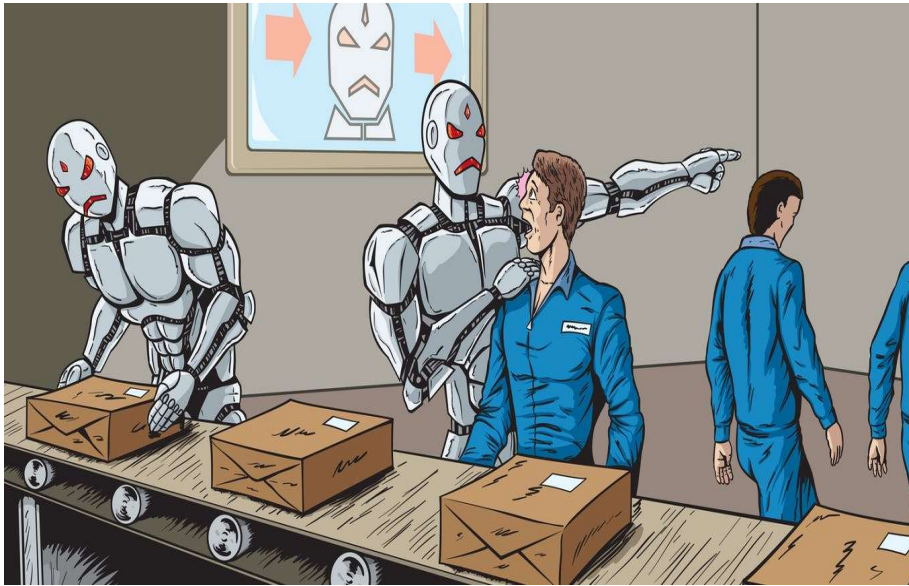


Introduction to Robotics

Soumya S



Recap



ISAAC ASIMOV'S THREE LAWS OF ROBOTICS



WHO IS ASIMOV'S ?

Isaac Asimov was an American author and professor of biochemistry at Boston University, best known for his works of science fiction and for his popular science books.

- **Zeroth Law** A robot may not harm humanity, or, by inaction, allow humanity to come to harm (*Survival of humanity*)
- **First Law** A robot may not injure a human being, or, through inaction, allow a human being to come to harm. (*Human safety*)
- **Second Law** A robot must obey orders given it by human beings, except where such orders would conflict with the First Law. (*Robots are slaves*)
- **Third Law** A robot must protect its own existence as long as such protection does not conflict with the First or Second Law. (*Survival of robots*)

What is Robot ??

- According to Rossum,

‘A man is something that feels happy, plays piano, likes going for a walk and, in fact, wants to do a whole lot of things that are unnecessary, but a working machine must not play piano, must not feel happy, must not do a whole lot of other things. Everything that doesn’t contribute directly to the progress of work should be eliminated’.

- Robots are mechanisms driven by electrical drives and controlled by electronic circuits, computers, or microprocessors/ microcontrollers.

Associated Terminologies

- **Automatic operation** : The word “automatic” means “self-acting, moving or acting on its own,” and is derived from Greek word **automatos**, from autos “self” + matos, “thinking, animated” (<http://www.etymonline.com>).
- . A machine is said to be automatic if it operates on its own, or equivalently, without (or with minimal) human intervention



CNC Machine



Automatic transmission system

Temperature control
using a room heater
Water level control in
a Dam

- **A machine can operate automatically by its design (fixed automation), or by a program**
- **Automatic operation does not necessarily require the machine to be intelligent or autonomous.**

- Intelligence comes from the Latin verb intellegere, which means “to understand”
- **Artificial intelligence:** AI is the science of making machines act intelligently. Though a machine may not comprehend or understand a situation, it can be made to act in a similar manner as that of a human being or an animal in a similar situation.



Echo dot

web for information, schedule appointments, shop, control lights, switches, thermostats, answers questions, reads audiobooks, reports traffic and weather, gives info on local businesses, provides sports scores and schedules, and more using the Alexa Voice Service



Siri

Assists us to find information, get directions, send messages, make voice calls, open applications and add events to the calendar



- Word autonomous is derived from Greek autos “self” + nomos “law” which means “having one’s own laws
- **Autonomy** : In the context of machines or robots, autonomy refers to the ability of a machine to arrive at a decision and act on it.



