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Robotics automation features and future trends in technology

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ABSTRACT

Robots can be programmed to function as servants, workers, factory workers, office clerks, and even doctors. This article shows how society will begin to incorporate automation technology to make production faster, better, and cheaper in the future. It is expected that the present technological revolution will see further incorporation of robots into society, with the emergence of companion robots in the second half of the twenty-first century, and in the process, will have a significant influence on social problems and social issues that may emerge. For instance, due to the impact of robots on society, in the long run, it is inevitable that robot-related disasters will occur in the future, resulting in a change in society and how robots are managed. This article also highlights the current state of research on social issues such as job loss, social stratification, ethics, and so on, to reveal the nature of robots in society.

Keywords: *Technology, Robotics, Machines, Programming*

1. INTRODUCTION

The word robot comes from the Czech word Robotnik, meaning labor robot, or labor servant, as was the initial use of the term. From an English point of view, robots are defined as machines that look, behave, and function like humans. However, in the Japanese context, a robot is defined as a mechanical machine that performs predetermined tasks according to preprogrammed instructions, thus eflecting a much wider meaning. The word robot is derived from the Russian word robot nits [1]. The term can be used to designate an animate artificial machine, consisting of a human body and a mechanical and electric brain. As an animate entity, it can move around on its own without the aid of a person, and it can perform action. This is different from the inanimate machines, or robots, which operate by themselves without being moved by a person, and act in the same way as other inanimate machines.

Robotics and the future: Robots are the most promising candidates for theme the next industrial revolution, i.e., the so-called Industry 4.0. In the previous industrial revolution, a major focus was on replacing people with machines, and industrial automation took place. From an economic viewpoint, the result of the I-I revolution was a drastic increase in the share of automation in the manufacturing sector. The second industrial revolution can be said to be more of a mechanization revolution, due to the massive scale and scope of investment in automation. However, despite the increased reliance on automation in manufacturing, the share of manual labor in the manufacturing industry is relatively high, at about 40%. In some cases, the employment rate of people employed in agriculture, industry, or services is still higher than that of those employed in manufacturing. In the current third industrial revolution, or the information society, the manufacturing sector is continuing to undergo further automation in the fields of production management, information and communication, and customer service. In the case of production management, a major focus is on streamlining of work processes by making use of automation technology, and computerization, for example. In information and communication, the focus is on developing new information and communication technologies that further enhance the efficiency of information dissemination. In customer service, the focus is on streamlining of work processes by making use of automation technology, and computerization, for example. These three processes will be integrated in the future. In other words, it is expected that the second industrial revolution will produce a new industrial revolution called the "fourth industrial revolution, i.e., the industry 4.0. Due to the massive increase in volume of information produced using robots and related devices, it is also expected that robots will become increasingly important for the field of information dissemination in the future. In parallel with these trends in the manufacturing industry, the service industry is also undergoing further automation and computerization, and this trend is expected to intensify in the future. Robots can be programmed to serve as office clerks, hotel clerks, or even doctors. It is estimated that, in the field of service, the share of service robots will rise from 2.6% in 2010 to 20% by 2030. Robots have also begun to appear in other fields, such as factories, homes, farms, etc. Furthermore, in the long run, it is inevitable that robots will appear in every aspect of human life, and in society in general.

Impact on manufacturing processes: The focus of the third industrial revolution is on the production process and associated processes. It is widely known that, in the future, the information age, also known as the post-industrial age, is expected to be a society in which information is produced, and everything is based on information. The present industrial society is defined by manufacturing, and the information age is a society in which the emphasis is on production. The following section looks at the production process, and the impact of robots on the production process. In the past, the manufacturing industry was highly fragmented, which caused a lot of problems such as low competitiveness and low economic efficiency. To solve these problems, it is necessary to establish a manufacturing system in which manufacturing is the priority, and high levels of production can be achieved [2]. Regarding a manufacturing system that can be set up in the post-industrial age, the system model proposed by a professor at the University of Tottori is a good example. In this system model, the production process is divided into three stages: information production, product manufacturing, and product packaging.

