

Applications Of Robotics

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Abstract:

Over the lifetime of human history, emergence of certain new technologies has globally transformed life. One such technological revolution is the concept of robots and more specifically the field of robotics. The modern world is built on robotics. It has the potential to bridge the gaps between electronic communication and corporeal systems. The researcher aims to discuss the numerous applications of robotics in various areas. At present, Japan is considered as the global leader in robotics. But as the pace of innovations rapidly increases, it is anticipated that robots will not only become more common in daily life but will play pivotal roles in our existence. The applications discussed in this paper are not only possible but exist in real time. The paper also proposes few applications which are fully hypothetical but have the potential to become mainstream in the near future.

Keywords: Robotics, Daily Life, Future Applications

INTRODUCTION:

Robotics is a branch of engineering and computer science that involves the conception, design, manufacture, and operation of robots. The objective of the robotics field is to create intelligent machines that can assist humans in a variety of ways. The concept of robots is prevalent across pop culture and literature. The concept of a being programmed to carry out a certain set of tasks as per the owner's desire is not a new one. There is wide mythological and folkloric evidence for this sort of entity across cultures. Arguably the most popular amongst these is the Golem, a figure shaped of clay, wood or rocks that is animated by Jewish Kabbalistic magic and will do its creators bidding without question. Once the magic within it is removed, the Golem collapses into its composite materials and is rendered useless.

Thus, the concept of robots is ingrained in the very consciousness of humanity itself and are a vital resource of the future. Robots offer multiple avenues by which humanity may benefit. Robots can perform menial tasks such as maintenance of infrastructure to conducting pioneer research into the mysteries of life. They form a fundamental cornerstone to our vision of the future and its attendant innovations. Although robots are regarded with a positive attitude in general, there are concerns as to the ethical and socio-economic consequences of robot production and prevalence. The earliest robots as we know them were created in the early 1950s by George C. Devol, an inventor from Louisville, Kentucky. He invented and patented a reprogrammable manipulator called "Unimate," from "Universal Automation." In the late 1960s, businessman/engineer Joseph Engleberger acquired Devol's robot patent and was able to modify it into an industrial robot and form a company called Unimation to produce and market the robots. For his efforts and successes, Engleberger is known in the industry as "The Father of Robotics." Issac Asimov also proposed his three "Laws of Robotics", and he later added a "zeroth law". These laws must be programmed into each and every robot when being manufactured to ensure the safety of the humans who operate it.

- **Zeroth Law** - A robot is not allowed to injured humanity, or, through inaction it allows humanity to come to harm.
 - **First Law** - A robot cannot injure a human being, or, through inaction it allows a human being to come to harm, unless it would violate the higher order law.
 - **Second Law** - A robot should follow the orders given it by human beings, except when such orders given by humans would conflict with a higher order law.
- Third Law** - A robot is allowed to protect its own existence as long as such protection would not conflict with a higher order law.

APPLICATIONS OF ROBOTS IN DAILY LIFE

Some ways in which robots are used in everyday lives are

1. Restaurants:

When it comes to the use of robots in everyday life, one cannot deny its application in the food industry, especially in Japan. Robots in Japan are commonly employed in jobs like chopping vegetables and making sushi as per a customer's request. This enables a smooth and effortless dining experience for customers since the factor of human error is removed from the equation leading to a more efficient system. Such restaurants are commonly referred to as conveyor restaurants since the food is sent to customers on conveyors belts.

Even outside Japan, it has become quite common for cafes or restaurants to have QR codes or online menus which eliminates the need for a human waiter to take on orders and sends each customer's order directly to the kitchen. It also ensures a seamless billing process since all the orders are recorded on the master software. This can be adapted to the entire hospitality setup with robots manning reception desks and pools in hotels and bars as well.

2. Assisted Living:

Robots are also now programmed to assist elderly people who live in assisted care facilities. A Korean robot that is designed to assist living is powerful enough to carry a human weighing 220 pounds. These robots are easy to operate usually with a joystick. The robots are designed to assist the elderly giving them a sense of friendship and carry out their everyday activities. They also ensure their safety since robots do not require sleep or food and are always vigilant for all signs of medical emergencies such as falls, strokes or heart attacks. Robots can also be programmed to act as trained nurses who can handle the simpler aspects required in hospice care such as changing of bedsheets, turning over the bedridden to apply topical creams, attending to the cleanliness and hygiene of the bedridden and so on.

3. Sewer Management:

Cleaning the sewer system is one of the dirtiest and most harmful tasks that a human can possibly do. Manually cleaning the sewer system is very problematic and downright dangerous. Robots can be used to manage the sewer instead of sending in humans and ensuring their certain death. In addition to cleaning the sewer system, the robots can also be used to inspect and maintain the sewer networks of vast cities. These can potentially ease the task of the inspection workers by many folds.

4. Industry:

In manufacturing industries, robotics is generally used for the fabrication, finishing, transfer and assembly of parts. In material handling industries where, finished products are prepared for distribution, robots are used for picking, sorting, packaging, and transport of products. Robots also serve the purpose of inspecting finished goods via scanning the packaged product. Robots are also used to keep logs of the number of products in each shipment and each specific package as a means of quality control and more efficient data management.

5. Agriculture:

According to the data collected in the last five years, advanced robots are being used in agriculture and cultivation. This was introduced to ensure profit and high productivity for the farmers using it. Agricultural robotics is capable, for example, of spraying pesticides only to the plants that need them. This is just one example of how concrete benefits can be seen in sectors that are traditionally not very automated. The incorporation of robotics in agriculture improves both productivity and working conditions for farmers and workers. Today, a large number of agricultural operations are already being done autonomously.

