BENEFITS AND PROBLEMS OF INDUSTRIAL ROBOTICS: A CASE STUDY

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Abstract:

The increasing digitization and development of manufacturing rely heavily on robotics and similar technology. Businesses from every area of the economy have begun to use robots and artificial intelligence for tasks like product production, delivery, customer communication, etc. in an effort to increase productivity, efficiency, and competitiveness. A number of global strategic initiatives, such as "Industry 4.0," which was unveiled in Germany in 2011, have been launched in recent years with the goal of enhancing and connecting industrial technology to maximize production techniques. The development of industrial robots and related control techniques is ongoing. Recent advancements in artificial intelligence have opened up new possibilities for industrial robot control schemes as well as opportunities for cognitive robots. Since flexibility and a thorough understanding of complex production processes are now the primary advantages to increase competitiveness, AI-based robotic systems are increasingly becoming one of the main areas of attention. Since they need less human interaction in automated processes than previous types of machinery, industrial robots significantly expand the potential for replacing human labor.. In this paper, the use of industrial robots has been studied through all aspects and especially the benefits and problems of using industrial robots have been examined.

Keywords: Robots, Robotics, Industry, Efficiency, Benefits, Problems

Растущая оцифровка и развитие производства в значительной степени зависят от робототехники и аналогичных технологий. Предприятия из всех областей экономики начали использовать роботов и искусственный интеллект для таких задач, как производство продукции, доставка, общение с клиентами и т. д., чтобы повысить производительность, эффективность и конкурентоспособность. В последние годы был запущен ряд глобальных стратегических инициатив, таких как «Индустрия 4.0», представленная в Германии в 2011 году, с целью совершенствования и объединения промышленных технологий для максимизации производственных технологий. Разработка промышленных роботов и связанных с ними методов управления продолжается. Недавние достижения в области искусственного интеллекта открыли новые возможности для схем управления промышленными роботами, а также возможности для когнитивных роботов. Поскольку гибкость и глубокое понимание сложных производственных процессов в настоящее время являются основными преимуществами для повышения конкурентоспособности,

роботизированные системы на основе ИИ все чаще становятся одной из основных областей внимания. Поскольку им требуется меньше человеческого взаимодействия в автоматизированных процессах, чем предыдущим типам машин, промышленные роботы значительно расширяют возможности замены человеческого труда. В этой статье использование промышленных роботов было изучено со всех сторон, и особенно преимущества и проблемы использования. были исследованы промышленные роботы.Ключевые слова: роботы, робототехника, промышленность, эффективность, преимущества, проблемы.

Introduction:

In recent years, there has been an increase in the availability of smart sensors, which can gather data from multiple transducers, process it, and make the appropriate decisions (such as activating one or more actuators). This has created new opportunities for the study of increasingly complex industrial applications. In the coming decades, industrial robots are anticipated to become increasingly commonplace as a result of the expanding trend toward robotization. According to the Boston Consulting Group, a true robotics revolution is about to happen since several manufacturing sectors are at a turning point when robotization will be profitable for businesses. BCG suggests that automation is pursued when employing robots is 15 percent less expensive than hiring people. In some industries, robots are anticipated to do more than 40% of production jobs (BCG, 2015). The usage of computer automated applications, which is expanding along with industrial robots, is anticipated to complement and replace human labor in the future (Frey and Osborne 2017). As a result, the trend of manufacturing becoming more and more automated by robots is a component of a larger one called "digitalization," which is predicted to fundamentally alter how industries operate. Companies will (need to) reorganize their domestic and international manufacturing processes, as well as adopt new business models, in light of the opportunities and difficulties presented by digitalization.

Numerous robots are now available to consumers because to recent technological advancements (e.g. intelligent digital assistants, home cleaning robots, cooking robots, etc.). Consumer robots are now seen as merely technology

items made by businesses and distributed to end users. Home robots may currently and in the future, however, search for, filter out, choose, and pay for a variety of goods and services on behalf of their owners. For instance, the Alexa-powered Amazon Echo can order Domino's pizza, hail an Uber, play music, operate smart home appliances, and more.