Roomba606



Tesla

Self-driving, Predictive capabilities

[bmw_video.mp4](#)

Robot

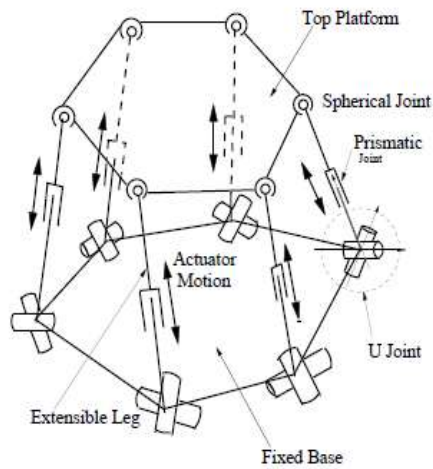
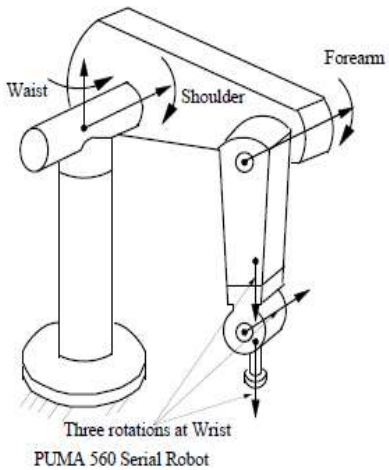
Stationary-Base (Manipulators)

Mobile

Serial Link

Parallel Link

Hybrid Link



Ground

Aerial

Surface

Underwater

Wheeled
Tracked
Legged
Other

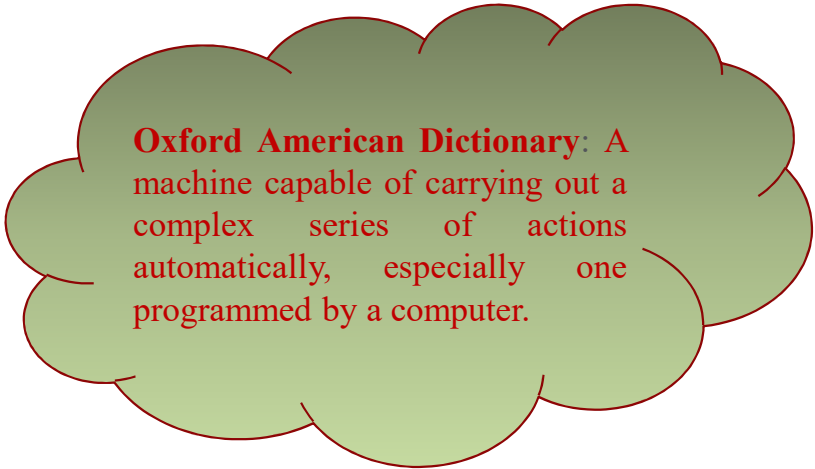
Fixed wing
flapping wing
Rotor-based

Ship-like

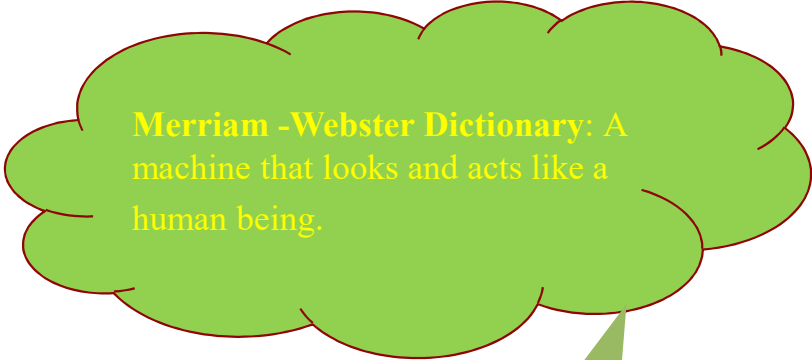
Submarine-like
fish-like

How do we define a robot?

