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EXPLORING THE INTEGRATION OF IOT AND ROBOTICS IN AUTOMATION INDUSTRY

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ABSTRACT:

A growing number of industries, including manufacturing, service, and communications, are turning to new technology for their applications. Industry 5.0 is the new definition of the fifth industrial revolution, which focusses on improving the efficiency of organisations. Industry 5.0 is a significant technological advancement that offers a wide range of possibilities in the industrial sector. Robotics is one of these kinds of skills. Automation technologies have been enhanced using this technology, allowing for the completion of repetitive operations with more precision and at a lower cost. Production of high-quality items is being facilitated by the deployment of robots, which is also protecting the value of current collaborative schemes. The major goal of this study is to investigate the problem of robotics and "Internet of Things (IoT)" connection in the field of automation business. The technique used in this inquiry was a qualitative research strategy. This research concludes that strategically planned factories that are efficient, powerful, and safe will be the principal result of Industry 5.0. the field of robotics "big data, cloud computing, robust safety measures, smart sensors, the online world of issues", and other cutting-edge technical advancements all play a role in the creation of these factories. In order to achieve broad adoption, automation manufacturers will refine their production by making the workplace safer, the real job more reliable, and costs less.

Keywords: IoT; Automation industry; Robotics; Industry 5.0; Technology

INTRODUCTION:

Automation in a variety of industries has been revolutionised as a result of the integration of the IoT and robotics. This is especially true within the context of Industry 5.0, which prioritizes eco-friendly production, intelligent systems, and human-machine cooperation. The IoRT is a good example of how these technologies are coming together; it's a system of interconnected sensors, devices, and robots with intelligence that work together to make manufacturing more efficient, increase output, and decrease error rates (Allam, 2022). The Web of Everything en-

ables the interchange of data in real time, the formulation of decisions, and the implementation of adaptive reactions, which in turn makes industrial automation systems more self-sufficient, flexible, and responsive to changing conditions. It is possible for factories to reach higher levels of efficiency, perform predictive maintenance, and improve their scalability if they enable robots to connect with Internet of Things networks (Javaid et al., 2021). Not only does this integration encourage advances in manufacturing, but it also helps to support sustainable development goals by lowering the amount of trash produced and the amount of energy that is consumed. With the continued adoption of IoRT by many industries, the development of intelligent robotics inside IoT ecosystems holds the potential to push the limits of automation. This will set the stage for a future where robots and people collaborate seamlessly to meet the demands of complex manufacturing. (Butt, 2020).

