



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with
'A++' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University,
Chennai



DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT213- IoT SYSTEM ARCHITECTURE

II ECE / IV SEMESTER

UNIT 5 – IOT APPLICATIONS

TOPIC 2 –Internet of Robotic Things (IoRT): Introduction to stationary and mobile robots;



A Robot is:



An electromechanical device that is:

- Reprogrammable
- Multifunctional
- Sensible for environment



What is a Robot: ||



Manipulator

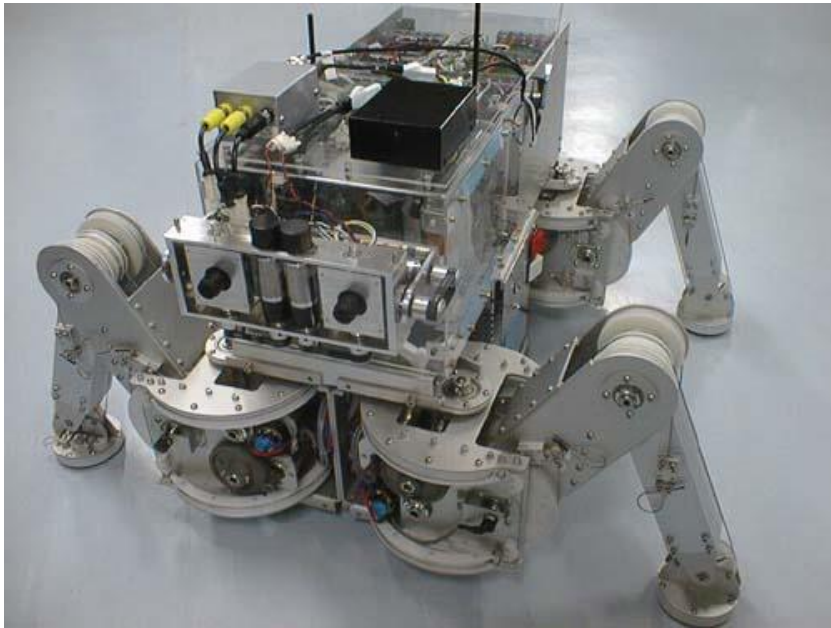




