subsequently, SOLIDWORKS is used for designing and constructing mechanical, electrical, and software components within the system.
https://www.solidworks.com

Vention
Vention offers a comprehensive solution for designing, automating, ordering, and deploying automated equipment. It specializes in creating tailored machines for various automation needs, such as assembly, material handling, and machine tending. Vention caters to some of the largest manufacturers and provide industrial-grade hardware. Vention has developed a user-friendly cloud-based CAD software and offers plug-and-play industrial automation components, and also provides customizable templates for designing automated systems. Vention's ultimate goal is to democratize the manufacturing industry by making automation accessible to a wider range of users.
https://www.vention.io