Industrial robots, particularly intelligent industrial robots in the context of Industry 4.0 and 5.0, are crucial to the automation process. However, if they do so at all, industrial robot manufacturers rarely offer such advanced control methods. Most intelligent industrial robot control techniques are either still in the research stage, being marketed, or being integrated for a single job. It might take a significant time and effort to prove a ready solution that has been verified in a lab setting in an operational one. When engineers must incorporate it into their production process and operators must maintain the machine's faultless performance, it becomes much more complicated. This is one of the factors contributing to the industry's lack of awareness of the prospects presented by intelligent industrial robots.

Literature Review:

Smart industrial robots also referred to as intelligent industrial robots in the literature have been mentioned as: “remarkably useful combination of a manipulator, sensors and controls” [14]. Even though the need for smart industrial robots and first discussions dates back to the 1980s [15], the idea on high-level remains the same—the wide variety of sensors in combination with reasoning abilities and control mechanisms are used to achieve desired industrial robot motions [18]. The development of industrial robots and related control techniques is ongoing. With the recent progress in the field of artificial intelligence [16], new perspectives in industrial robot control strategies have emerged, and prospects of achieving more of a human-like performance have arisen. Due to the fact that modern factories are still essentially made for a single function, there is little to no space for modifications in product design. By looking at smart manufacturing and

digitization trends [9], we see that future factories will be multi-purpose and able to adapt to new designs in a very short amount of time. Although the potential of digitalization in smart manufacturing has not yet been completely explored or utilized, certain technologies have already staked out a permanent position in the manufacturing industry. AI-based approaches have been already internationally accepted as the main driver [10] in a transformation and digitization of factories as flexibility and deep understanding of complex manufacturing processes are [18] becoming the key advantage to raise competitiveness [11]. The smart factory in a way is a manufacturing solution driven by smart industrial robots, acting as one of the key elements of Industry 4.0 [12] and as an enabling technology of Industry 5.0 where the creativity of human experts in conjunction with smart, efficient and accurate machines is explored [13].

Relationship between Technology and Robot use:

The future of work appears to be more likely to focus around cost-containment tactics that limit investment in efficient technology and infrastructure in favor of cheap sweated labor. It is more probable that managers will pass up efficiency-enhancing benefits from digital technology out of a fear of losing control. Despite the fact that each industrial sector is different, some problems are universal. How, for instance, may delivery times be shortened and quality increased while prices are also decreased. Manufacturers all throughout the country are using industrial robots to address these issues.

Robotic approaches to industrial problems enhance productivity, boost capacity, and occasionally merge process processes. Reliability, predictability, accuracy, repeatability, and resistance to hazardous conditions are some of the qualities that make robots valuable in the industrial sector. When compared to humans, robots are constrained in various ways. Robots can't adapt to changing conditions or get better at what they do as a result of past performance, unlike humans.

Industrial Robotics:

New applications have started to appear in all industries as a result of the advent of digital technology. Robot arms used in factories for production purposes are generally referred to as industrial robots. The types of movement (degrees of freedom), applications (manufacturing process), architectures (serial or parallel), and brands of conventional industrial robots may all be used to categorize them.

For a very long time, industrial applications and automation systems have included robots. In the public's perception, they are commonly linked to automation and the industrial revolution in general. Today, industrial robots are utilized in a wide range of industries, such as metal forging, semiconductor production, the automotive, and plastics processing industries. A robot is a great fit for almost any repetitive work, especially if it would be dangerous or difficult for a person to complete. Robotics use in the manufacturing sector is highly advantageous. Traditionally, robots have been used for high-volume tasks, but as technology advances and industrial robot costs decline, new opportunities and economic opportunities are opening up for medium- and small-sized businesses.