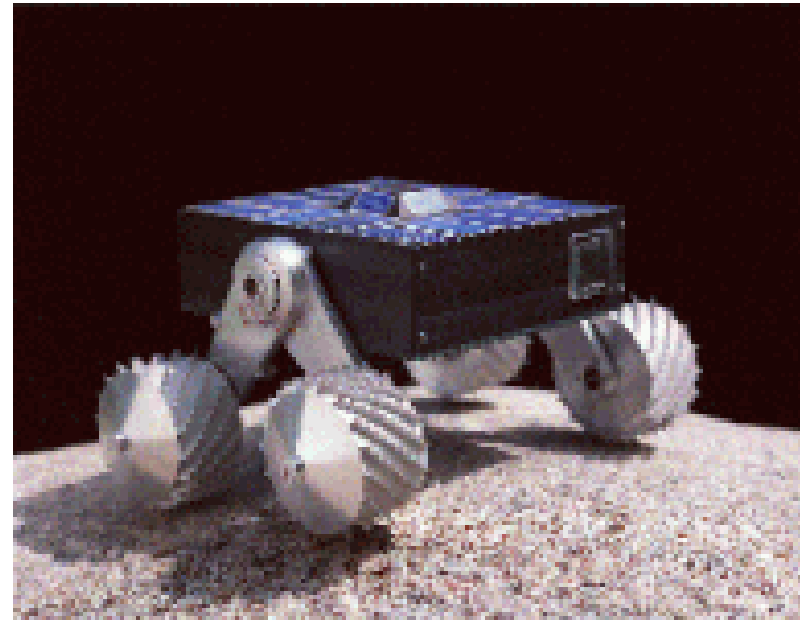
What is a Robot: II



Legged Robot



Wheeled Robot

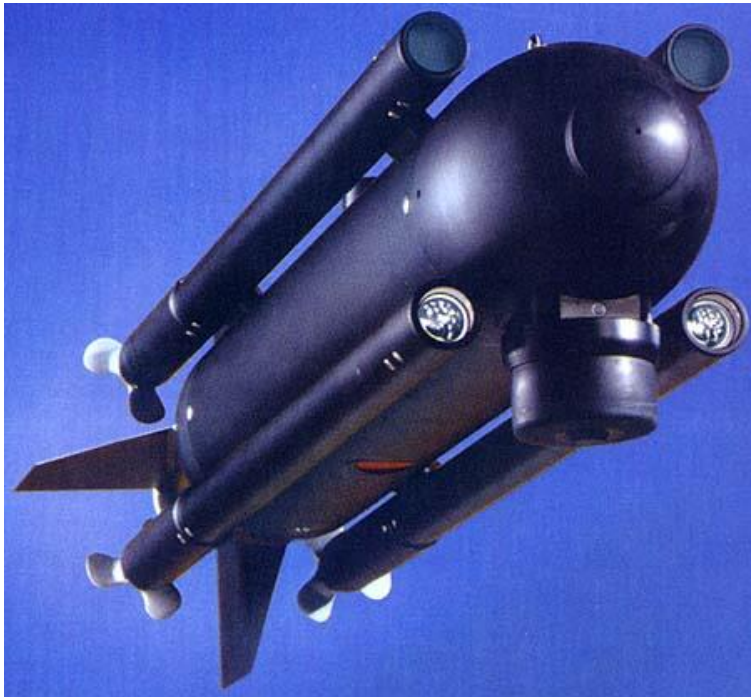




What is a Robot: III



Autonomous Underwater Vehicle



Unmanned Aerial Vehicle





What Can Robots Do: |



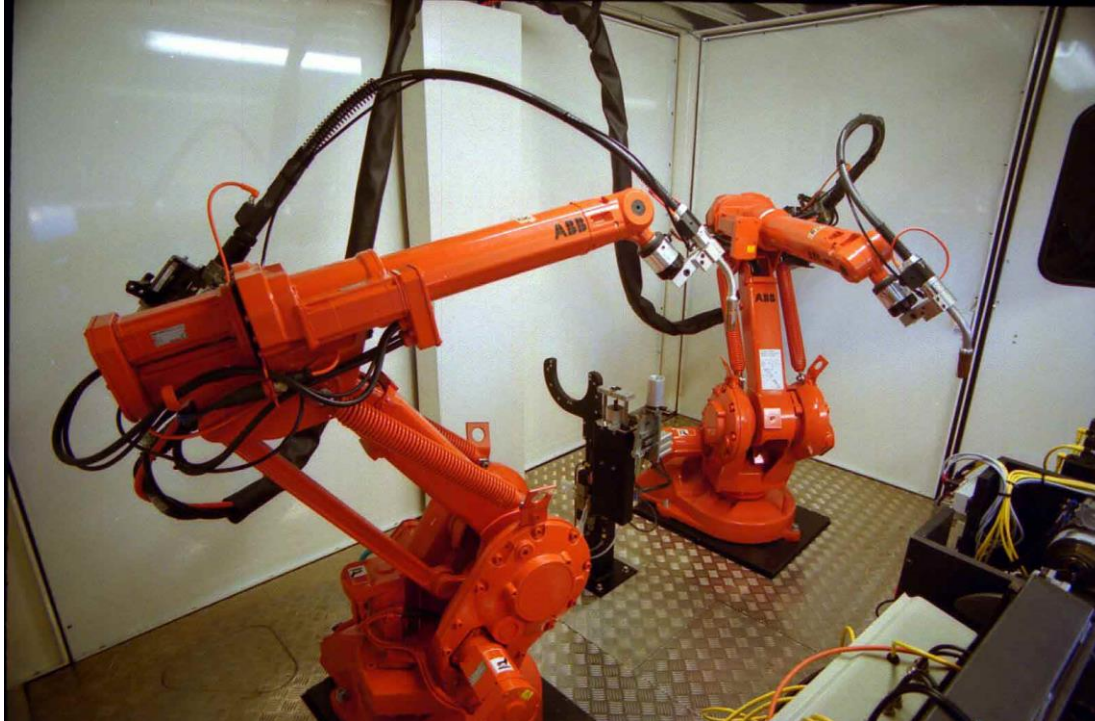
Jobs that are dangerous for humans

Decontaminating Robot

Cleaning the main circulating pump housing in the nuclear power plant



What Can Robots Do: ||



Welding Robot

Repetitive jobs that are boring, stressful, or labor-intensive for humans



What Can Robots Do: |||



The SCRUBMATE Robot

