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Robotics Applications in Healthcare and Industry Sectors: Review

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Abstract. *The detailed inspection surveys the literature surveys the significant influences that robotics has been on many different fields, like healthcare and industry. This study takes a look at the advantages and the challenges of robots in different industries, following their development from simple devices into complex and very intelligent components today. The research demonstrates how robots have been developed from traditional manufacturing to more effective types that are used in healthcare and industry by depending on academic research, technical progress and real data. The use of robots has dramatically increased the efficiency of production in the industrial field, eliminating the error limits which resulted in cost savings as well as maximum quality articles. Many usages that, appear for robots, like those in healthcare for the monitoring and diagnostics of patients, as well as increase the precision of surgical operations. This full change explains the robot's potential to transform the care of patients as a whole. Also, many studies focused on the robot's growing importance in the service sector. This article confirms the robot's potential to transform multiple industries to be under the control of robots to obtain more precision, quality and improved production in various fields.*

Keywords: *Robotics; Technology Impact; Industry; Healthcare.*

1. INTRODUCTION

Robotics represent a group of technology currently in the untimely fields of field. The design of robots is essential in order to implement tasks with more accuracy and speediness than humans which produce at maximum efficiency and minimum time in different industries like medical services. Also, robots may work in dangerous environments which may cause risks for humans. The initial digital robotic system was designed by 'George Devol' in 1954 [1].

Recently, the robotics sector has achieved great progress with major influences on numerous different domains. The aim of the literature review is the examination of the development of robotic techniques and their applications. The robotic is used in various sectors such as healthcare, education and industries, solving interesting problems. The aim of this review is to offer an overview of robotics, which is utilized a lot in our lives today by studying the important trends, changes and problems in many fields. The review has been organized to show the applicable research in the past years. The role of networks, artificial intelligence and information technology is essential in developing robotic systems. The dependence on information networks enables robotic connectivity to accomplish the work, given the

proper decisions and doesn't take the physical domain into consideration. The moral concerns in designing the robots in industries are taken into consideration as this literature review constructs clearly. These moral concerns involve those related to the privacy and the security of data as well as the possible human replacement of human work in some positions. There are many limits still, despite the progress of robotic systems, especially in the fields of emotional comprehension and supportive qualities. The appearance of Industry 4.0, which is synonymous with smart manufacturing, is the realization of the digital transformation of the field, delivering real-time decision-making, enhanced productivity, flexibility and agility to revolutionize the way companies manufacture, improve and distribute their products is characterized by merging physical processes with the digital techniques, where the technological development promise with a future in which the robots will carry on with playing a maximum substantial part in healthcare and industries sectors. The appearance of Industry 4.0, which is synonymous with smart manufacturing, is the realization of the digital transformation of the field, delivering real-time decision-making, enhanced productivity, flexibility and agility to revolutionize the way companies manufacture, improve and distribute their products is characterized by merging physical processes with the digital techniques, where the technological development promise with a future in which the robots will carry on with playing a maximum substantial part in healthcare and industries sectors. This progress signifies enhancing the abilities of humans [2]. Finally, the robots are becoming not only tools, but they represent integral elements supporting the global economy and contributors to daily lives.

2. ROBTIC IN THE SECTOR OF HEALTHCARE

Over the last years, robotics systems have growing significantly, mainly in the industry domain. Nonetheless, minimal attention is given to the health sector than other sectors because of the challenges related to providing a personal care service. So, that has resulted in delays in the robots' progress to help the patients, but all that has been changed since Coronavirus' appearance. The Robotic is utilized to prevent the spread of bacteria and viruses by logistics, telehealth and disinfection. So, the services of robots can be used to aid the healthcare workers and nurses [3].