Industrial Robotics: It's Benefits

Automation is being used by more firms than ever before to stay competitive in the global market. Robotic automation is now more commonly used by both small and large enterprises to relieve repetitive work from human workers and increase production. Among the numerous advantages of industrial robots is their ability to provide solutions of consistently high quality. For instance, a painting robot can apply paint uniformly and without spills or drips.

Increased effectiveness and productivity- Manufacturers may increase the productivity and efficiency of their companies by introducing robotic automation and utilizing the advantages of robotic workforce. Industrial robots are capable of working continuously, unsupervised, for a whole day every day. They may be

programmed to do rapid, dependable, accurate, repeated actions. This increased level of productivity can significantly boost a factory's overall output and advance factory workers' status.

Increased system adaptability - Robots used in industry are designed to be adaptable. Manufacturers can quickly retool, redeploy, and reposition robots for new production plans and applications thanks to industrial automation. This is especially useful in contexts with high-mix, low-volume production where the needs of the products vary regularly.

Higher standard of the goods - Industrial robots are trained to carry out highly specific jobs repeatedly and without variation, in contrast to human employees who may occasionally make mistakes. This leads to increased product uniformity and higher overall quality. Manufacturers aren't only enhancing product quality by lowering the chance of production mistakes. Additionally, they are saving time and resources that might otherwise be used to fix mistakes. If manufacturers effectively maintain and repair their industrial robots, they may profit from continuously excellent product quality.

Higher cost savings - Industrial robots can assist in lowering total manufacturing costs by 20% to 60% by cutting production lead times and boosting overall productivity. By shifting valuable human labor from mundane to strategic duties, operating expenses are also decreased. The initial expense of implementing an industrial robot may appear prohibitive for some small enterprises.

Increased workplace security- Industrial robots can do repetitive jobs that would be extremely risky or hazardous for human workers to perform. For instance, working with blades or carrying excessive weight. Manufacturing employees may be at danger of dying through exposure to fire, fumes, or lasers, among other things. So, by assigning this kind of hazardous activity to industrial robots that are capable of doing it, manufacturers can proactively protect their workers. This promotes long-term worker health by lowering accidents and injuries in the manufacturing work environment.

Increased client satisfaction- Customers are likely to be significantly satisfied with manufacturing outputs if product unpredictability is decreased and the rate at which new items are made available for purchase is accelerated. Increased word-of-mouth recommendations and favorable product evaluations can lead to greater customer satisfaction, which can increase revenue for your company. Industrial robots can guarantee product consistency, which can result in a constant level of customer satisfaction, as well as the quickest and most efficient execution of any new product improvements that consumers desire.

Modern data analytics- The majority of industrial robots have wireless Internet access and machine vision capabilities, allowing them to follow specific production data in a way that is impossible for human observers. The most recent robot generations can combine all data from sensors to analytics programs like Forge/Sight, allowing plant owners, managers, and operators access to comprehensive production data that may uncover untapped potential for process optimization.

Waste reduction- Manufacturing companies may use production precision to optimize material use and reduce resource waste across the business. Because industrial robots are trained to create products with accuracy and consistency, materials are only utilized when absolutely necessary. Industrial robots, for instance, may make sure that the least quantity of wire is used during welding and that the least amount of paint is sprayed during product development. This aids in factory conservation and financial savings for producers.

Increased floor area- Today's industrial robots are frequently designed on portable, tiny platforms that allow them to fit in tight locations. Robots may be installed on walls, ceilings, and other surfaces in addition to moving about on a movable base, which helps a manufacturer conserve floor space. Industrial robots enable producers to conserve precious space that could be used for additional manufacturing processes by creating output in constrained areas.

Allowing staff to focus on higher-value jobs- Manufacturers may considerably profit from concentrating their precious human labor on high-level jobs that call for greater strategy, experience, and flexibility while boring and repetitive duties are carried on by industrial robots. By concentrating on strategic methods to increase output and generate revenue, manufacturing workers may directly contribute to the future success of the business. This can involve concentrating on new product developments or new ways to drive production efficiency. These more interesting duties will not only benefit the business but may also make factory workers feel satisfied with their work, lowering employee turnover and easing hiring difficulties.

