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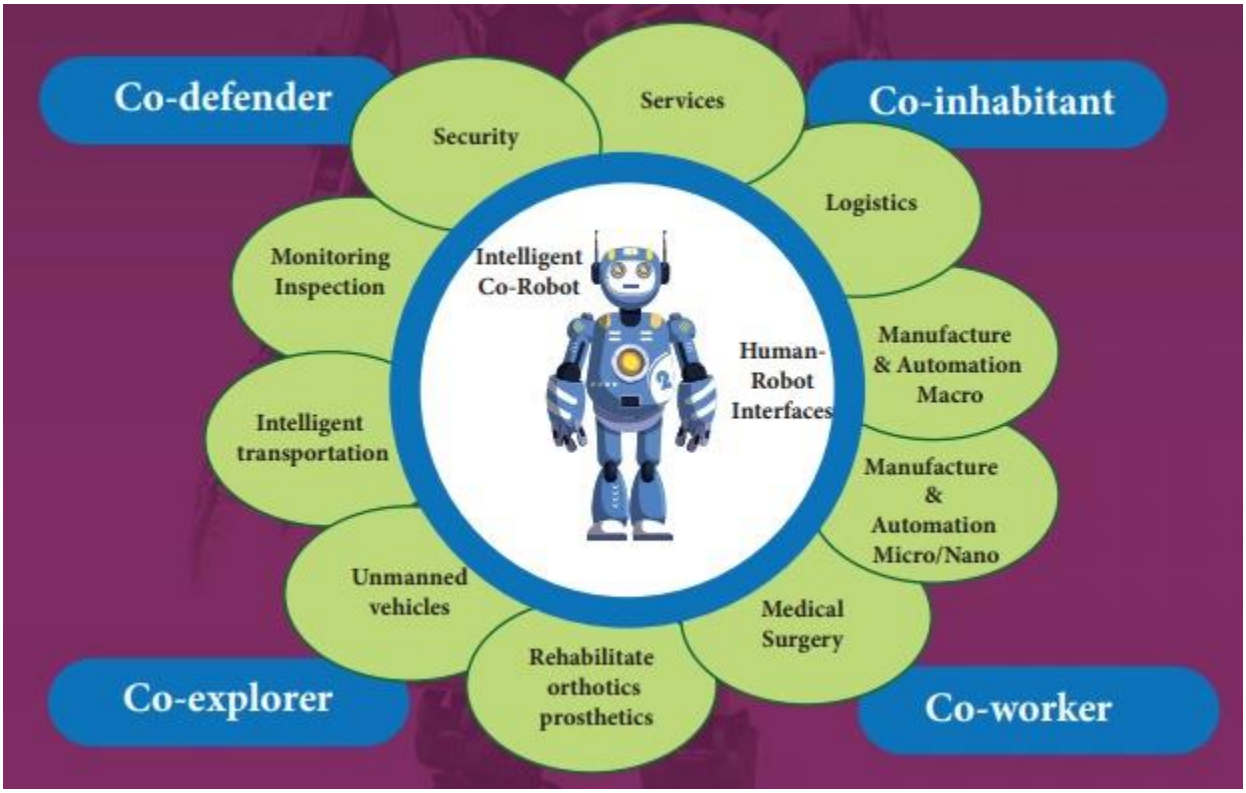
Robotics

What is robotics?

Robotics is an integrated study of mechanical engineering, electronic engineering, computer engineering, and science. Robot is a mechanical device designed with electronic circuitry and programmed to perform a specific task. These automated machines are highly significant in this robotic era. They can take up the role of humans in certain dangerous environments that are hazardous to people like defusing bombs, finding survivors in unstable ruins, and exploring mines and shipwrecks.



