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Artificial Intelligence & Robotics

Zeba Mahat[1], Dr. Swati Pramod Mane[2]

[1] ***(Student, Department of Computer Science, Sarhad College of Arts, Commerce and Science, Pune, Maharashtra)***
Email: zebamahat001@gmail.com
[2] ***(Assistant. Professor, Department of Computer Science, Sarhad College of Arts, Commerce and Science, Pune, Maharashtra)***
Email: sarhadswatimane@gmail.com

ABSTRACT

An overview of the dynamic junction of robotics and artificial intelligence, as well as how it affects organizational and economic dynamics, is provided in this research article. The emerging research areas in economics and management that investigate the complex effects of these state-of-the-art technologies are examined. Utilizing the many methodologies employed by researchers in this domain, we offer discernments regarding the consequences of automation, robotics, and artificial intelligence on corporate strategy and organizational architecture. The directions for future research endeavours and urge organizational and strategy researchers to become more involved and attentive in these domains are highlighted.

Keywords: *human-robot interaction, robotics, artificial intelligence, machine learning, humanoid robots, deep learning ,reinforcement learning*

INTRODUCTION

Robotics and artificial intelligence (AI) have become cutting edge fields that could revolutionize many facets of the economy and society. Robots can now automatically see, reason, and act in complicated settings thanks to the integration of AI into robotics, which has sparked the creation of sophisticated robotic systems in sectors including manufacturing, healthcare, and logistics. Furthermore, new avenues for research and development in areas like human-robot interaction, social robotics, and cognitive robotics have been made possible by the convergence of AI and robotics. Consequently, an increasing amount of scholarly work has been conducted to explore the most recent developments, difficulties, and possible uses of AI in robotics. The objective of the research paper is to give a broad overview of the state of artificial intelligence (AI) in robotics, emphasizing research trends, technical methods, and practical applications, as well as discussing the moral, societal, and financial ramifications of this quickly developing sector.

LITERATURE REVIEW

The area of robotics could undergo a revolution thanks to the potential progress of artificial intelligence (AI). Growing interest has been shown in incorporating artificial intelligence (AI) methods into robotic systems so they can operate independently and adjust to changing surroundings. Robotics has made substantial use of machine learning techniques, such as supervised, unsupervised, and reinforcement learning, to allow robots to learn from data and make judgments based on patterns and experiences. Robotic perception has been greatly improved by advances in computer vision, an AI subfield, which have made it possible for robots to see and comprehend their environment. Moreover, the application of natural language processing (NLP) has enabled robots to comprehend and produce human language for the goal of facilitating human-robot interaction. The area of robotics could undergo a revolution thanks to the potential progress of artificial intelligence (AI) [1].

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Moreover, the application of natural language processing (NLP) has enabled robots to comprehend and produce human language for the goal of facilitating human-robot interaction. Natural language processing (NLP) techniques have been used in a variety of robotic applications, including social, service, and personal support robots, to enhance their natural and intuitive human-robot interaction. Deep learning, which uses massive amounts of data to train artificial neural networks, has shown impressive results in a variety of robotics applications, including as motion planning, object recognition, and speech recognition.

CURRENT STATE OF THE ART OF ROBOTICS AND AI

Robotics, building on developments in mechatronics, electrical engineering, and computing, is creating ever-more-advanced sensorimotor capabilities that enable machines to adjust to their constantly changing surroundings. Up until now, the industrial production system has been structured around the machine, which is environment-calibrated and can withstand only small deviations. These days, integrating technology into an existing ecosystem is easier. Three categories comprise a robot's autonomy in an environment: perception, planning, and execution (manipulating, navigating, collaborating). The primary goal of merging robotics with AI is to maximize autonomy through learning. The ability to forecast the future can be used to gauge this level of intelligence, either through task planning or interaction (either through navigating or altering) the environment [2]. The interaction with AI fields has been explained below:

Robotic Learning

Numerous issues occurring in robot design are being addressed via learning approaches. The above-mentioned structure indicates that learning approaches can assist both perception and action. Additionally, a number of methods are being investigated that involve a training phase, such as neural networks, genetic programming, and machine learning techniques.

Education

Due to their low cost and great student appeal, toy robots hold great promise for use in both education and research. Toy robots are undoubtedly an intriguing economic sector, even though the current instructional kits appear to offer too few features. As a result, AI researchers have an intriguing potential to design intelligent toy robots.

Multiple agent systems

You can think of a multi-robot system (MRS) as a multi-agent system (MAS). However, the methods used in MAS to achieve cooperation and coordination are frequently unsuitable for handling the uncertainty and incompleteness of models that are characteristic of robotics. When many robots work together to complete coordinated tasks that are impossible for a single robot to complete, they may exhibit more resilient and efficient behavior.

Natural Language Interpretation

Natural language processing algorithms find an intriguing application domain on robots since the ability to connect with people in natural language is a clear necessity of home and service robotics.