The usage of industrial robots is becoming more commonplace due to its numerous advantages. Robots are capable of working continuously for long periods of time and carrying out the same job for many years.

Industrial Robotics: It's Limitation

Industrial robots are being utilized in nearly every industry, from the automobile to the plastics and medical technologies. They have a number of advantages for companies and are laying the foundation for tomorrow's intelligent factories. Manufacturers should take into account a few restrictions, nevertheless, while selecting their robotic machinery.

Affordability- Industrial robots typically demand a sizable initial investment, as well as subsequent installation and configuration fees. The necessity for additional components and future maintenance expenses must also be taken into account by the manufacturers. Some businesses may find it difficult to invest in new robots on a regular basis, especially smaller ones that risk going out of business by trying to stay up with market trends.

Safety- On the production floor, industrial robots have traditionally been viewed as potentially hazardous. They are large, hulking, and capable of moving at high rates, and for good cause. Older machines are even less able to sense surrounding humans, which puts them at risk for collisions and mishaps. Because of this, several

manufacturers include cages or partitions to keep robots and their human coworkers apart.

Harder to Train- Industrial robots need specialized programming and training to complete jobs, thus businesses must employ skilled engineers and programmers to supervise the installation of robots. Additionally, as new software is created or new robots hit the market, even veteran employees may need to undergo retraining. A robot that has not been properly programmed may malfunction and endanger persons nearby.

However, no-code or low-code programming has recently been used as a novel technique for training robots. Visual modeling and drag-and-drop user interfaces make it possible for staff members with less coding skills to set up a robot. Robots may also be reprogrammed for different duties by simply changing their arm thanks to the user-friendly design of no-code and low-code platforms. Previously, businesses would need many robots, but today a straightforward modification can be performed by a non-technical person, saving businesses time, space, and money.

In order to reduce their reliance on coding, 84% of businesses in the US, UK, Canada, and Australia are embracing low-code development platforms.

Conclusion:

Technology for industrial robots is developing quickly. Future robots will be much more advanced than those we have now, automating jobs that were formerly impossible. Many of these future robots, which will change the way we travel, work, shop, and other aspects of our lives, are already in development. The potential of robot technology is being substantially increased, and whole new types of automation are developing, in many of the most cutting-edge robotics labs around the nation.

Many businesses believe that robots are unsuitable for them. Some people believe they are exclusively for large-scale manufacturers, like automakers. Others

contend that using robots is inappropriate or that they cannot do the necessary tasks. Unfortunately, there are a number of robot-related fallacies that need to be dispelled. Robots are another example of a technology created by humans to raise human quality. The amount of work completed and the algorithm used determine how effective U-systems are. Robots, on the other hand, are energy-hungry machines. The robot's component parts determine how much energy may be reduced. These systems must be robust as the employment of robots grows as a result of advancing technology.

Industrial robots have been shown to speed production, reduce human error, and simplify human job. They do have certain restrictions, though. They present safety risks, are more expensive to invest in and maintain than people, and are more difficult to train. These are legitimate worries for manufacturers, but with careful planning and modern technology, they can be dealt with.

Politics are changing and there is a lot of public discussion about the future of work and jobs. The role of automation has come into focus, with automation and robots being portrayed as "job killers." But the facts don't support this. According to research, robots enhance and supplement labor rather than replacing it, improving the quality of output and increasing the pay of employees performing new duties.

Future workplaces will be increasingly shaped by robots and automation, which has huge potential to boost productivity, national competitiveness, and the quality and pay of work20. Governments and businesses must collaborate to build an environment that will allow people, businesses, and nations to benefit from these advancements. This entails encouraging investments in robotics research and development and, most crucially, giving current and prospective workers access to education and skill-upgrading programs.

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