Types of robots used in agriculture:

These are some applications of robotics in agriculture for which robots are used:

- Crop condition identification and corresponding chemical application.
- Spraying or harvesting, as required by the fruit or plant.
- Mobile manipulation through collaborative arms (harvesting, fruit handling).
- Collection and conversion of useful information for the farmer.
- Selection of the healthiest produce to avoid food waste.
- Use of driverless tractors and robots for sowing seeds.
- A primary use of robots on farms often comprises of a robot with picking arms to pick ripened fruit and vegetables.

- Packing fruit and vegetables for distribution to retail is often carried out by the use of a conveyor belt and robotic arms to pack the produce according to type. They can be programmed to identify good from bad produce so only the best ends up in the supermarket.
- Palletizing can be automated in many instances using palletising robots or robotic arms.
- Robots can be programmed to maintain crops by pruning, weeding, and providing irrigation.
- There are many repetitive tasks involved with livestock farming which can be automated including milking cows, spreading feed and monitoring land for grazing.



Agricultural robots in action

6. Dairy Farming:

Dairy farming has come a long way from the days of hand-milking cows. Farmers have milked cows by hand for generations, but with the advancement of technology, milking robots has revolutionized the dairy business. Milking robots, also known as automated milking systems (AMS), monitor, milk, and clean cows using advanced sensors and algorithms. Milking robots have been a game changer for dairy producers, delivering better efficiency, accuracy, and flexibility in milking operations as demand for dairy products has increased.

7. Beauty Products:

Panasonic took the wraps off a new version of its hair-washing robot at the CEATEC 2011 tech exhibition that currently takes place in Japan. The robot handles the entire process of hair washing autonomously: wetting, shampooing, conditioning, and drying. The new version washes hair with a total of 24 (instead of just 16) fingers. Panasonic also says they improved the scanning system wherein the robot scans the head's shape before it does it begins, allowing for a better experience. This ensures that the beauty industry needs only skilled and trained workers to conduct more complex procedures such as cutting of hair which requires skill and dexterity. This allows for most customers to complete their day of self-care quickly and efficiently and to also receive services without any human error that may result in loss of hair or any such consequences.



Hair-Washing Robot

8. Household:

A domestic robot is a type of service and autonomous robot that is primarily used for household chores, but may also be used for education, entertainment, or therapy. While most domestic robots are simplistic, some are connected to Wi-Fi home networks or smart environments and are autonomous to a high degree. There were an estimated 16.3 million service robots in 2018 and more are expected to be produced to meet increasing demands for domestic labour.



A Domestic robot

9. Space Exploration:

Microgravity robots refers to robots that are specifically designed to operate in zero-gravity environments, such as the International Space Station (ISS). These robots are typically used for maintenance and repair, scientific research, and to assist human astronauts with their daily tasks. We can send robots to explore space without having to worry about their safety. Of course, we want these carefully built robots to last. We need them to be able to investigate and send us information about their destinations. But even if a robotic mission fails, the humans involved with the mission stay safe. Sending a robot to space is also much cheaper than sending a human since they don't need to eat or sleep. Robots can be built to withstand harsh conditions, like extreme temperatures or high levels of radiation. Robots can also be built to do things that would be too risky or impossible for astronauts.

A few such robots in use are NASA's Mars rovers, Perseverance and Curiosity along with A-PUFFER, short for Autonomous Pop-Up Flat Folding Explorer Robot.



A PUFFER rover on mars



NASA's moon rover

10. Medicine:

Robot-assisted neurosurgery uses an advanced surgical tool called ROSA Brain to perform minimally invasive procedures in the brain. ROSA stands for Robotic Operating Surgical Assistant. It combines a robotic arm with the ability to get detailed pictures the brain. ROSA helps neurosurgeons treat children with epilepsy and other problems with the brain faster, more safely and more effectively.

ROSA has many benefits:

- Avoids removing part of the skull (craniotomy).
- Allows for more precise procedures.
- Shortens the child's time in surgery and under anaesthesia.
- Reduces the number of stitches, which means faster recovery and less scarring

- Lowers the risk of infection because the cuts (incisions) are so small.
- Lowers the child's pain and their need for pain medicine.



Images of ROSA in operation

11. Blood Detection:

A hypothetical robot can be used to detect the blood anomalies in humans. Instead of using invasive and painful injections, the patient's arm is placed in front of a scanner to which a laser is affixed. This laser beams trajectory is analysed by software to detect any vitamin deficiencies or haemoglobin counts.

ADVANTAGES OF USING ROBOTS

- It is productive, time efficient and consistent.
- Until somebody switches it off it keeps continuing its task.
- They are more accurate than humans.
- They are capable of eliminating dangerous jobs.
- They can work in hazardous environment
- They don't have time limit for working.
- **Reduced Human Error:** In many situations, robots are more accurate than humans, which lowers the likelihood of human error. Working together, humans and robots can complete hazardous tasks without endangering any lives.

DISADVANTAGES OF USING ROBOTS

- Skilled human employees may lose their jobs to automation.
- Companies may need to hire extra staff to maintain their robots.
- There may be over-dependence on technology leading to sedentary lifestyles.
- If any automated system goes down due to a technical issue the whole system may come to a halt due to lack of backup plans.
- Installation, upkeep, additional components, programming, continual power supply required for robotic automation comes at a heavy monetary cost.
- Robots are ideally suited for a limited number of specialized jobs to save labour costs and time. They are reliant on people because they program them for particular jobs.

CONCLUSION

We frequently come across robots in our daily lives as robotic technology develops. They are everywhere, including the checkout lines of grocery stores and manufacturing facilities. As a result, productivity and safety standards rise, and people can concentrate on more crucial tasks. As a result, robots will likely play a more significant role in shaping the future as technology develops and becomes more sophisticated.

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