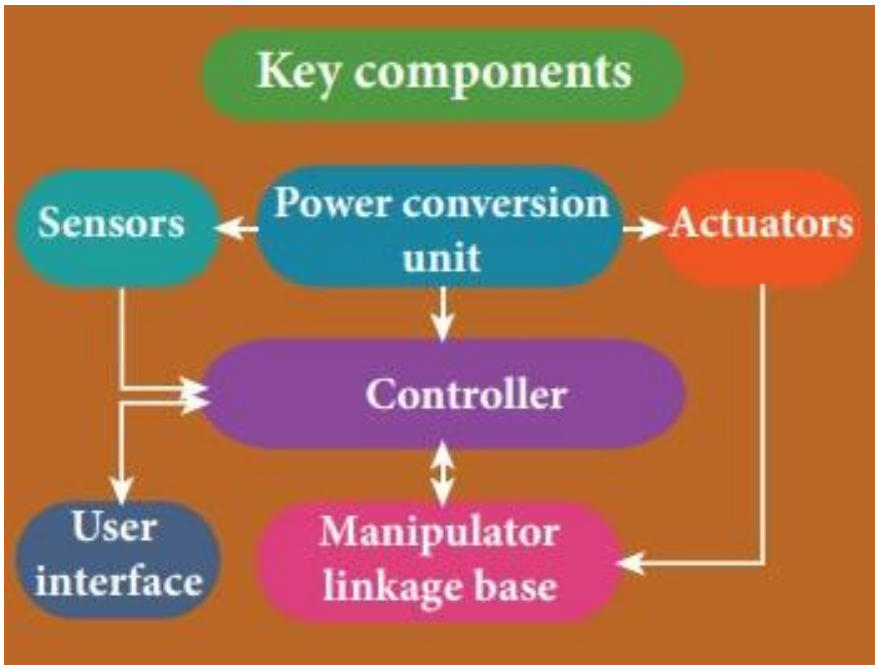
Co-defender, Co-inhabitant, Co-explorer, Co-worker

Logistics, Intelligent transportation, Unmanned vehicles, Rehabilitate orthotics prosthetics, *Human- Robot Interfaces*, Medical Surgery, Manufacture & Automation Macro, Manufacture & Automation Micro/Nano, Monitoring Inspection, Security, Intelligent Co-Robot, Services

In 1954, George Devol invented the first digitally operated programmable robot called Unimate. George Devol and Joseph Engelberger, the father of the modern robotics industry formed the world's first robot company in 1956. In 1961, Unimate, was operated in a General Motors automobile factory for moving car parts around in New Jersey.

COMPONENTS OF ROBOTICS

The robotic system mainly consists of sensors, power supplies, control systems, manipulators and necessary software.



Most robots are composed of 3 main parts:

1. The Controller - also known as the "brain" which is run by a computer program. It gives commands for the moving parts to perform the job.

2. Mechanical parts - motors, pistons, grippers, wheels, and gears that make the robot move, grab, turn, and lift.

3. Sensors - to tell the robot about its surroundings. It helps to determine the sizes and shapes of the objects around, distance between the objects, and directions as well.

TYPES OF ROBOTS

HUMAN ROBOT

Certain robots are made to resemble humans in appearance and replicate the human activities like walking, lifting, and sensing, etc.

1. Power conversion unit: Robots are powered by batteries, solar power, and hydraulics.

2. Actuators: Converts energy into movement. The majority of the actuators produce rotational or linear motion.

3. Electric motors: They are used to actuate the parts of the robots like wheels, arms, fingers, legs, sensors, camera, weapon systems etc. Different types of electric motors are used. The most often used ones are AC motor, Brushed DC motor, Brushless DC motor, Geared DC motor, etc.

4. Pneumatic Air Muscles: They are devices that can contract and expand when air is pumped inside. It can replicate the function of a human muscle. They contract almost 40% when the air is sucked inside them.

5. Muscle wires: They are thin strands of wire made of shape memory alloys. They can contract by 5% when electric current is passed through them.