Surgical robots were entered in the operating halls distant before entering the applications of robots in other medicine services which gave better results for all the healthcare fields. In COVID-19, some robots have been employed in hospitals in order to carry medicines, maintain the hygiene conditions and screen [4]. Figure 1 demonstrates different robotics systems, ordered according to the function of devices and level of physical contact depending on the physical touch. The robotic systems can be split into rehabilitation aids, prostheses and orthoses. Physical, medical treatment, cognitive and psychological important for neurological problems.

The normal outcomes possess limitations in traditional healing and limb motion techniques which require the movement of the extremities [5]. Drones or flying robots can be used to alleviate the trouble of delivering healthcare aids to area that reach can hardly reach to, such as transport transporting the laboratory samples, pharmaceuticals, emergency equipment, vaccines and clinical care. Today, the system of healthcare has been focused to make people's lives better by employing the new technology [6].

Recently, international events have shown that the healthcare field represents the backbone of the present life, which working in this domain causes different risks for both occupational health and safety. Robotic systems provide a way to hold up health care workers. Within the last two decades, we have noticed the designing of the initial surgical robots that permit surgeons to work remotely with more precision on patients [7]. Robotic automation is used in the healthcare domain to assist in telepresence during consultations and diagnostics. Robots can be employed in cleaning tasks and disinfecting clinics. As the technology looks good on more advanced services, robotic systems have been interacted on the different tasks with the medical staff [8].

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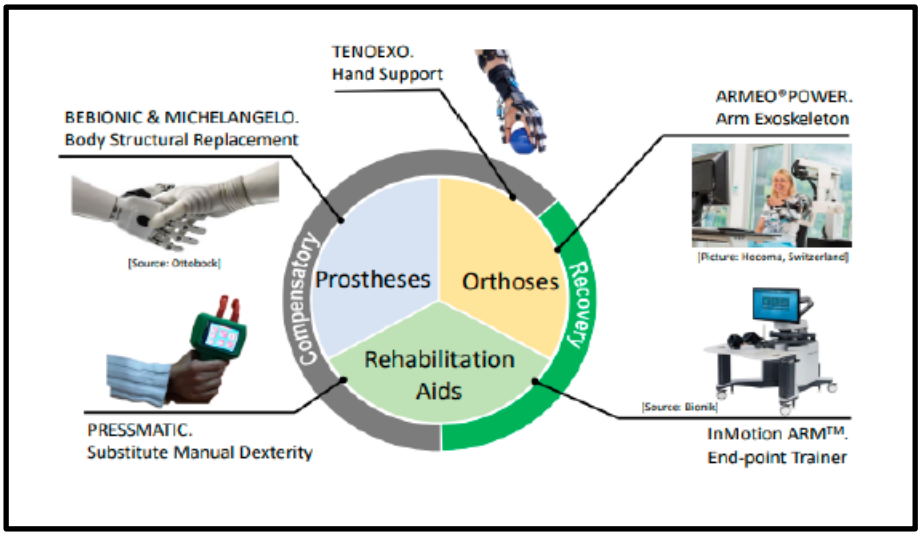

Fig. 1. The field of rehabilitation robotic systems [5]

3. ROBTIC IN THE SECTOR OF INDUDTERIAL

The revolutionized robotic systems have produced many changes and lots of services were provided, so, they became the key synthesis in the present industrial current. Robotics is a pivotal revolution which has altered the processes of manufacturing by maintenance in the industrial field at the technical development forefront [9]. The industrial robots represent the main automation devices in the new manufacturing sectors, which combine modern technology with different disciplinary like control, mechanical, sensors, electronics, computer and artificial intelligence [10]. The robots of distribution, electric welding, handling and assembly have been most employed in many activities of industrial production [11]. Today, the industrial robotic systems are focused to improve the production accuracy and became one of the experimental applications for (off line) programming techniques.

