



Introduction to robot and robotics

Assessment Plan

Mid-1	20%
Mid-2	20%
End	25%
Assignment	10%
Project	25%

**"Education is not
the learning of facts,
but the training
of the mind to think"**

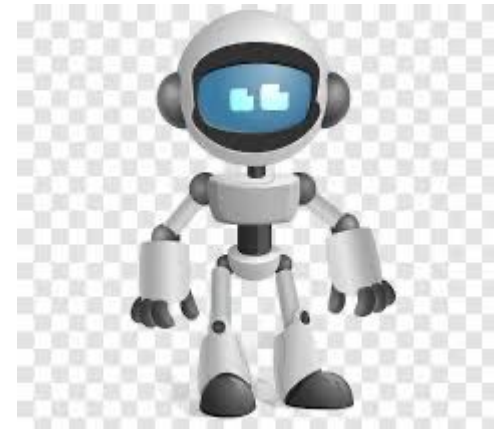
-Albert Einstein



Introduction to Robots and Robotics

A Few Questions

- What is **robot**?
- What is **robotics**?
- Why do we **study** robotics?
- How we can **teach** a robot to perform a particular task?
- What are possible **applications** of robotics?
- What are the **different types** of robots which we generally see?
- Can a human being be **replaced** by a robot ?,
- And so on.



Definitions

- The term: **robot** has come from the **Czech word: robota**, which means **forced** or **slave laborer**
- In 1921, **Karel Capek**, a Czech playwright, used the term: **robot** first in his drama named **Rossum's Universal Robots (R. U. R)**
- According to **Karel Capek**, a robot is a **machine** look-wise similar to a **human being**.



ANDROIDS
Resemble
humans and are
often mobile



TELECHIR
Complex and
remotely
controlled



TELEPRESENCE
Simulates
being physically
present



INDUSTRIAL
Adaptable,
reprogrammable,
multipurpose
manipulator



SWARM
“Insect robots”
working in fleets;
supervised by a
single controller



SMART
Built-in AI that
learns from
environment and
experiences

Robot has been defined in various ways:

1. According to **Oxford English Dictionary**

:A **machine** capable of **carrying out a complex series** of actions automatically, especially one programmable by a computer

2. According to **International Organization for Standardization (ISO)**:

:An automatically **controlled, reprogrammable, multipurpose manipulator programmable** in three or more axes, which can be either fixed in place or mobile for use in **industries automation applications**

Robot has been defined in various ways:

3. According to Robot Institute of America (RIA)

:It is a reprogrammable multifunctional manipulator designed to move material, parts, tools or specialized devices through variable programme

Note: CNC machine is not a robot.

Robotics

- It is a **science**, which deals with the **issues related** to **design, manufacturing, usages of robots**
- In 1942, the term robotics was introduced by **Issac Asimov** in his story Run- around
- In robotics, we use the fundamentals of **Physics, Mathematics, Mechanical Engg., Electronics Engg. Electrical Engg., Computer Sciences, and others**

3 Hs in Robotics

- 3 Hs of human beings are copied into robotics, such as
 - *Hand*
 - *Head*
 - *heart*

Motivation

To cope with increasing demands of a dynamic and competitive market, modern manufacturing methods should satisfy the following requirements

- **Reduced** production cost
- **Increased** productivity
- **Improved** product quality

Notes:

1. Automation can help to fulfil the above requirements
2. Automation: Either hard or flexible automation
3. Robotics is an example of flexible automation

Production

- Piece production: several design
 - No automation
- Batch production: few design
 - Flexible automation
- Mass Production: one design
 - Fixed or hard automation

A Brief History of Robotics

Year	Events and Development
1954	First patent on manipulator by George Devol , The father of robot
1956	Joseph Engelberger started the first robotics company: Unimation
1962	General Motors used the manipulator: Unimate in die-casting application

A Brief History of Robotics

Year	Events and Development
1967	General Electric Corporation made a 4-legged vehicle
1969	<ul style="list-style-type: none">• SAM was built by the NASA, USA• Shakey, an intelligent mobile robot, was built by Stanford Research Institute (SRI)
1970	<ul style="list-style-type: none">• Victor Scheinman Demonstrated a manipulator Known as Stanford Arm• Lunokhod 1 was built and sent to the moon by USSR• ODEX 1 was built by Odetics

A Brief History of Robotics

Year	Events and Development
1973	Richard Hohn of Cincinnati Milacron Corporation manufactured T3(The tomorrow Tool) robot
1975	Raibart at CMU, USA, built a one-legged hopping machine, the first dynamically stable machine
1978	Unimation developed PUMA (Programmable Universal Machine for Assembly)