6. Piezo Motors and Ultrasonic Motors: Basically, we use it for industrial robots.

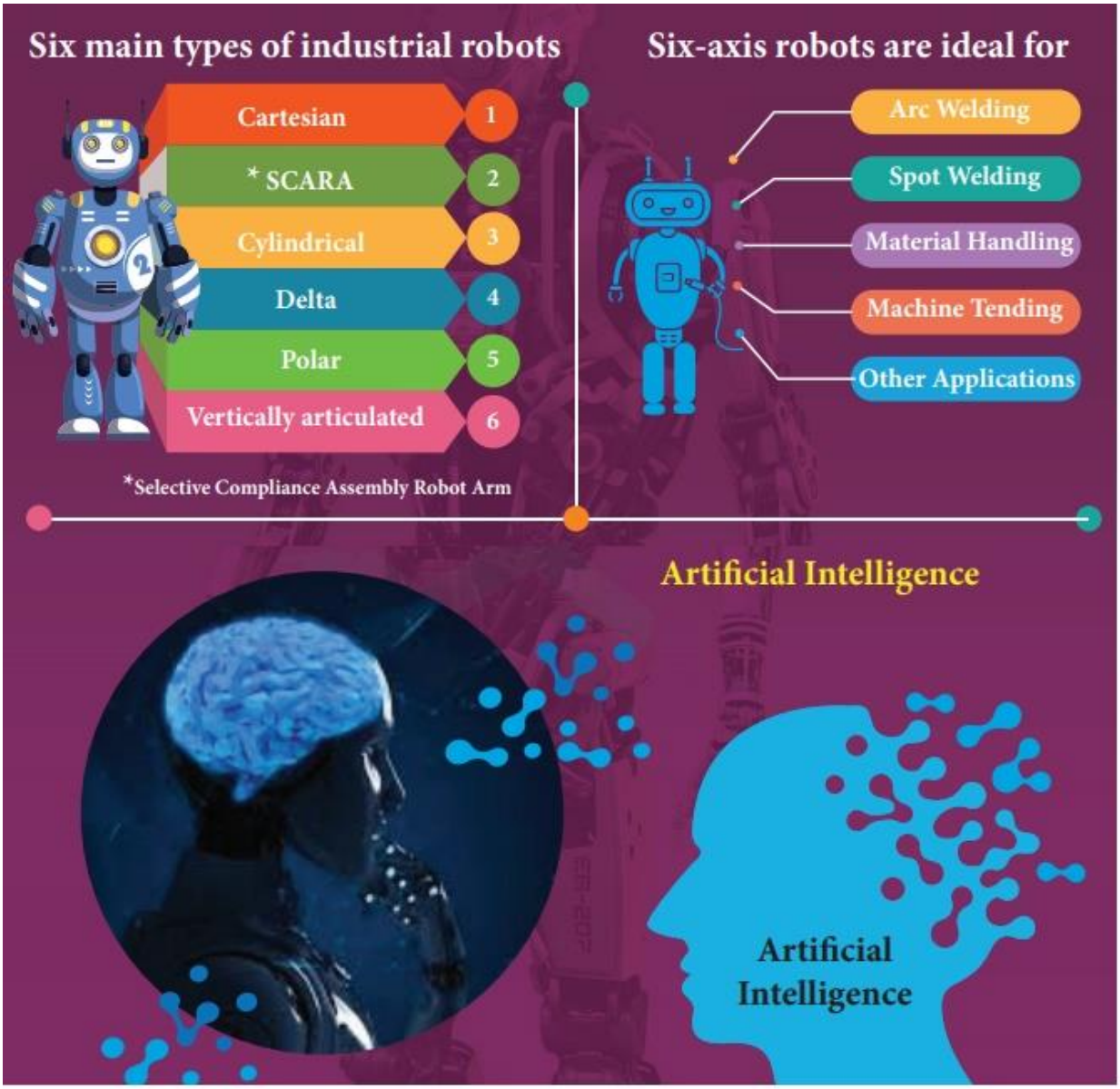
7. Sensors: Generally used in task environments as it provides information of real-time knowledge.

8. Robot locomotion: Provides the types of movements to a robot. The different types are

(a) Legged (b) Wheeled (c) Combination of Legged and Wheeled Locomotion

(d) Tracked slip/skid

INDUSTRIAL ROBOTS



Six main types of industrial robots

1. Cartesian

2. * SCARA

3. Cylindrical

4. Delta

5. Polar

6. Vertically articulated

Six-axis robots are ideal for

1. Arc Welding

2. Spot Welding

3. Material Handling

4. Machine Tending

5. Other Applications

*Selective Compliance Assembly Robot Arm

Artificial Intelligence

The aim of artificial intelligence is to bring in human like behavior in robots. It works on