Manual tasks that human don't want to do



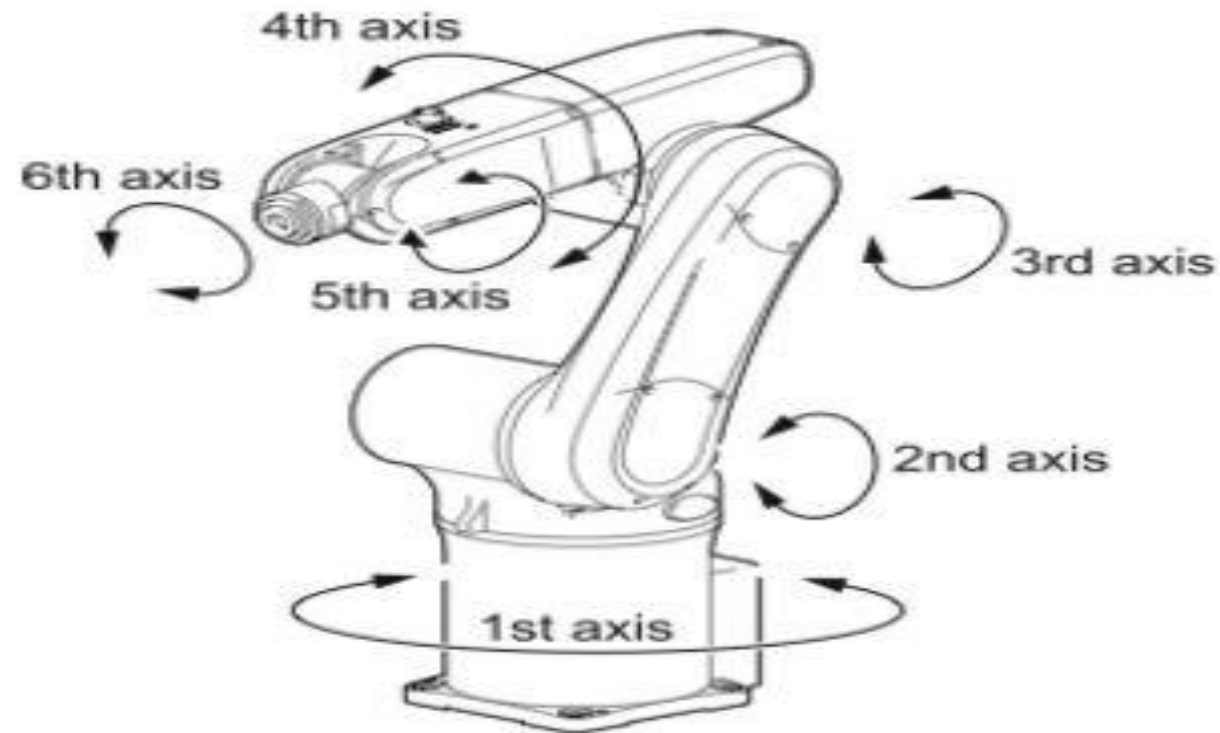
Robotics Field



- Robotics is a multi-disciplinary field. Best robotics researchers and engineers will touch upon all disciplines:
- **Mechanical Engineering** – concerned primarily with manipulator/mobile robot design, kinematics, dynamics, compliance and actuation.
- **Electrical Engineering** – concerned primarily with robot actuation, electronic interfacing to computers and sensors, and control algorithms.
- **Computer Science** – concerned primarily with robot programming, planning, and intelligent behavior.