A company produces information products, such as software, games, and so on, and then the products are delivered to retailers. This system is very similar to the current information society production process, except that information products are replaced with software. In the manufacturing stage, a process is set up in which workers produce the products, and then they are delivered to retailers. This system model is quite like the current manufacturing system, except that the manufacturing stage has been replaced with the stage in which the products are produced, and they are delivered to the retailers. Lastly, in the product packaging stage, after delivery to the retailers, the products are delivered to users. In this stage, the products are sold to consumers. In the system model, the focus is on making, whereas the current production model is more focused on doing. This is because it is a major problem for the current model that production processes are highly fragmented, and low productivity levels result.

2. TYPES OF ROBOTS

Most mechanical robots are manually controlled and are dependent on a human operator to perform a task, be it by remote control or by proximity. A number of mechanical robots can also have autonomous operations, though they generally have a limited range of movement, are programmed in fixed patterns, are usually static in appearance, and are operated and controlled through remote control. The term mechanical robot can refer to a general class of mechanically driven robots, including remote-controlled robots, but it may also be used more specifically to describe the variety of robots that perform tasks autonomously. Autonomous mechanical robots have a wide range of potential applications and are employed in a variety of environments, from manufacturing facilities to oil fields, mining operations, disaster areas, hospitals and even the ocean floor.

1. **Pre-Programmed Robots:** The mechanical arm takes manufactured goods from a supply cabinet and places them on the car chassis. There are many limitations on the functionality of a pre-programmed robot [1]. First, a pre-programmed robot is limited to doing only one simple task. The robot cannot be programmed to accomplish a variety of tasks. Instead, it must be taken out of service and disassembled to accomplish new tasks. Second, a pre-programmed robot cannot operate in an unstructured environment. Instead, it must have a task and complete it at a specific time. There is also no ability to make minor course adjustments or to be reprogrammed in the field. Programmed robots on the other hand, operate in an uncontrolled environment where the robots must interact with other robots and humans and perform a specific task. The program provides for the motion of the robots and the decision-making process of which direction the robot should turn to proceed in performing the task. In such environments, robots must continuously be able to detect the presence of other robots or humans in their surrounding environment. In addition, the robots must be able to interact with other robots and humans to accomplish the specific task at hand. To interact with other robots or humans, programmed robots must be able to detect and classify objects and other robots within the surrounding environment. These objects include other robots and humans. One area where programmed robots must operate in an uncontrolled environment is military operations. In a military operation, a robot must operate within the boundaries of war zones, i.e., areas where live firing can occur. The robot may have to be able to perform various tasks such as moving weapons to a target, moving humans, or performing other tasks. Since the robot is programmed, it will not be pre-programmed with the ability to detect and classify objects or other robots. It will not know how to avoid contact with other robots. It will not know the best route to travel to reach a target area. Therefore, to successfully complete a military operation, the robot must be able to classify and detect objects and other robots in its environment to know how to avoid the objects. If the robot can classify and detect the objects, it can avoid the objects and/or other robots, thereby making it much easier to successfully complete the military mission. Another area where programmed robots must operate in an uncontrolled environment is in industrial assembly lines [2]. In a factory, robots may be programmed to perform a simple task such as assembling small parts in a very large and complex assembly line. Since the robots are programmed, they can function autonomously. However, since the assembly lines may be very large, a robot may be programmed to work on the assembly line for many hours at a time. In addition, the assembly line may have other robots and humans operating on it. As a result, the programmed robot may have to interact with other robots and humans on the assembly line. Again, since the robots are programmed, they will not be pre-programmed with the ability to detect and classify objects and other robots. There are many advantages of using robots for assembling and inspecting work products in factories. Robots can perform assembly tasks and inspection tasks with accuracy and reliability. In addition, robots are safer and quieter than humans performing the tasks. As a result, robots can reduce the risk of ergonomic problems and injuries that humans face when performing these tasks.

