Research Inventy: International Journal of Engineering And Science
Vol.13, Issue 7 (July 2023), PP 106-108
Issn (e): 2278-4721, Issn (p):2319-6483, www.researchinventy.com

Robotics and Artificial Intelligence Working Together: A Complete Integration

Sushanta Kumar Panigrahi[1] Rati Ranjan Sahoo[2] Amalendu Bag [3]
[1,2,3]*Dept. of CSE, Einstein Academy of Technology and Management, Bhubaneswar*

Abstract
Most software-driven robotic systems, such as mobile robots, unmanned aerial vehicles, and, increasingly, semi-autonomous cars, are associated with the emergence of artificial intelligence. However, given the substantial differences between the computational domain and the physical domain obstructs existing systems' efforts to develop intelligent, user-friendly robots that can interact and interact with our human-centredenvironment.Developing dependable and embodiment-aware artificial intelligence systems is the goal of the emerging discipline of machine intelligence (MI), which blends robotics and AI. Because these systems are self-conscious and aware of their surroundings, they may adjust to the interacting body in which they are functioning. To achieve fully autonomous intelligent systems in our daily lives, robotics and artificial intelligence (AI) must be integrated into control, perception, and machine-learning systems. An outline of the is given in this review. The historical evolution of artificial intelligence, dating back to the 12th century. The examination of robotics and artificial intelligence (AI) as it is today follows, with a discussion of important systems and current research prospects. In addition, the paper discusses the unmet potential future of human-machine interactions and lists the remaining obstacles in these sectors.

I. INTRODUCTION

The convergence of robots and artificial intelligence (AI) is rapidly emerging as a catalyst for the development of novel industries, state-ofthe-art technology, and enhanced productivity and efficiency across established sectors [1]. The ongoing development of artificial intelligence (AI) in the field of robotics is leading to a growing recognition of its practical applicability in various real-world contexts [2]. Artificial intelligence (AI) is significantly contributing to the transformation of various industries and enhancing the quality of everyday life. Its applications range from self-driving automobiles, customer service and healthcare to industrial and service robots [3]. Despite apprehensions around the potential displacement of human labour by AI and robotics, the World Economic Forum (WEF) forecasts a net increase of 12 million employment resulting from the use of this technology by the year 2025 [4]. The current expansion offers a favourable circumstance for the retraining and acquisition of new skills among the workforce, as well as the allocation of resources towards knowledge development that is in line with the most recent technological advancements [5].

The integration of artificial intelligence (AI) and robotics holds significant promise for transforming work responsibilities in many sectors. This includes the automation of repetitive operations within manufacturing facilities, as well as the introduction of adaptability and cognitive capabilities into monotonous applications. The potential applications of artificial intelligence (AI) in the realm of robotics are many and diverse, rendering it a captivating area of study and comprehension. Continue reading to get further knowledge about robots and artificial intelligence, as well as discover ways in which you may actively contribute to the future development of this significant sector [6,7].

MACHINE LEARNING

Machine learning has emerged as a potent instrument for enabling robots to perform complex tasks. Robots can enhance their understanding of the world, devise strategies to navigate barriers, and optimize problem-solving techniques to enhance task completion efficiency through the process of exploring their surroundings. Machine learning is playing a crucial role in enhancing the intelligence and adaptability of robots across various domains, ranging from household robots such as vacuum cleaners to industrial robots employed in manufacturing facilities. These aforementionedexamples represent a mere fraction of the myriad uses of artificial intelligence within the realm of robotics in contemporary times. With the ongoing expansion and increasing sophistication of these technologies, it is certain that a plethora of further inventive uses will emerge in the foreseeable future [10,12].