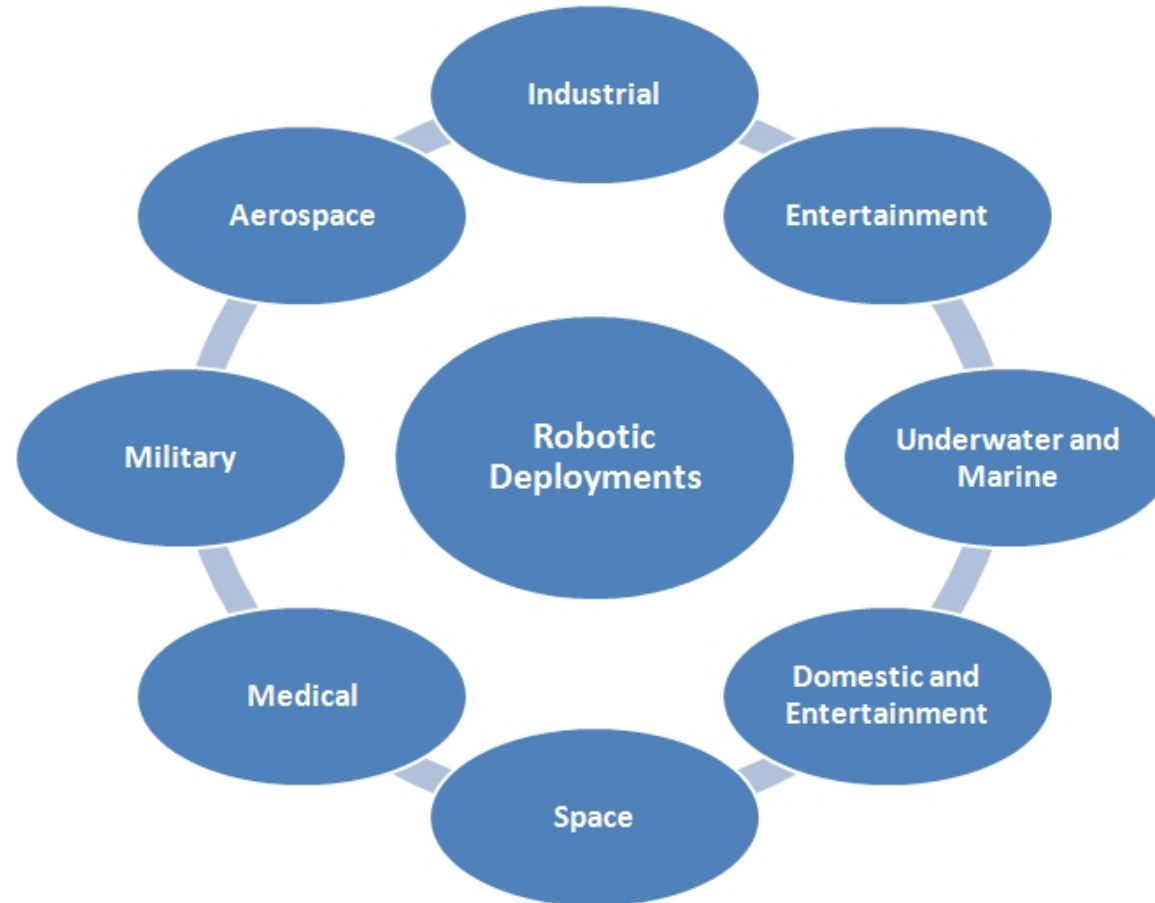


Robotics Axis





Key Dimensions of Robotic Deployments





Free and Open Source Platforms for Robotic Simulations

Robotic Simulation Platform	URL
Webots	cyberbotics.com
Gazebo	gazebo.org
Robot Operating System	ros.org
Open Robot Control Software	orocos.org
Yet Another Robot Platform	yarp.it/git-master
Mobile Robot Programming Toolkit	mrpt.org
Robatarium	robotarium.gatech.edu
Poppy-Project	poppy-project.org
CoppeliaSim	coppeliarobotics.com