A Brief History of Robotics

Year	Events and Development
1983	Odetics introduced a unique experimental six-legged device
1986	ASV (Adaptive Suspension Vehicle) was developed at Ohio State University, USA
1997	Pathfinder and Sojourner was sent to the Mars by the NASA, USA (failure due to mismatch of some specification)

A Brief History of Robotics

Year	Events and Development
2000	Asimo humanoid robot was developed by Honda
2004	The surface of the Mars was explored by Spirit and Opportunity (successful)
2012	Curiosity was sent to the Mars by the NASA, USA (successful)
2015	Sophia (Humanoid) was built by Hanson Robotics, Hong Kong

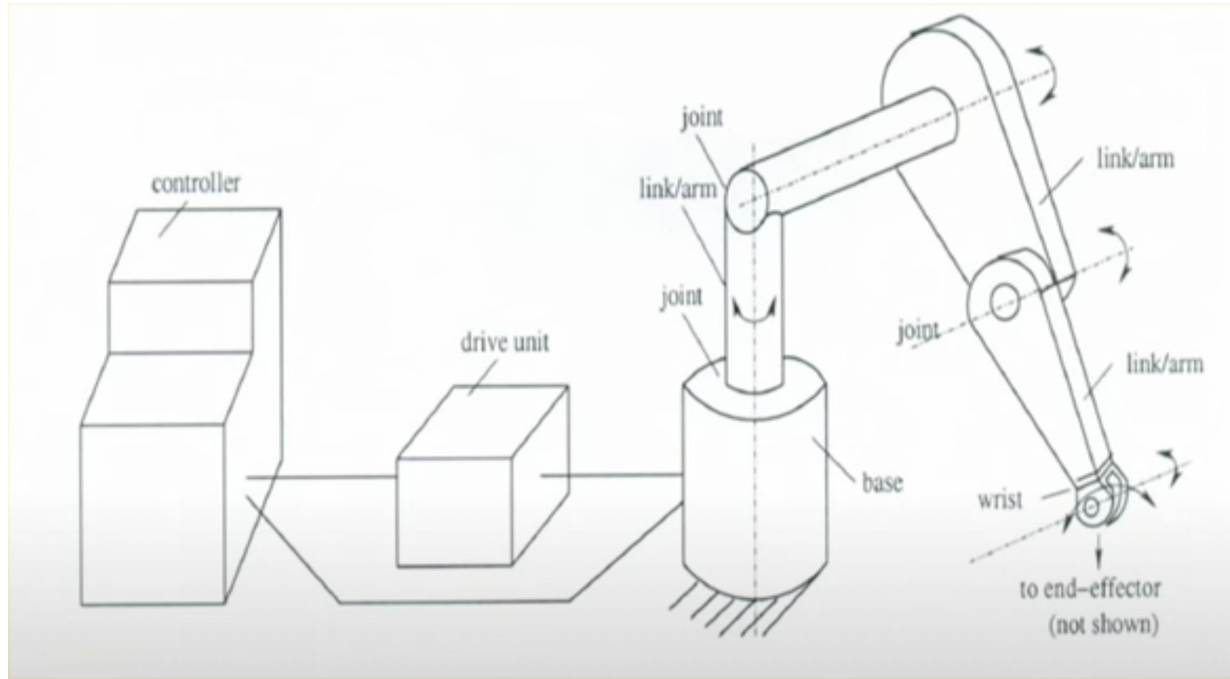
A Brief History of Robotics

Year	Events and Development
2016-2017	Cassie was developed by the Dynamic Robotics Laboratory at Oregon State University
2018-2019	Digit v1 robot was invented Damion Shelton, CEO and co-founder of Agility
2019-2020	Digit v2, v3 robot was invented Damion Shelton, CEO and co-founder of Agility
2021	Robotic Dog (Cyber dog) Features 11 Sensors, Can Do Backflips, but Only a 1000 Will Be Made.

A Brief History of Robotics

Year	Events and Development
2022	<u>Optimus humanoid robot by Tesla's</u>
2023	<u>Tesla Unveils Optimus Gen 2</u>

A robotic System



Various Components

1. Base
2. Links and Joints
3. End-effector/gripper
4. Wrist
5. Driver/Actuator
6. Controller
7. Sensors

References

- <https://www.youtube.com/watch?v=xrwz9lxpMJg&t=893s>
- [https://en.wikipedia.org/wiki/Optimus_\(robot\)](https://en.wikipedia.org/wiki/Optimus_(robot))