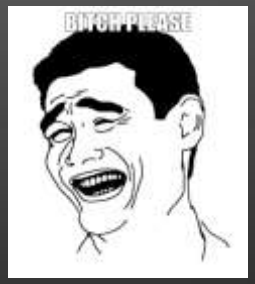
ROBOTICS

I Have my own brians

I m the worlds best superhero

I m RAJNI…



HISTORY

- **The term "robot" was first used in 1920 in a play called "R.U.R." Or "Rossum's universal robots" by the Czech writer Karel Capek.**

- **The word “Robot”comes from the word “Robota”,meaning,in Czech”,forced labour,drudgery.**

Robotics Terminology

- **Robot** - Mechanical device that performs human tasks, either automatically or by remote control.
- **Robotics** - Study and application of robot technology.
- **Telerobotics** - Robot that is operated remotely.

Definition

- What is the Defination of a Robot?

- A reprogrammable multifunctional **manipulator** **d**esigned to move material,parts, tools or specialized devices through various **programmed motions** for the performance of a variety of **Tasks**.

Robot Institute of America.

Laws of Robotics

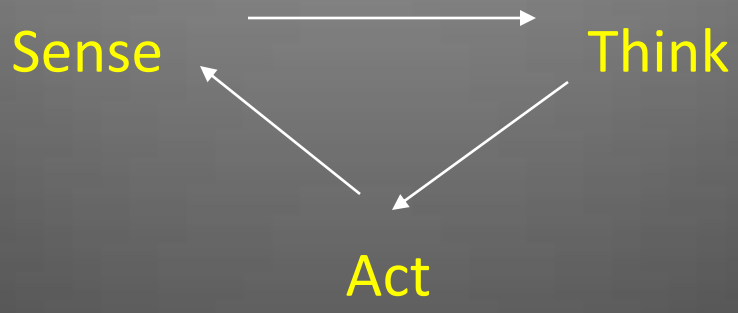
- Asimov proposed three "Laws of Robotics"

- Law 1: A robot may not injure a human being or through inaction, allow a human being to come to harm.
- Law 2: A robot must obey orders given to it by human beings, except where such orders would conflict with the first law.
- Law 3: A robot must protect its own existence as long as such protection does not conflict with the first law.

The robot control loop

Speech, Vision
Acceleration, Tempe
rature
Position ,Distance
Touch, Force
Magnetic field ,Light
Sound
,PositionSense

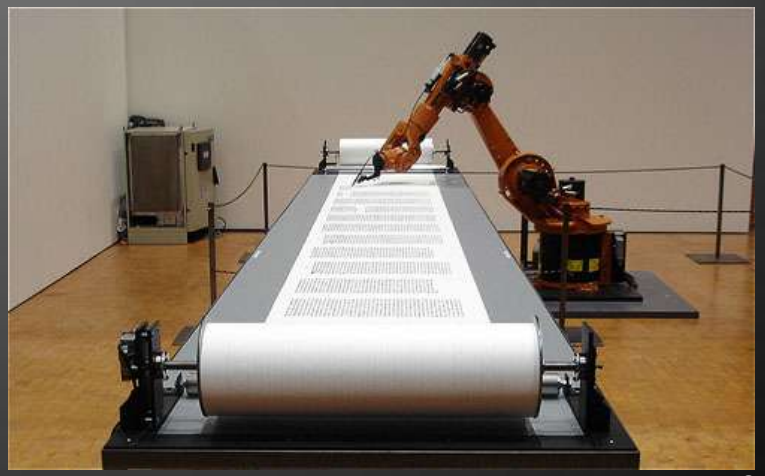
Task planning
Plan Classification
Learn
Process data
Path planning
Motion planning



Output information Move, Speech
Text, Visuals Wheels Legs
Arms Tracks

Types of Robots

- Industrial Robots –
  - –materials handling
  - –welding
  - –inspection
  - –improving productivity
  - –Laboratory applications



Types of Robots

- Mobile Robots-

–Robots that move around on legs, tracks or wheels.