Mobile vs. stationary robots:

- Industrial robots play a crucial role in automated production processes.
- These versatile motion robots with multiple axes enable the programming of motion sequences, paths or angles.
- There are two different methods:
 1. Fixed Sequence Robots and
 2. Variable Sequence Robots.



Fixed Sequence Robots

- Operate according to a predefined, constant motion pattern and perform repetitive tasks.
- As a result, they are highly optimized in terms of their cycle time.





Variable Sequence Robots

- It used for position variations, which frequently occur in mobile robots.
- They can change their motion sequence quickly and easily in the event of position variations.
- A vision sensor provides the robot with the necessary information so that it can easily adapt to changing conditions (e.g. due to flexible processes, product variety or component tolerances).
- This is referred to as "image-guided robotics".
- Robots can be equipped with various "End of Arm Tools" (EOAT) or end effectors to perform tasks such as gripping, welding, screwing and grinding with high precision and efficiency.



Industrial Robotics



- In industrial robotics, two basic categories of robots can be distinguished:
 1. Stationary robots and
 2. Mobile robots.

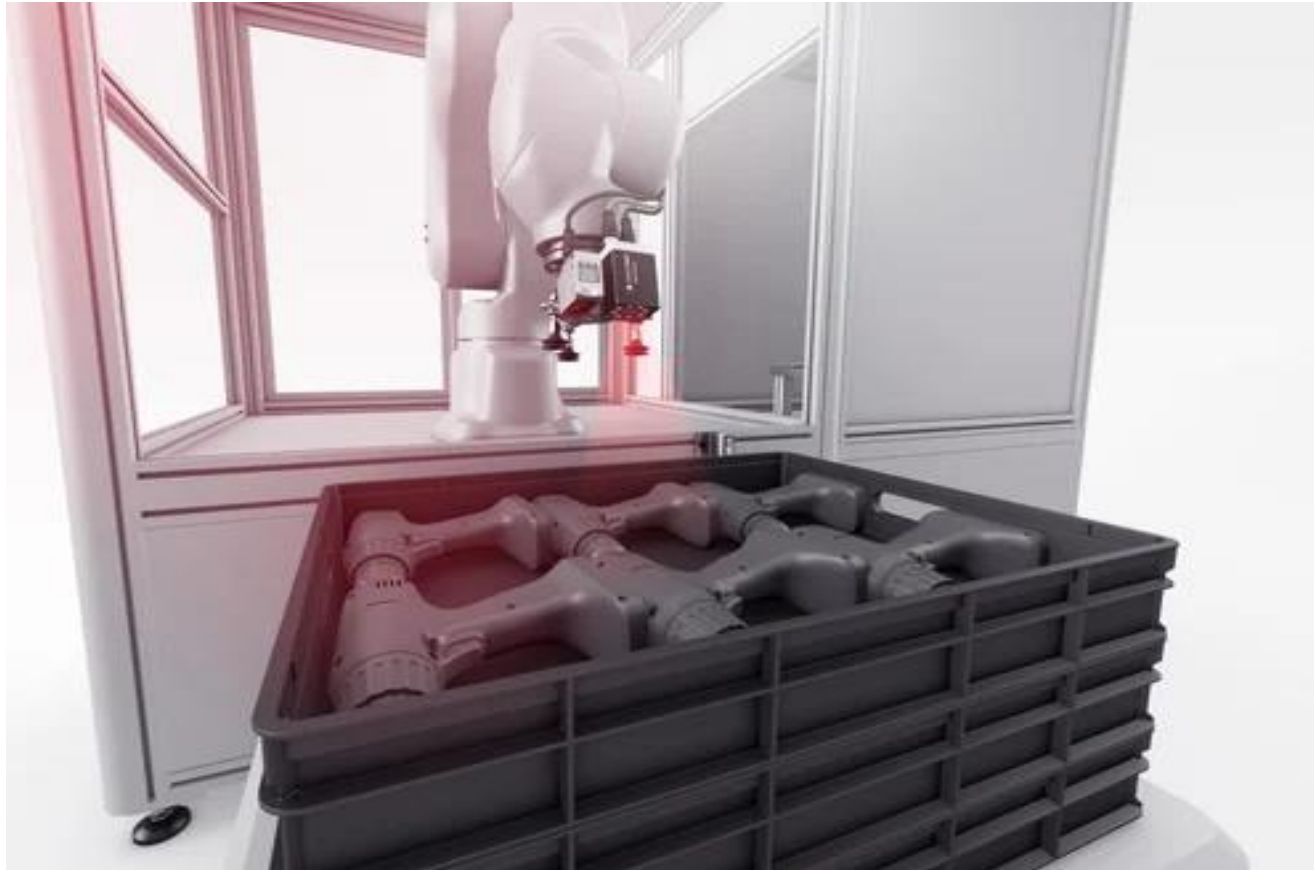


Stationary robots

- Tied to a fixed point and cannot change their location independently.
- The workspace of stationary robots is limited to their individual kinematics.
- They work efficiently in systems in which the object is guided to the robot, for example in car body construction. Here, a stationary robot is perfectly adequate.
- The working space of a stationary robot can be extended by an additional, 7th axis on which the robot moves on a rail.
- A robot can be used even more flexibly if it is guided to the task via a mobile system, using vision-guided robotics.
- This type of robot is called a "mobile robot" and is typically used when the workplace needs to be changed.



Stationary robots





Mobile robots

- Enable the flexible and location-independent transport of robots and material in production.
- There are two types of mobile robots: "Automated Guided Vehicles" (AGVs) and "Autonomous Mobile Robots" (AMRs).