2. **Humanoid Robots:** A humanoid robot is designed to behave and act in a way like a human. It is usually designed with at least one sensor that allows it to detect the surrounding environment and have a movable and programmable body to interact with its environment. They are usually designed to mimic human behavior and actions. Most robots are also designed with a human-like appearance. A humanoid robot is a type of robot. Many humanoid robots are designed to act like a human but are not necessarily able to speak. It is important for these robots to be able to detect human intention and emotion, as well as being able to interact with human users. These robots are in widespread use for domestic, entertainment and commercial purposes. There is a need for a simple, cheap, and effective robot that can be used for detecting or identifying the presence of humans in a space. In addition, there is a need for a robot that can alert people to potentially dangerous situations or

situations that need urgent attention. Robots that are intelligent, responsive, and alert may not only save lives, but also significantly save the cost of human life and reduce the cost of a response to disasters and other situations. It is possible that with the right technology, it may be possible to increase security in areas such as airports, military, nuclear power facilities, power plants, hospitals, hotels, trains, and subways. For instance, at airports, a security robot could be used to look out for terrorists or criminals, or to patrol areas where security is not adequate. An intelligent robot would be able to scan the baggage, identify objects, detect bombs or chemical weapons, or even monitor air quality.

3. **Autonomous Robots:** The main functions of autonomous robots include searching for resources; transportation of loads and people; surveillance and search and rescue; navigation; exploration and mapping; and military operations. There is no limit to the kinds of tasks that an autonomous robot can perform. The main advantages of autonomous robots are: (1) they can perform tasks more efficiently than humans, especially in the presence of a high number of tasks to be performed simultaneously, and (2) they can execute tasks in unpredictable or hazardous environments. The first category of autonomous robots are mobile robots. The most basic mobility model is the ground vehicle and other land vehicles, including amphibious vehicles. Mobile robots can move around autonomously. Mobile robots may be equipped with sensors and actuators and with a navigation and guidance system to allow them to travel through their environment. Mobile robots can also be equipped with special devices for visual, auditory, or electronic means of communication. For example, they can be equipped with cameras or sonar to collect images or sounds in their environment. Since the 1980s, research has been carried out to develop mobile robots. There are two types of mobile robots: wheeled robots and legged robots. Wheeled robots move on wheels; they may move via various types of vehicles such as cars, bicycles, or tracks. Typical wheeled robots include cars; wheelchairs; and robotic platforms for moving around in the physical therapy and medical sectors. A legged robot is a robot with two or more legs. Legged robots include walking robots, which move on legs; mobile robot platforms for walking on stairs or rough terrain, called tracked legged robots; and mobile robots with four legs, for locomotion in water, called amphibious robots.

4. **Teleoperated Robots:** Teleoperated robots can be divided into two main groups, namely, the mobile teleoperated robots and the stationary teleoperated robots. Mobile teleoperated robots are those with wheels that must be moved from place to place by their human operator and include the teleoperated wheeled machine for mining and the teleoperated backhoe. Stationary teleoperated robots do not need to be moved and therefore have a fixed location and the ability to teleoperate from any location within range of their wireless network. These robots can be divided into mobile and stationary classes based on whether they can be relocated easily from a fixed location. In both classes, the robots must generally provide enough power to run all the robot subsystems. Such power supplies, however, are both bulky and costly. They generally are used only once and then thrown away. They also are a source of significant pollution when the robot is dismantled, because of their high lead content. Consequently, power supplies, although needed to operate the robots, present a significant disadvantage to designers who would like to minimize the weight, cost, and lead content of the robot. The conventional means for supplying power to the robot is by connection to a wired power supply. By placing the power supply with the robot, the robot must be placed within the reach of a suitable wired power supply, such as a wall outlet or a vehicle that has a wired power supply. This means that the robot can only be used in places where a wired power supply is available, or in places that are reachable by a vehicle with a wired power supply. Otherwise, the robot will not operate properly or, worse yet, the robot will break down or be stolen. Thus, there has been a need for a robot that is more portable than conventional teleoperated robots, is lighter, less expensive, less polluting, less subject to damage or theft, and less limited in the geographic areas where it can be used.