Eg-

In 1979 a nuclear accident in the USA caused a leak of radioactive material which led to Production of special robot –which Can handle the radioactive materials.

Types of Robots

- Educational Robots – Robotic kits Are used extensively in education. Eg-Robolab,Lego and RoboCup Soccer
- Domestic Robots–2 types–those designed to perform household tasks and modern toys which are programmed to do things like talking, walking and dancing,etc.

Robot Components

- 1. **Manipulator or Rover**: Main body of robot (Links, Joints, other structural element of the robot)
- 2. **End Effecter**: The part that is connected to the last joint hand) of a manipulator.
- 3. **Actuators**: Muscles of the manipulators (servomotor, stepper motor, pneumatic and hydraulic cylinder).
- 4. **Sensors**: To collect information about the internal state of the robot or To communicate with the outside environment.

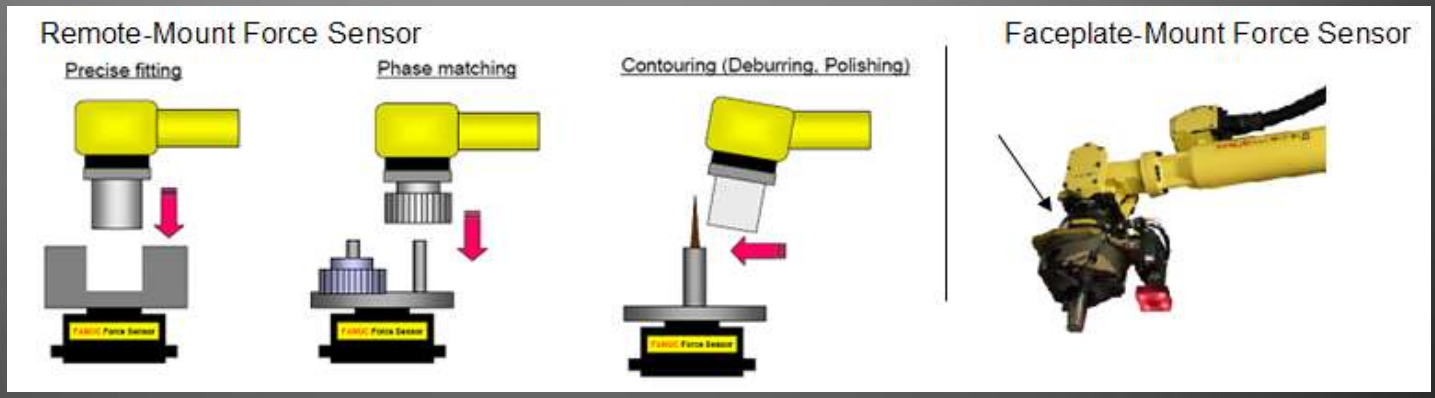
Robot Components…

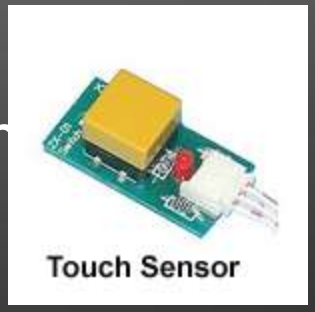
- 5. **Controller**: Similar to cerebellum. It controls and coordinates the motion of the actuators.
- 6. **Processor**: The brain of the robot. It calculates the motions and the velocity of the robot's joints, etc.
- 7. **Software**: Operating system, robotic software and the collection of routines.

SENSORS

- Sensors provide awareness of the environment by sensing things.Sensors are the core of robots.It is the system that alerts the robots..
- Sensing can be in different forms like-

- Light
- Sound
- Heat
- Chemicals
- Force
- Object proximity
- Physical orientation/position
- Magnetic & Electric Fields
- Resistance





End Effectors

- In robotics, an end effector is the device at the end of a robotic arm, designed to interact with the environment.
- End effectors may consist of a gripper or a tool. The gripper can be of two fingers, three fingers or even five fingers.