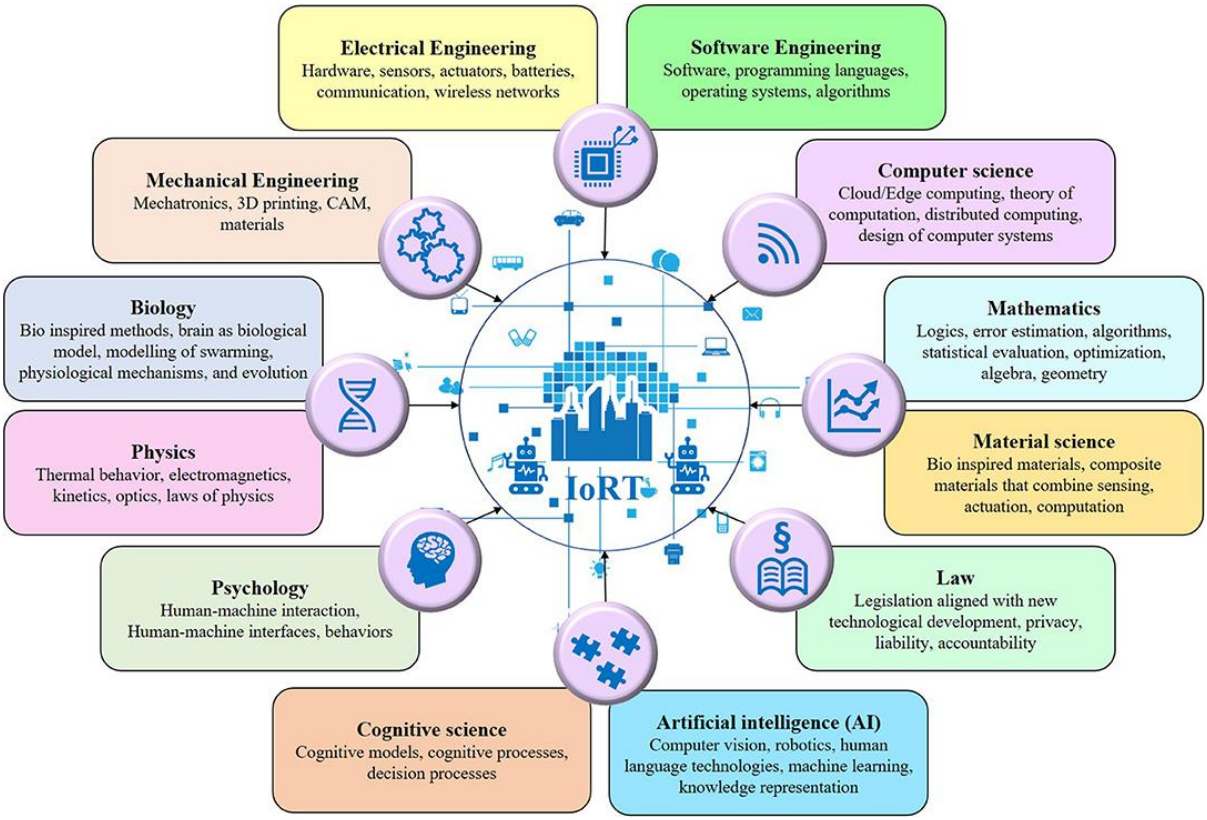

Figure 1: Various applications of IoRT in different fields (Vermesan et al., 2020)

The major purpose of this study is to investigate the automation industry's use of robots and the Internet of Things (IoT). Detailed explanations of related works are provided in the years to come. literature reviews.

LITERATURE REVIEW:

The following table provides an in-depth analysis of the previous research that has been conducted on the topic of the IoT and robotics in the machinery manufacturing sector.

Table 1: Related Works

AUTHORS AND YEAR	METHODOLOGY	FINDINGS
Kathirvel (2024)	A case study approach, analysing IoT-based robotics systems across various industry applications to assess their impact on automation efficiency and innovation.	The study finds that the integration of IoT and robotics significantly enhances Automated factories that are more responsive, predictive maintenance that may be done in real time while and operational efficiency.
Bhadra et al., (2023)	Utilized a comparative analysis of Cognitive IoT and Robotic Process Automation (RPA) systems, highlighting their convergence through case studies and evaluating their transformative effects in Industry 4.0.	The research demonstrates that the integration of Cognitive IoT with RPA leads to significant improvements in automation processes, enabling enhanced decision-making, reduced human intervention, and greater adaptability in industrial operations.
Singh et al., (2021)	A systematic review approach, examining the integration of "Cyber-Physical Systems (CPS) and IoT in smart automation and robotics"	The study concludes that the emergence of CPS and IoT in automation significantly improves the operational intelligence, scalability, and responsiveness of robotic systems, leading to smarter, more adaptive automation processes in industrial environments.
El-Gendy (2020)	Conducted an empirical analysis of IoT-based AI systems by examining their applications across different industries, focusing on the integration of AI algorithms with IoT frameworks to optimize automation and de	The study demonstrated that IoT-based AI implementations significantly enhance industrial automation, enabling smarter, more efficient operations through real-time data analysis, predictive maintenance, and improved system adaptability.

Research Gap:

Despite notable progress in the integration of IoT and robots for industrial automation, comprehensive study on the long-term scalability and interoperability of these systems across various industries remains insufficient. Moreover, current research frequently neglects the difficulties associated with real-time data processing and the comprehensive capabilities of human-robot collaboration in dynamic and unpredictable industrial settings, resulting in deficiencies in optimising these technologies for Industry 5.0.

METHODOLOGY:

This research employs a qualitative methodology, utilising secondary data collecting to investigate the "integration of IoT and robotics in industrial automation". Data is collected from current literature, market reports, case studies, and academic publications to evaluate the advancement of IoT-robotic systems in automating various sectors. The investigation aims to uncover patterns, trends, and critical aspects that facilitate the successful adoption of these technologies, emphasising both opportunities and obstacles in achieving seamless integration within Industry 5.0 frameworks.