3. MAIN COMPONENTS OF A ROBOT

Robots can include a variety of components in the form of robotic arms, hands, sensors, vision, and actuators. An actuator is the component that makes a machine move in a desired direction, and the various robotic arms, hands, sensors, vision and/or other components make a robot capable of accomplishing many different tasks. While the various components of a robot are utilized to complete tasks, it is often beneficial to be able to monitor or examine the components of the robot to identify problems that can cause the robot to fail. For example, the robot can experience problems because of a failure in a component or an unexpected loss of power in an electrical or mechanical system. It would be advantageous to be able to examine a component of a robot to assess its reliability or functionality [1]. One potential way to examine robotic components is to examine how they perform when operated by a human. One or more aspects of a robotic arm, for example, can be examined to determine how the robotic arm can operate while being physically manipulated by a human. For example, a human can test the speed with which the robotic arm can perform a task as opposed to the speed with which the robotic arm can perform the task with the use of a preprogrammed sequence. The robot may require several steps to perform a task, and the human can test how the robot can execute each step using a process of trial and error to determine how to complete the task.

Control system: In the body, a group of people can make a simple movement, like lifting an arm. The brain signals that arm to start lifting, it then tells other groups of neurons what to do with that arm once it has lifted. In a robot, a group of muscles might signal a computer to move an arm. The computer will then send signals to a motor, which controls the motion of a small motor that moves the robot's legs. Once both the computer and the motor receive the instruction from the brain to move the arm, they both will move in sync, and the arm will lift off the ground. Currently, computer-controlled systems only rely on the brain for input. Robots are programmed to control their actions through a control system. By combining a large group of people, the control system, and a robot, one could create a collective mind. Robots could be programmed to do whatever a person could do, but with less of a control system.

Sensors: A sensor is a device that detects stimuli and sends the information back to the controller. They can also be called a detector. In some cases, the signals coming from a sensor might be used to indicate something like that a switch has been tripped. The simplest sensor is an on/off switch that sends a high voltage to the controller indicating a true or false situation. The less precise sensor is the light-dependent resistor [3]. It contains two parts that have different voltage ratings. The first part determines whether the current is high or low. If the

current is low, it will glow red or darken. If it is high, it will glow or turn dark blue. The voltage from the sensor is proportional to the level of current. A large variety of sensors exist, each of which detects a different kind of stimulus. In addition to sensors, many robotics systems include actuators, such as electric motors, hydraulic or pneumatic cylinders, and so on. While actuators can be controlled in response to the processed stimulus, actuators can also perform an autonomous action, such as cleaning the floor, lifting an object, driving in a certain direction, or any of the other possible actions which can be implemented. To enable robots to interact with the world, robotics systems usually include some form of artificial intelligence, typically a robot control system. The control system can monitor the environment, can determine its state, and control the robot's behaviors accordingly. While robots have been around for several decades, recently robotics has experienced a new vogue. Robots have become ubiquitous and can be found in homes, offices, factories, and other places where people and/or things are being assembled, built, and repaired, and so on. Robotics, particularly as applied to home robotics, is largely concerned with consumer products. Many robotic devices are designed with entertainment as their main consideration. However, in more recent years, the consumer robotics market has found its niche in other areas, such as building automation. The latter has become even more important in view of the recent increase in power outages, as more buildings incorporate power-generating equipment, such as solar panels, wind turbines, or other forms of alternative power generation.