- AMRs have the ability to move freely in space without relying on external navigation features such as induction loops. This allows them to be used in almost any environment.
- To meet the requirements for accuracy and speed, mobile robots are often used in combination with vision systems.
- Integrating a vision sensor into the robot system enables greater flexibility, especially for complex or variable tasks.
- This allows vision-guided robotics systems to adapt flexibly to new environments or requirements.



Automated Guided Vehicles (AGVs)



- A geoguided AGV recognizes its environment to establish its location.
- Without any infrastructure, the forklift equipped with geoguidance technology detects and identifies columns, racks and walls within the warehouse.
- Using these fixed references, it can position itself, in real time and determine its route.





Mobile robots

- A further increase in workspace and flexibility is achieved by combining a mobile robot with a cobot.
- "Cobots," also known as "collaborative robots," are a rapidly growing branch of robotics.
- They are designed to work closely with humans without the need for elaborate external safety technology such as protective fencing systems.
- Cobots offer a safe and efficient solution to support human workers and provide ergonomic relief.
- Mounting cobots on mobile robots creates a flexible and mobile automation solution.
- This combination allows the robot-guided system to be used flexibly at different locations without the need for a separate robotics cell or station.



Comparision

- Both stationary and mobile robots play an important role in automated production processes. While stationary robots are tied to a fixed point and perform repetitive tasks in a predefined sequence, mobile robots offer flexible and location-independent material handling.
- Both types of robots can benefit from a vision sensor such as the SensoPart VISOR[®] Robotic, which provides precise position information and enables greater flexibility.
- The VISOR[®] Robotic sensor has a proven track record in both stationary and mobile robotic systems, helping robots adapt to new environments and requirements.
- As technology continues to develop, the applications of stationary and mobile robots in industry will continue to expand and help enable efficient and flexible production processes.