Types of Robots

Here is a discussion of the various types of robots that are already in use and those that are in the offing in the foreseeable future.

From the robot maid Rosie in *The Jetsons*, to the famous droids of Star Wars R2-D2 and C-3PO, to Arnold Schwarzenegger in the role of a cyborg in The Terminator, to Robocop, I, Robot, The Matrix, Robots... human beings have long been fascinated with the idea of robots, a term that can broadly be defined as an artificial human being. While in the past humans only fantasized about them, today, many types of robots are a reality. For example, there are industrial robots, toy robots, robots that help in space exploration, robots used in the medical field, robots used in agriculture, to increasingly humanoid robots being created for the service sector, whether helping with the chores in the home or as caregivers for the elderly and the handicapped.

Various Types of Robots
Given below are some of the types of robots that have been conceived by humans, many of which are already in active use.

Industrial Robots:
Robots today are being utilized in a wide variety of industrial applications. Any job that involves repetitiveness, accuracy, endurance, speed, and reliability can be done much better by robots; which is why many industrial jobs that used to be done by humans are increasingly being done by robots. For example, for the past 30 years or so robots have progressively taken over the *fully automated production lines of the automobile industry*, wherein a chassis of a vehicle is transported along a conveyor belt and is welded, affixed, painted, and assembled by a succession of robot stations. Some of the other in-

dustrial jobs robots are performing are palletizing and packaging goods, dispensing jobs, laboratory applications, and robots that pick miniscule electronic components from trays or strips and accurately place them on printed circuit boards in the electronics industry.

Mobile Robots:

Also known as Automated Guided Vehicles, or AGVs, mobile robots are used for transporting material over large building complexes, such as hospital grounds, container ports, and warehouses, using wires or markers placed in the floor, or lasers, or vision, to sense the environment they operate in. An advanced form of the AGV is the SGV, or the Self Guided Vehicle, like PatrolBot Gofer, Tug, and Speci-Minder, which can be taught to autonomously navigate within a space, or do it by being given a map of the area. These robots have the ability of performing tasks that are non-sequential and non-repetitive in environment that are complex, hence are defined as intelligent robots.

Robots Used in Agriculture:

Although the idea of robots planting seeds, plowing fields, and gathering the harvest may seem straight out of a futuristic science fiction book, nevertheless there are several robots in the experimental stages of being used for agricultural purposes, such as robots that can pick apples, prune grapevines, transplant seedlings, and so on. In fact, there already is a type of robot that shears sheep in Australia.

Telerobots:

These robots are used in places that are hazardous to humans, or are inaccessible or far away. A human operator located at a distance from a telerobot controls its action, which was accomplished with the arm of the space shuttle. Some other examples of telerobots are *laparoscopic surgery* being done with the help of a telerobot, or doctors using remotely located robots to communicate with their patients, which enables them to treat patients anywhere in the world. This has the potential of patients in remote places of the world, without adequate medical facilities, being able to consult doctors across the world, or even in the next town, and the doctors in turn having the ability to monitor them. Telerobots are also useful in *nuclear power plants* where they, instead of humans, can handle hazardous material or undertake operations potentially harmful for humans.

Telerobots are particularly useful for space exploration. Some of the applications in space that are on anvil are robots used for the maintenance of satellites, robotic arms for manufacturing in space, robots used for constructing space ships and space stations, and so on.

Telerobots are also being increasingly used for *military purposes*, for instance the Unmanned Aerial Vehicle used for surveillance and also fire at targets. Some of them have even advanced to the level of having the ability to automatically make decisions like choosing the location to fly to, and deciding which enemy target to engage with. Many telerobots are being used by the US military in Afghanistan and Iraq to diffuse IEDs, or Improvised Explosive Devices. An Unmanned Ground Vehicle, or UGV, is on the anvil which can carry out military missions independently.

Service Robots:
The Japanese are in the forefront in these types of robots. Essentially, this category comprises any robot that is used outside an industrial facility, although they can be subdivided into two main types of robots: one, robots used for professional jobs, and the second, robots used for personal use. Amongst the former type are the above mentioned robots used for military use, then there are robots that are used for underwater jobs, or robots used for cleaning hazardous waste, and the like.

Personal use robots are becoming more and more popular, with increased sophistication in Artificial Intelligence and with them becoming increasingly affordable, and are being seen in areas like caregiving, pet robots, house cleaning and entertainment. Although it is more expensive and difficult to make highly intelligent and sensitive machines, but service robots designed with minimal intelligence are already fairly common, such as the vacuum cleaning robots.

The creation of the amazing walking humanoid named Asimo gave the impetus for several others, such as the house-helping robot named Wakamaru, and Aibo, the robot dog. Then there are the popular robocon competitions held in Japan, with robots playing soccer or having fighting matches.

Another area where personal use robots are being introduced is in the care for the elderly. In countries where there are increasing numbers of the aged with comparatively

fewer numbers of young people to provide them with care, due to low birth rate and increased longevity, such as is the case in Japan and a growing number of Western countries, robots are increasingly thought to be the answer. These robots are being designed to provide physical services such as carrying bedridden elderly people (or even the handicapped), or washing for them, and doing various other day-to-day tasks. And then there are robots being designed to provide mental services, such as offering the therapeutic effect of interacting with the often lonely elderly people.

Hence, the trend is towards developing more and more sophisticated humanoid types of robots, with human-like physical features and intellectual abilities.