THE MODERN ERA OF ROBOTICS AND AI

The contemporary epoch of robotics and artificial intelligence is distinguished by the progressive reduction in size of electrical and mechatronic components, as well as a substantial augmentation in computational capabilities. These advancements have resulted in the emergence of increasingly feasible and functional robotic systems [5,6]. In 1973, a research team from Waseda University in Japan introduced the WaBot, which was the inaugural humanoid robot designed to replicate human motion. WaBot possessed rudimentary functionalities for locomotion, object manipulation, and transportation between different locations. The year 1978 witnessed the introduction of a technologically advanced iteration of the Unimate by Unimation, known as the Programmable Universal Machine for Assembly (PUMA). PUMA has gained significant traction across both industry and academics, becoming as a prominent exemplar for anthropomorphic robots. The system continues to be extensively utilized in contemporary academic robotics literature and publications as a prominent reference and benchmark. The establishment of the contemporary discipline of reinforcement learning occurred during the 1980s through the integration of diverse methodologies from multiple academic domains. The initial premise originated from the concept of trial-anderror learning, which was drawn from psychological research on animal behaviour dating back to the early 18th century [7,8]. Reinforcement refers to the manifestation of a specific behavioural pattern resulting from the interaction between an animal and its surrounding environment. The animal is exposed to various stimuli that are temporally correlatedwith its behaviour, resulting in the persistence of specific behavioural patterns even after the stimuli have ceased. From a technical perspective, this process can be characterized as an optimization problem that has stochastic elements due to limited knowledge of the entire system. An extended iteration of the optimal control framework previously discussed can be employed to characterize and address the aforementioned system. One of the pioneers in implementing this concept was Witten, who employed an adaptive optimum control methodology [9,4].

MAN, AND MACHINE IN THE AGE OF MACHINE INTELLIGENCE

In this section, we will examine existing intelligent systems in further detail. On one side, there is a growing prevalence of AI systems that are solely reliant on software. In the optimal scenario, these services, predominantly accessible through the internet and smart devices, furnish us with valuable knowledge [54]. However, in less favourable circumstances, they inundate us with copious quantities of unorganized and potentially unreliable information and data. In contrast, the private sector encompasses several categories of robotic systems, including mobile robots like lawn mowers, vacuum-cleaning systems, unmanned aerial aircraft, and, notably, semi-autonomous autos. Articulated robots are currently limited to the industrial sector due to safety concerns associated with human interaction and the intricate and specialized nature of their programming processes. It is evident that the development of sophisticated, intricate, and user-friendly robotic systems capable of effectively engaging with and controlling our human-centric environment is still a considerable distance away. To address this disparity, it is imperative to establish a more efficient integration between the realms of algorithms and the physical world. The nascent field of machine intelligence (MI) offers a comprehensive framework to tackle this concern. The integration of perception (sensing), AI (planning), and robotics (acting) with pervasive control and machine-learning functions is a crucial field of study. Its significance lies in its ability to facilitate the development of fully autonomous AI robots, autonomous vehicles, aerial taxis, networked cyber-physical systems, molecular robots for drug delivery, and other intelligent systems. These advancements have the potential to transform various domains such as our homes, workplaces, and healthcare facilities. The overarching objective of the field of machine intelligence (MI) is to develop a reliable and perceptive artificial intelligence (AI) that possesses self-awareness and environmental awareness. This advanced AI not only governs its actions, but also adjusts its control mechanisms to suit the intelligent entity it is intended to oversee.

FUTURE PERSPECTIVES AND CONCLUSIONS

The potential for artificial intelligence (AI) in the field of robotics is extensive and holds considerable promise. The subsequent phase of artificial intelligence, sometimes referred to as AGI or Artificial General Intelligence, with the capacity to attain a degree of comprehension comparable to that of humans. The crucial aspect of this endeavour involves the integration of the computational framework of artificial intelligence with a robotic system. In order to function effectively, the robot must exhibit the essential attributes of mobility, sensory perception (including touch, vision, and hearing), and the capacity to engage with physical entities. These capabilities are crucial for enabling the system to acquire real-time sensory input in response to its actions. The presence of this feedback loop facilitates the system's ability to acquire knowledge and understanding, hence advancing its progress towards attaining genuine Artificial General Intelligence (AGI) .

The present emphasis on artificial intelligence (AI) in the field of robotics is undergoing a transition from the inquiry into the tasks that robots are capable of executing for humans, to the examination of the kind of input that a robot can furnish to the cognitive faculties of AI. By providing AI systems with the opportunity to engage in the exploration and experimentation of tangible items, it becomes feasible for them to attain a more profound level of comprehension, akin to that of a human child. The integration of artificial intelligence (AI) with robots is anticipated to provide substantial progress across several industries, encompassing manufacturing, healthcare, security, and space exploration.

The potential for significant advancements in our understanding and interaction with the world is promising when we consider the future of artificial intelligence (AI) in the field of robotics. The integration of artificial intelligence's computing capacity with the physical capabilities of robots has the potential to facilitate exploration and invention, thereby bringing us closer to achieving true artificial general intelligence (AGI).