Actuators: They can be classified into three different types based on their function and movement. These three different classes of actuators are pneumatic, hydraulic, and electrical.

a) **Pneumatic:** Pneumatic actuators have the least capacity of movement and the least mechanical power and the greatest cost. These actuators have the least movement and the least load bearing capacity. The most widely used actuators in the building sector are pneumatic cylinder, air bladders and pneumatic motors [4].

b) **Hydraulic:** Hydraulic actuators have the highest load bearing capacity and movement. They have good dynamic movement and can be used in situations where heavy loads are involved. They can be used in situations where load movement is involved. They are used in applications where continuous force is needed, such as elevators, hoists, elevators etc. and in situations where shock or vibration are to be prevented, as in the manufacture of precision machines and precision instruments.

c) **Electrical:** Electrical actuators are the third most common type of actuator. They can be used in large capacities and in situations where a low level of force or movement is required. They have a wide range of applications in the field of hydraulics, as when driving a fan or pump. Electrical actuators also have their application in areas such as aircraft, water transportation and industry.

d) **Power Supply:** Once their energy is depleted, these robots must be recharged or disconnected from power and taken to an on-site charging station, to which they are returned once they have recharged. Portable robots, such as lawnmowers and robots found on an operating table, however, are battery-operated [2]. They do not have access to AC power in the same way as stationary robots, and their recharge requirements are not practical to take with them. Such robots, therefore, need to be recharged using a stationary recharger. Stationary robots with power cords are often recharged using rechargers mounted to a wall. One such example is illustrated; robot owners were allowed to plug their robots directly into wall outlets. Since robot batteries can store sufficient power for only about 20 minutes of continuous use, such an arrangement allowed a robot owner to connect her robot to a wall outlet while she was otherwise not using her robot. As the cost of robots declined, however, robot manufacturers began to market a charging system that allowed a user to place a robot in its charging station, then connect it to power using a docking cord. This allowed a robot owner to easily recharge a robot, which was often purchased as part of a kit, such as a lawnmower kit. A user could then simply dock the robot into a charging station to recharge it.

4. APPLICATIONS OF ROBOTICS

There are robots used for production, robots used in healthcare, robot used for mining, robotic arm used for construction. Some of the most popular applications of robots today are as follows:

a) **Airline Security:** Airline security is one of the most highly regulated industries in the world today. There are some key areas that make this process more difficult. There are several things that must be inspected and there are certain items that cannot be checked. The focus of this area is ensuring the safety of the passenger. For instance, if a passenger tries to board a flight in his or her undergarments, he or she must remove these items before entering the security area

b) **Gaming:** Gaming companies are always looking for new ways to bring the “real world” into gaming and bring people together [1]. For instance, companies are creating physical security robots that can monitor gaming events, monitor player safety, and assist the people conducting the event. These real-world robots can improve the customer experience, promote trust and safety in a virtual environment, and can monitor for suspicious activities.

c) **Agriculture:** Like the transportation industry, we have all heard of farming robots. These robots can perform a number of functions, such as plowing fields, weeding fields, fertilizing fields, removing weeds, moving equipment around, etc. The benefits of using these robots in the agriculture industry are endless. They have the potential to improve safety and productivity for farmers.

d) **Public Safety:** We are entering an age where there will be an increased amount of people using public transportation and walking across town. The problem is that there are not many systems that can automatically monitor and keep people safe [3]. This is where security robots come into play. These robots have the ability to identify objects and people quickly, alert police when an emergency occurs, and can even identify the criminals. For instance, in the case of Boston’s transit system, the MBTA was able to successfully operate the Transit Wire system. This system was able to detect, track, and predict a future incident. It is safe to say that using security robots for public transportation will allow us to be better prepared for public safety events [4].

e) **Entertainment:** The idea of robots has become a part of our daily lives, especially in the entertainment industry. Even if the concept of robots had existed before, it would not have been accepted in the mainstream, and would still be restricted to a few industries such as the military. But since the industrial