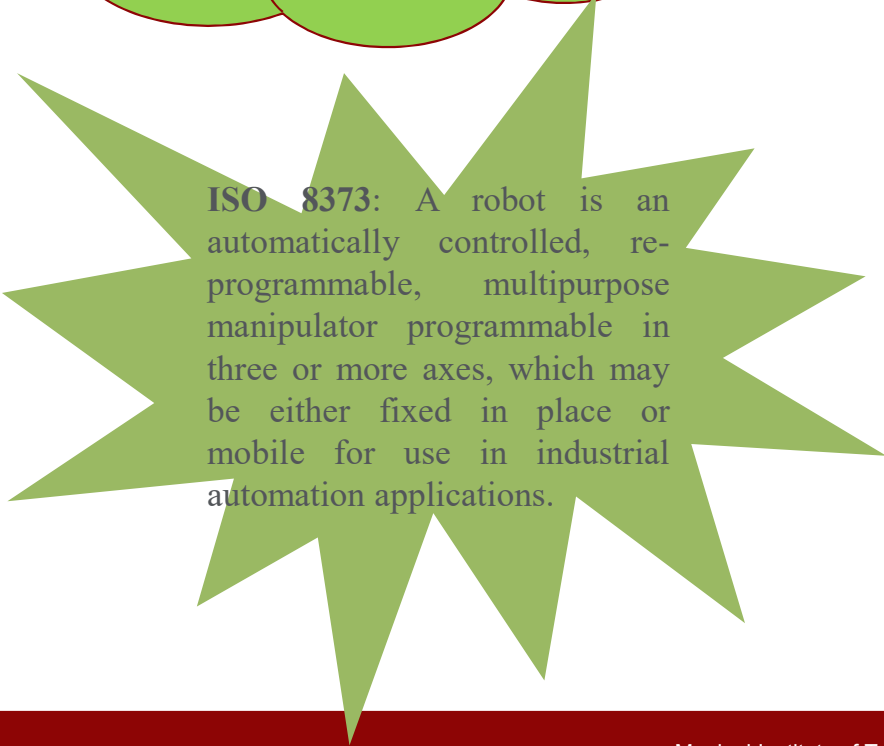
- Is it an artificial man/creature?
- Is it an intelligent machine?



Oxford American Dictionary: A machine capable of carrying out a complex series of actions automatically, especially one programmed by a computer.



Merriam -Webster Dictionary: A machine that looks and acts like a human being.



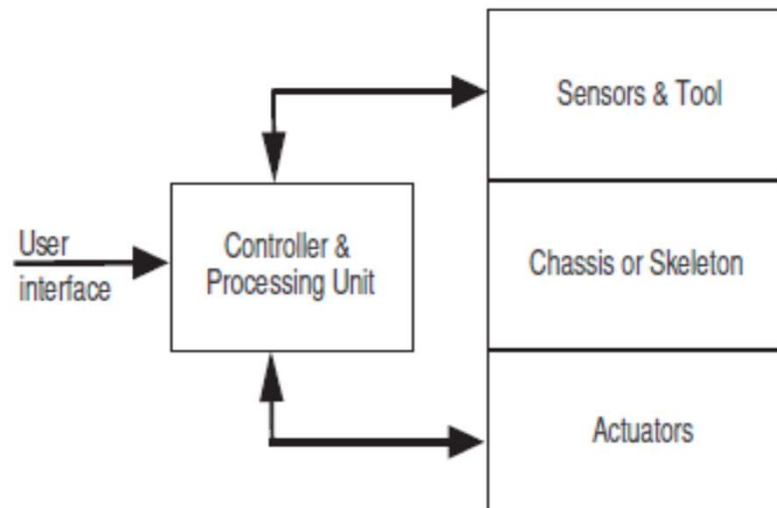
ISO 8373: A robot is an automatically controlled, re-programmable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications.

British Automation and Robot Association (BARA): A robot is a reprogrammable device with minimum of four degrees of freedom designed to both manipulate and transport parts, tools, or specialized manufacturing implements through variable programmed motions for performance of specific manufacturing tasks.

- **Robot Institute of America:** A robot is a reprogrammable, multi-functional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

Japanese Industrial Robot Association: JIRA has created a (industrial) robot classification system. Industrial robots can be Manipulators (Manual, Sequential, and Programmable), Numerically controlled robots, Sensate robots, Adaptive robots, Smart robots, or Intelligent mechantronic systems.

A generic robot



Reasonable definition of a robot

- **A robot is an automatic, reprogrammable, multi-functional machine, a mechanical creature which is a product of engineering innovation inspired by the animal kingdom, which may have some degree of intelligence and autonomy in performing some desired complex tasks.**