Today, industrial robotic systems are focused on improving production accuracy and have become one of the experimental applications for (offline) programming techniques. The robot error can be extremely eliminated through the calibration and the robot accuracy can be achieved to the repeat accuracy level [12]. The desired object positions of the robot are fixed in the working area, where the positions can be reached by them through the control of the robot link angle. By ignoring the robot pose error and the actual manufacture environment error, so, it thinks that the robot manipulator may fully track the required trajectory which is specified through the suitable software [13]. Because of the structural parameters errors in the robotic systems and the robot dynamics effects, the robot's actual trajectory will be mostly deviated from the simulation and the programming trajectories. Thus, these errors which are produced through the thematic parameters may be reduced through the calibration of the robot kinematic system model [14]. The basic system components as shown in Figure (2) [15] consist of virtual robots, actual robots and a controller and also contain a database server as well as Virtual Reality (VR) computer. Also related (VR) glasses. For accuracy and safety requirements, external sensors may be needed. The robot manipulator represents mechanical equipment having moving links which is controlled by dynamic

and kinematic mathematical models. The review will test the difficulties and the advantages of robotic systems in space by examining many types of academic studies, recent technical developments and business data. Our aim is to explain how in robotic systems are changing by supplying manufacturing processes and logistics services in a proper environment.

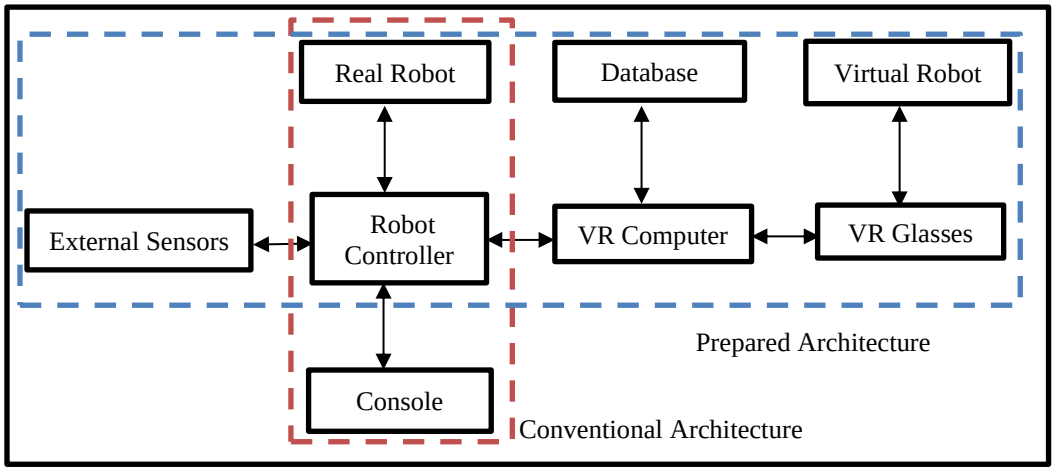

Fig. 2. Architecture of the system that altered the console with (VR) system [15]

4. LITERATURE REVIEW

This research studied the cognitive robots that are considered a product of the progress of Artificial Intelligence (AI), contributing to the recent developments in Industry 4.0. Industries are focusing on improving product consistency, productivity and reducing operating costs, and they want to achieve this with a collaborative partnership between robotics and people connected with control strategies and industrial robots. The (AI) Robotic systems have many capabilities to execute industrial operations which need more competitiveness and flexibility. The study tests the present improvement in learning methods involving deep learning, traditional learning, computer vision, restrictions, problems and tackles gaps and unsolved problems in manufacturing. Since the production requires superior performance, safety, less cost and flexibility, the conventional control schemes are unable to be workable. The industrial robot which is based on intelligent control techniques enables dynamic surroundings and understand the manufacturing steps. To completely discover the technology, additional studies are needed to overcome concerns such as knowledge popularization and pattern inefficiency [16]. This article investigates the influences of (AI) robots on personal interactions. By utilizing a case taken in (Anhui Provincial Hospital) which investigates the methods that depend on modern techniques and their effects on people and personal interactions via defining four groups of knowledge nature; the (AI) robots' knowledge embodiment, the development of knowledge lab or as well as the relationship between human cognition and the embodiment. The social aspects are taken into consideration in this study which goes further into the technological technology with careful handling. The outcomes of this study provide fresh information for the scientists to reshape the human techniques by depending on the knowledge embodiment [17].