Reasoning Systems for AI and Automated

Since it was covered in the previous part, we won't go into additional detail here, but the relationship to the Logics for AI and Automated Reasoning is crucial to the work on Cognitive Robotics.

Genetic Programming and Evolutionary Computing

A new method called "evolutionary robotics" views robots as sentient artificial creatures that learn on their own through intimate interaction with their surroundings and without the help of humans. Therefore, evolutionary robotics uses techniques from evolutionary computation.

RISKS AND FEARS OF AI AND ROBOTICS

Experts have advocated for extensive research on the effects of AI on our society, encompassing not only technological but also legal, ethical, and socioeconomic domains, due to the exponential surge in interest in this field. This answer also raises the possibility that autonomous super artificial intelligence will eventually surpass human cognitive capacity. This future state is frequently referred to in AI forums as the "AI singularity" [3]. The ability of machines to create better machines on their own is the conventional definition of this. Many specialists have questioned and are skeptical of this possible scenario. The goal of today's AI researchers is primarily to create extremely proficient systems for specific types of work. This approach conflicts with the goal of creating a super generic AI system that can replicate every cognitive skill associated with human intelligence, including emotional intelligence and self-awareness.

APPLICATIONS

Health Care: Artificial intelligence also helps medical personnel better comprehend the daily routines and requirements of the patients they treat. They are able to offer more individualized advice, support, and comments for preserving good health because of this understanding. In general, by empowering people and enhancing the care given by medical experts, the integration of AI and IoMT in consumer health applications has the potential to completely transform the healthcare industry.

Farming: Agronomists can improve agricultural output with the help of artificial intelligence (AI), machine learning (ML), and robotics integrated into agriculture. Farmers can attain excellent yields and minimal operating expenses by utilizing this information, which will ultimately result in farm profitability. By automating labor-intensive processes like irrigation, seed distribution, pest management, and harvesting, robots in agriculture hopes to free up farmers' time for more fruitful endeavors. Precision is a major benefit of robots in agriculture as it maximizes land utilization and minimizes waste.

Storage: Because robotics can save functional time and intermediate expenses, large enterprises with vast storage facilities are voracious robot users. Robots can operate independently thanks to the high-tech detectors used in these storages, which include thermal, haptic, optical, and auditory detectors. By enhancing perception of the girding terrain, AI integration has increased safety even further especially when paired with thermal and haptic detectors.

Automobiles: Robotics is an essential component of automobile efficiency, covering a broad spectrum of tasks from product conditioning and design to force chain management and general operations. Systems like motorist threat backing, autonomous driving, and motorist backing are beneficial for machine assiduity in transportation. With notable advances in AI and ML in recent years, robotic intelligence has been integrated into automobile automation for more than 50 years. There are several benefits of robotics in automobiles.

ALGORITHMS USED FOR ROBOTICS

Reinforcement Learning (RL): An agent interacting with its surroundings and learning to make decisions based on input in the form of rewards or penalties is known as Reinforcement Learning (RL). RL is one kind of machine learning methodology. Reinforcement learning (RL) is very beneficial to robots since it enables them to learn from errors, adjust to changing circumstances, and make decisions quickly. However, RL may have sluggish convergence rates and need a lot of processing resources.

Supervised Learning: An agent learns from labeled data using a machine learning process called supervised learning, in which inputs and outputs are coupled. Supervised learning is widely used in robotics to accomplish tasks like mapping, localization, and object recognition. When trained on large labelled datasets, it can achieve high accuracy and is regarded as relatively simple to deploy. However, the quantity and quality of available labelled data might constrain supervised learning and make it difficult for it to generalize to new, unseen data.

Deep Learning: Convolutional Neural Networks (CNNs), a type of deep learning algorithm, are extensively used in robotics to perform planning, control, and perception tasks. CNNs are useful for tasks like object detection, grasping, and manipulation because of their remarkable performance in fields like image and audio recognition. Deep learning methods, however, can be computationally demanding and frequently require large amounts of labelled data for training [4].

CONCLUSION

While robotics and artificial intelligence (AI) have the potential to completely change civilization, they also pose moral quandaries. These include worries about abuse, independence, prejudices, openness, and the effects on the workplace and interpersonal relationships.

In order to overcome these obstacles, ethical issues including as bias identification and mitigation, transparency and human oversight, and machine ethics that are in line with human values should all be incorporated into the design process. A close working relationship between technologists, ethicists, and legislators should be developed to establish legislation, policies, and education and awareness initiatives that oversee the moral application of AI and robotics.

We can leverage the advantages of robots and artificial intelligence for the good of society by emphasizing moral decision-making and responsible behavior. To sum up, every algorithm used in artificial intelligence for robotics has advantages and disadvantages of its own. SLAM is essential for navigation and mapping, computer vision offers visual perception skills, reinforcement learning is excellent for adaptive decision-making, supervised learning is useful for labelled data tasks, evolutionary algorithms are efficient for optimization, and deep learning is strong for perception and control.

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