RESULTS AND DISCUSSIONS:

The convergence of the IoT and robots has become a pivotal influence in the automation sector, especially within the context of "Industry 5.0", which emphasises intelligent technology, human-machine collaboration, and sustainability. This convergence, known as the IoRT, facilitates real-time communication across robots, devices, sensors, and systems, resulting in highly automated and adaptive industrial environments. IoRT integrates the data acquisition and processing functionalities of IoT with the autonomous decision-making and operational skills of robotics to optimise operations, enhance efficiency, and improve overall system responsiveness across diverse industrial sectors. A significant innovation in IoRT is the capability to link robots to IoT networks, enabling autonomous operation based on real-time environmental data. This connection allows machines to autonomously monitor themselves, do predictive maintenance, and make informed decisions based on real-time data from interconnected devices. In manufacturing, the IoRT enables robots to adjust to fluctuating production requirements by acquiring data from IoT sensors integrated within machinery, materials, and the

production line. This minimises downtime, enhances flexibility, and elevates product quality by facilitating more accurate and adaptive automation processes.

In addition to manufacturing, IoRT is employed in logistics, healthcare, agriculture, and other industries where automation is essential. In logistics, IoRT-enabled robots may monitor and control inventories in real-time, facilitate the transportation of items through automated systems, and enhance supply chain operations. Surgical robots connected with IoT systems in healthcare provide remote monitoring and real-time data collecting during procedures, enhancing precision and patient outcomes. In agriculture, IoT-enabled robots oversee crop conditions and automate processes such as planting, irrigation, and harvesting, resulting in enhanced efficiency and sustainability in farming techniques.

Notwithstanding its potential, difficulties impede the complete realisation of IoRT. Interoperability continues to be a critical challenge, as numerous IoT platforms and robotic systems are constructed utilising disparate standards, hindering seamless communication. Moreover, security issues associated with the extensive deployment of networked devices and robotics pose threats of cyberattacks, data breaches, and system vulnerabilities. To tackle these problems, it is essential to establish standardised communication protocols, improve cybersecurity safeguards, and ensure that IoRT systems are scalable to manage the increasing complexity of industrial automation.

COCNLUSION:

In conclusion, the amalgamation of IoT and robotics via IoRT is enhancing automation by developing more intelligent, adaptable, and efficient industrial systems. As industries transition to Industry 5.0, the Internet of Robotic Things (IoRT) will be pivotal in facilitating seamless cooperation between humans and machines, fostering creativity, and enhancing sustainability in automated operations. Nonetheless, addressing the difficulties of interoperability, scalability, and security will be crucial for fully realising the advantages of this breakthrough technology.

REFERENCES:

Vermesan, O., Bahr, R., Ottella, M., Serrano, M., Karlsen, T., Wahlstrøm, T., ... & Gamba, M. T. (2020). Internet of robotic things intelligent connectivity and platforms. *Frontiers in Robotics and AI*, *7*, 509753.

Allam, K. (2022). SMART ROBOTICS: A DEEP EXPLORATION OF BIG DATA INTEGRATION FOR INTELLIGENT AUTOMATION. *EPH-International Journal of Humanities and Social Science*, *7*(4), 10-14.

Javaid, M., Haleem, A., Singh, R. P., & Suman, R. (2021). Substantial capabilities of robotics in enhancing industry 4.0 implementation. *Cognitive Robotics*, *1*, 58-75.

Butt, J. (2020). Exploring the interrelationship between additive manufacturing and Industry 4.0. *Designs*, *4*(2), 13.

Kathirvel, A. (2024). Innovation and Industry Application: IoT-Based Robotics Frontier of Automation in Industry Application. In *Internet of Things and AI for Natural Disaster Management and Prediction* (pp. 83-105). IGI Global.

Bhadra, P., Chakraborty, S., & Saha, S. (2023). Cognitive IoT Meets Robotic Process Automation: The Unique Convergence Revolutionizing Digital Transformation in the Industry 4.0 Era. In *Confluence of Artificial Intelligence and Robotic Process Automation* (pp. 355-388). Singapore: Springer Nature Singapore.

Singh, K. K., Nayyar, A., Tanwar, S., & Abouhawwash, M. (2021). Emergence of cyber physical system and IoT in smart automation and robotics. *Computer Engineering in Automation*.

El-Gendy, S. (2020, December). IoT based AI and its implementations in industries. In *2020 15th International Conference on Computer Engineering and Systems (ICCES)* (pp. 1-6). IEEE.

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