revolution, many robots have been created that are used for various purposes. Although robots are not fully developed to a human level yet, they have become a useful tool in our modern society. One of the main functions of a robot is to assist the human, and this has been the focus of many inventions. Since they can be extremely versatile, robots are also being used in the entertainment industry. A robot can be anything from a voice-activated device that assists a certain activity to a fully functional automaton that can execute simple tasks for humans. So, if you think that it is time to invest in a robot as the most efficient and practical solution for your business, be sure to know that this technology can help you greatly. The basic function of a robot is to assist the human in whatever he or she needs to do, including simple tasks such as moving objects or serving meals. There are robots that are created to assist the elderly. Such machines move objects and even assist people with bathing and washing. A robot can also assist in operating a car or in carrying out repetitive tasks. In terms of the entertainment industry, robots are not much different from the video games that people play. They are often seen in places that people do not like, such as on the streets, in the offices, and at public places such as in shopping malls. It is, however, good news to know that people do not see such machines as monsters or strange creatures. They are, in fact, helpful for people who may find it difficult to do certain activities. For example, a robot can be very useful in hospitals where it helps to perform operations and tasks that are too difficult for the human hands.

f) **Health Care:** However, there are still challenges for robots to work in everyday healthcare setting. For example, some doctors feel uneasy if they can be replaced by a robot and the hospital staff needs to think about the replacement. For the past several years, many countries have been developing smart data technology. A large volume of medical data is generated by healthcare providers such as hospitals and diagnostic centers, doctors, dentists, and medical institutions. It is a big opportunity to use data to advance healthcare industry. The volume of healthcare data is growing. The number of medical images and medical videos stored in the hospitals are exponentially increasing every day. In addition to medical information, doctors, researchers, and statisticians can analyze and use health data to study patterns and patterns and make decisions more effectively. For example, let's say a patient went to the hospital and his/her medical record contains many information such as symptoms, body temperature, blood tests, and other medical data. The health provider uses a smart data technology to search this huge amount of medical data in seconds, analyze and predict possible symptoms and illnesses, and make appropriate medical decisions.

5. CONCLUSION

Robots can work 24 hours a day, seven days a week, which is more than human beings, thus more productive. It is because these robots are less fatigued and are less likely to make mistakes. But it can also be seen in other jobs like home help, medical and caretaking. A robot can help with the caretaking of elderly people who have trouble getting out of bed or other daily tasks. A medical robot can take blood samples and make an accurate medical diagnosis of the patient, while medical personnel only diagnose from the patient's symptoms. In the education sector, robots can help in tutoring and teaching. This is the new trend in the education field because human teachers are not really prepared for handling children. Robots can handle multiple students at once and monitor the progress of the students without any physical contact, thus teaching is no longer only done by human teachers. Also, in the field of military robots are used. This is especially in war time when there is enemy to fight, a lot of jobs must be done to protect the country from the enemy [5]. The work can be done easily by robots since they can perform better in this type of activities. For instance, a robot can collect data from a battlefield, send data to a nearby base, communicate and even attack enemies without human's involvement. It is because robots are less likely to get in a conflict with each other. In the manufacturing industry, robots are used to assemble and disassemble, or pick and sort parts. There are many ways to make use of robotics in the workforce. And it does not mean all robots need to replace people. However, this technology can surely do more efficient and productive work, no matter the field. There are many advantages and disadvantages to robots.

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7. REFERENCES

[1] De Backer, K., DeStefano, T., Menon, C., & Suh, J. R. (2018). Industrial robotics and the global organization of production.

[2] Marinoudi, V., Sørensen, C. G., Pearson, S., & Bochtis, D. (2019). Robotics and labor in agriculture. A context consideration. Biosystems Engineering, 184, 111-121.

[3] Ortenzi, V., Cosgun, A., Pardi, T., Chan, W. P., Croft, E., & Kulić, D. (2021). Object handovers: a review for robotics. IEEE Transactions on Robotics.

[4] Sünderhauf, N., Brock, O., Scheirer, W., Hadsell, R., Fox, D., Leitner, J., ... & Corke, P. (2018). The limits and potentials of deep learning for robotics. The International journal of robotics research, 37(4-5), 405-420.

[5] Taniguchi, T., Mochihashi, D., Nagai, T., Uchida, S., Inoue, N., Kobayashi, I., ... & Inamura, T. (2019). Survey on frontiers of language and robotics. Advanced Robotics, 33(15-16), 700-730.