REFERENCES

[1]. Angwin J, Larson J, Mattu S, Kirchner L. Machine bias: there’s software used across the country to predict future criminals. And it’s biased against blacks. Propublica; 2016.
[2]. Athey S. The impact of machine learning on economics. In: Agarwal AK, Gans J, Goldfarb A, editors. The economics of artficial intelligence: an agenda. University of Chicago Press; 2018.
[3]. Bessen JE. How computer automation affects occupations: technology, jobs, and skills. Boston University School of Law, law and economics Working Paper No. 15-49; 2015.
[4]. Bessen JE, Impink SM, Seamans RC, Reichensperger L. The business of AI startups. Boston University School of Law, Law and Economics Research Paper No. 18-28. SSRN Journal. 2018. DOI: 10.2139/ssrn.3293275
[5]. Brynjolfsson E, Hui X, Lu M. Does machine translation affect international trade? Evidence from a large digital platform [National Bureau of Economic Research working paper]; 2018a (No w24917).
[6]. Brynjolfsson E, McAfee A. The business of artificial intelligence. Harv Bus Rev; 2017.
[7]. Feng S. The proximity of ideas: an analysis of patent text using machine learning. NYU stern working paper. PLoS One. 2020; 15(7):e0234880. DOI: 10.1371/journal.pone.0234880, PMID 32645050.
[8]. Mandel M. How e-commerce creates jobs and reduces income inequality. Progressive Policy Institute; 2017.
[9]. McKinsey global institute (MGI). A future that works: automation, employment, and productivity; 2017. Available: https://www.mckinsey.com/~/media/mckinsey/featured%20insights/Digital%2 0Disruption/Harnessing%20automation%2 0for%20a%20future%20that%20works/MG I-A-future-that-works-Executivesummary.ashx
[10]. Menon A, Choi J, Tabakovic H. What you say your strategy is and why it matters: natural language processing of unstructured text. Acad Manag Proc. 2018;1.
[11]. Pajarinen M, Rouvinen P. Computerization threatens one-third of Finnish employment. ETLA brief from the research institute of the Finnish Eocnomy; 2014.
[12]. Roy R, Islam M. Nuanced role of relevant prior experience: sales takeoff of disruptive products and product innovation with disrupted technology in industrial robotics. In: Furman J, Gawer A, Silverman BS, Stern S, editors. Entrepreneurship, Innovation, and Platforms. Emerald Publishing Limited. 2017;37:81-111. DOI:10.1108/S0742-332220170000037004
[13]. It’s learning. Just not as we know it; 2018.
[14]. Acemoglu D, Restrepo P. Robots and jobs: evidence from US labor markets. Journal of Political Economy. 2020;128(6):2188- 244. DOI: 10.1086/705716
[15]. Adomavicius G, Tuzhilin A. Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions. IEEE Trans Knowl Data Eng. 2005;17(6):734-49. DOI: 10.1109/TKDE.2005.99
[16]. Akerman A, Gaarder I, Mogstad M. The skill complementarity of broadband internet. Quarterly Journal of Economics. 2015;130(4):1781-824. DOI: 10.1093/qje/qjv028
[17]. Autor DH, Katz LF, Kearney MS. The polarization of the US labor market. AEA Pap Proc. 2006;96.
[18]. Autor DH, Levy F, Murnane RJ. The skill content of recent technological change: an empirical exploration. Q J Econ. 2003;118.
[19]. Autor, D.H. and A. Salomons, Is automation labor-displacing? Productivity growth, employment, and the labor share. Cambridge: National Bureau of Economic Research; 2018.
[20]. Barach MA, Golden JM, Horton JJ. Steering in online markets: The role of platform incentives and credibility. Management Science. 2020;66(9):4047- 70. DOI: 10.1287/mnsc.2019.3412
[21]. Barach M, Kaul A, Leung M, Lu S. Small numbers bargaining in the age of big data: Evidence from a two-sided labor matching platform. SSRN Journal; 2018. DOI: 10.2139/ssrn.3277455
[22]. Belloni A, Chernozhukov V, Hansen C. High-dimensional methods and inference on structural and treatment effects. J Econ Perspect. 2014;28(2):29-50. DOI: 10.1257/jep.28.2.29
[23]. Bloom N, Garicano L, Sadun R, Van Reenen J. The distinct effects of information technology and communication