This study demonstrated that in the industry (4.0) model, the robots may be expected to be safer and more flexible while mostly being extra size efficient and extra affordable. Thus, it is easy to merge robots to work in proper environment, and created opportunities collaborations human and robots. So, Collaborative Robots (Cobots) were introduced which used to help the workers to accomplish different tasks and give superior results by combining via the workers' skills, the endurance and the physical

strength of robots [18]. This study pursues to analyze trends and technologies in intelligent robotic systems which have the potential to reshape different industries by streamlining operations, amplifying output and improving the interactions of customers. The intelligent robots are used in this article to demonstrate the significant improvements in many fields, like agriculture, manufacturing, healthcare, logistics, construction and tourism. The main outcomes are explained by the collaboration between the robot and the human. The continuous progress and technological refinement will shape the life of humans and industries, which drive advancements and innovation in intelligent robotics [19]. This research looks into the (AI) robotic systems in aged care, healthcare and rehabilitation. The risks and the difficulties of using robots in hospitals are taken into consideration in this study. Robotics in a healthcare environment includes both dependable and flexible performance. The robotic systems require them to work with different people to maintain security in unstructured and unexpected environments. The troubles of robotic applications in manufacturing, rescue, business, logistics and search must be controlled to guarantee smooth incorporation [20].

In this study, different applications of (AI) robots are utilized for many medical domains involving dermatology, radiology, ophthalmology, hematology etc. by employing some essential criteria. This study objective is to introduce how the AI robotic systems can be used in medical applications, where the researchers recognized the potential pitfalls of AI robots in a global manner. Finally, the study highlights the main challenges to integrating AI robotic systems in various medical fields and take taking into consideration the trust, ethical, legal and the future suggestions of (AI) in the healthcare sector [21]. This article searches for the (AI) robots' moral implications in the healthcare domain, focusing on the ambiguity which appears between worries and expectations. Depending on the care ethics, this study offers many activities, especially for children's useful robots in children's hospital, instead of ideal situations. The moral study of the ERN method discusses how to developing responsible (AI) robots. Applying the techniques in the healthcare sector will promote popular health applications and the networks of care [22]. This study seeks two (AI) systems for the first is a dictation system of voice recognition for radiological reports, the second system was discovering the breaking on (X-rays) images. By analyzing the qualitative observations of the work and doing an interview with emergency physicians, medical secretaries and radiologists to provide the effects of (AI) robots in that sector. This study demonstrates how various types of (AI) robotic systems help physicians and the workers in many activities in the healthcare sector [23]. To build a suitable environment for simulation, control of robots and training, this study uses the technology of commercial gaming in order to test the virtual reality and robotics synergies. This engaging meeting raises the output and supplies a better solution. The physical systems of Cyber and Artificial Intelligence involving robots are basic components of industry (4.0)'s safety and productivity gains. The efficient cooperation between the human and the robot are required to guarantee the security of the robot and improve the output product output of industry. The paper presents a virtual framework with a protection system and a robust control system of the robot through training, settings, quality in production and simulation [24].

5. CONCLUSIONS

This literature reviews the significant influences of robotics on the healthcare, industrial and different service fields. Robots have been developed from simple devices to complicated systems that are necessary for current operations. They increase the precision and production in the place of work which drives industry advancement. The robots improved the care of patients by utilizing modern technology in rehabilitation and surgery operations. In the industry, the technological evolution of employing robots has increased the accuracy and the quality of work production. The future studies will focus on exploring new applications for robots in different sectors in life. The using of robotics in many sectors like transport systems, and pharmacies can be extended and applied as future work.

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