Actuators

- Locomotion
- Manipulation

Actuators…

- Locomotion-
- Legs
- Wheels
- Other exotic means

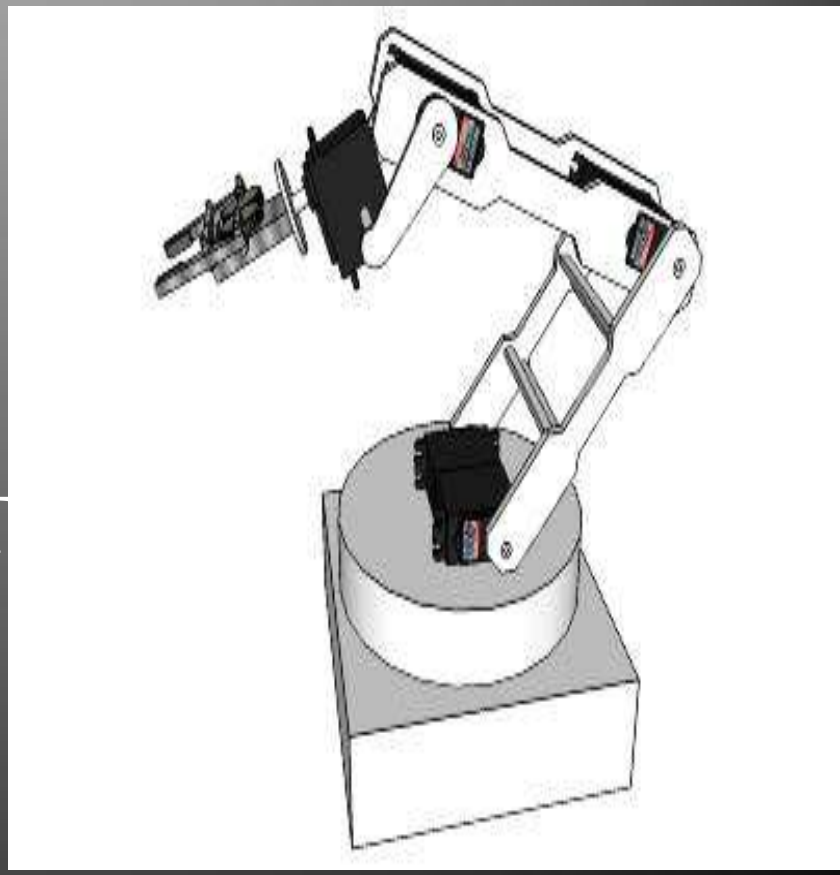
Actuators…

- Manipulations-
- Degrees of freedom
  - **independently controllable components of motion**
- Arms
  - **convenient method to allow full movement in 3D**
  - **more often used in fixed robots due to power & weight**
  - **even more difficult to control!**
    - **due to extra degrees of freedom**
- Grippers
  - **may be very simple (two rigid arms) to pick up objects**
  - **may be complex device with *fingers* on end of an arm**
  - **probably need feedback to control grip force**

Degrees of Freedom

Each plane in which a robot can maneuver.

- ROTATE BASE OF ARM
- PIVOT BASE OF ARM
- BEND ELBOW
- WRIST UP AND DOWN
- WRIST LEFT AND RIGHT
- ROTATE WRIST



The Purpose of Robots

- Robots are also used for the following tasks:
- Dirty Tasks
- Repetitive tasks
- Dangerous tasks
- Impossible tasks
- Robots assisting the handicapped
- Can operate equipments at much higher precision than humans.
- Cheaper on a long term basis.

Robotic Applications

- EXPLORATION-
  - – Space Missions
  - – Robots in the Antarctic
  - – Exploring Volcanoes
  - – Underwater Exploration
- MEDICAL SCIENCE
  - – Surgical assistant
- ASSEMBLY- factories Parts-
  - - handling
  - - Assembly
  - - Painting
  - - Surveillance
  - - Security (bomb disposal,etc)
  - - Home help (grass cutting, nursing)


Thank you!