1. Face recognition

2. Providing response to player's actions in computer games

3. Taking decisions based on previous actions

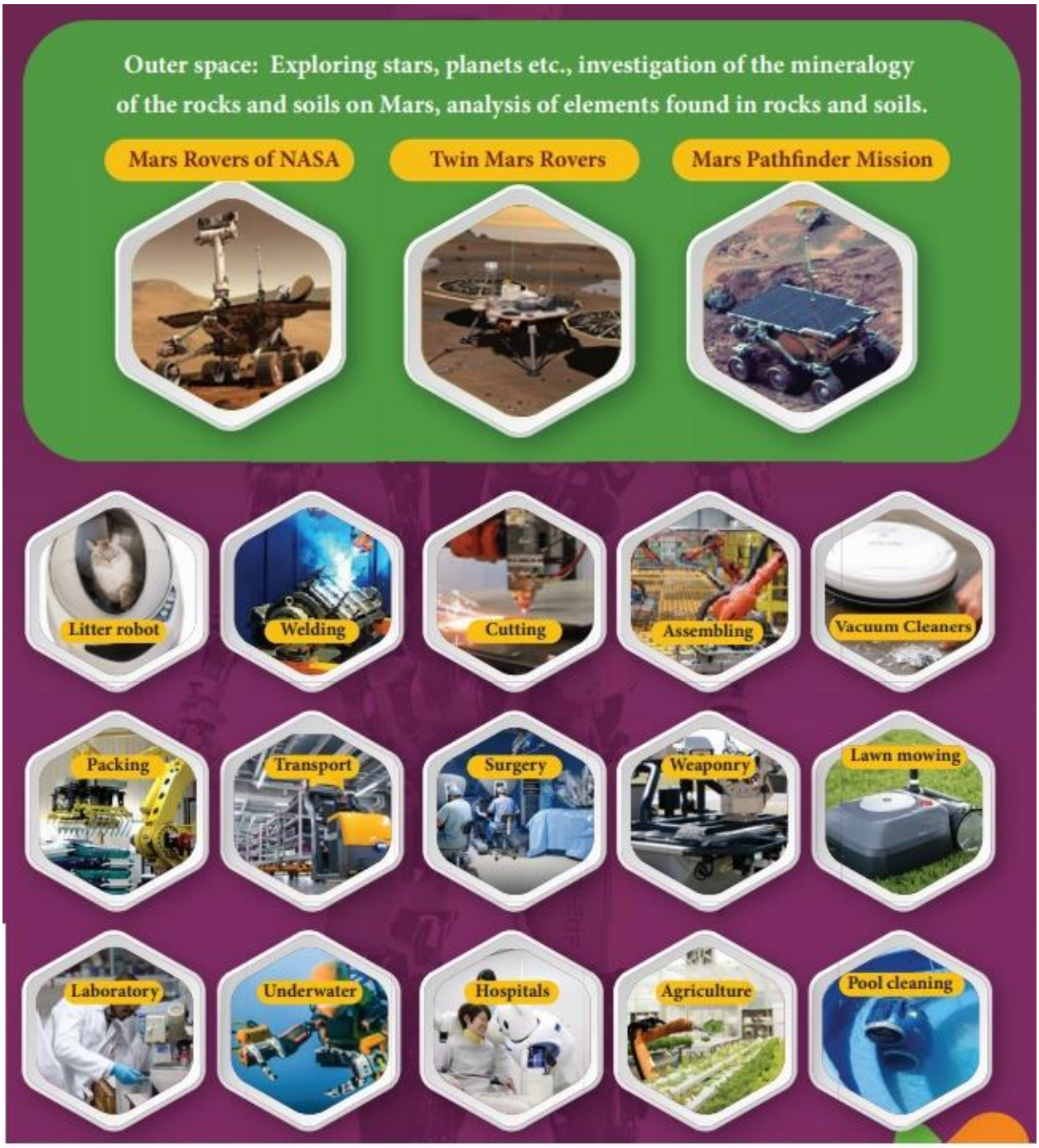
4. To regulate the traffic by analyzing the density of traffic on roads.

5. Translate words from one language to another

Applications

Outer space: Exploring stars, planets etc., investigation of the mineralogy of the rocks and soils on Mars, analysis of elements found in rocks and soils.

Mars Rovers of NASA, Twin Mars Rovers, Mars Pathfinder Mission



Nanorobots

The size of the nano robots is reduced to microscopic level to perform a task in very small spaces. However, it is only in the developmental stage. The future prospects of it are much expected in the medical field: Nano-robots in blood stream to perform small surgical procedures,

to fight against bacteria, repairing individual cell in the body. It can travel into the body and once after the job is performed it can find its way out. Chinese scientists have created the world's first autonomous DNA robots to combat cancer tumours.

Materials used to make robots

For robots, aluminum and steel are the most common metals. Aluminum is a softer metal and is therefore easier to work with, but steel is several times stronger. In any case, because of the inherent strength of metal, robot bodies are made using sheet, bar, rod, channel, and other shapes.

Advantages of Robotics

1. The robots are much cheaper than humans.

2. Robots never get tired like humans. It can work for 24 x 7. Hence absenteeism in work place can be reduced.

3. Robots are more precise and error free in performing the task.

4. Stronger and faster than humans.

5. Robots can work in extreme environmental conditions: extreme hot or cold, space or underwater. In dangerous situations like bomb detection and bomb deactivation.

6. In warfare, robots can save human lives.

7. Robots are significantly used in handling materials in chemical industries especially in nuclear plants which can lead to health hazards in humans.

Disadvantages of Robotics

1. Robots have no sense of emotions or conscience.

2. They lack empathy and hence create an emotionless workplace.

3. If ultimately robots would do all the work, and the humans will just sit and monitor them, health hazards will increase rapidly.

4. Unemployment problem will increase.

5. Robots can perform defined tasks and cannot handle unexpected situations

6. The robots are well programmed to do a job and if a small thing goes wrong it ends up in a big loss to the company.

7. If a robot malfunctions, it takes time to identify the problem, rectify it, and even reprogram if necessary. This process requires significant time.

8. Humans cannot be replaced by robots in decision making.

9. Till the robot reaches the level of human intelligence, the humans in work place will exit.