

Stepping into robotics



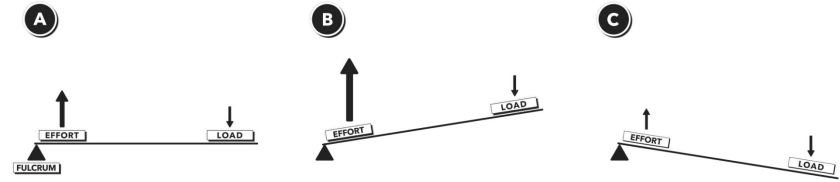
Machines

A machine is anything that reduces human effort. ... Anything that simplifies work, or saves time, is a machine.

Chanchad

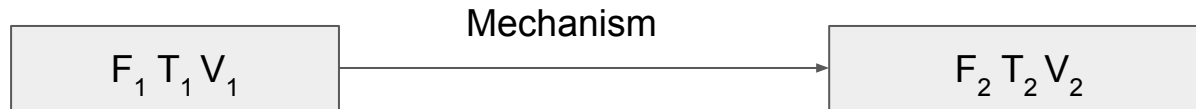
Simple Machines

- The first kind of Machines.
- Examples
 - Wedge
 - Levers
 - Screws
- Gives us Mechanical Advantage(Leverage) to amplify force.
- Thus, they make our lives simpler and more productive.



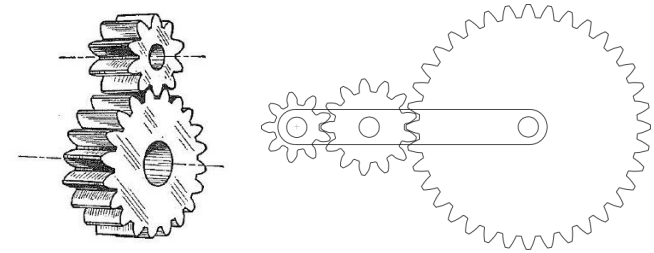
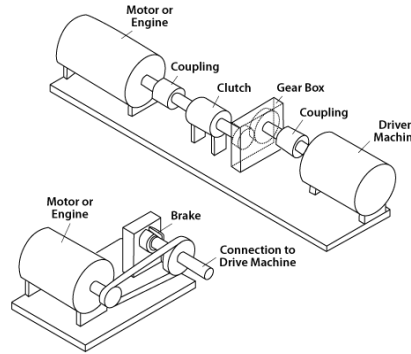
Mechanism

These are devices that transform input forces and movement into a desired set of output forces and movement

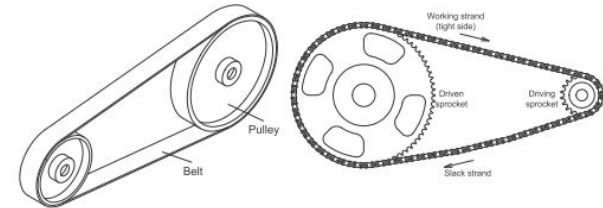
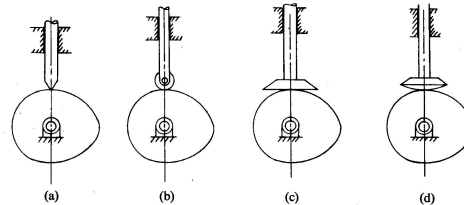


Mechanism

- *Gears and Gear trains*
- *Belts and Chain drives*
- *Cams and Followers*
- *Linkages*
- *Brakes and Clutches*

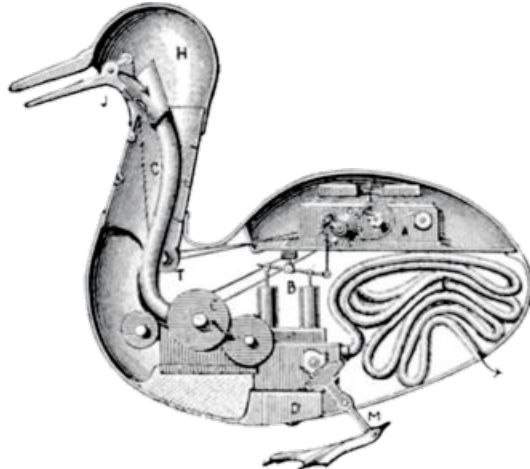


Gear and Gear trains

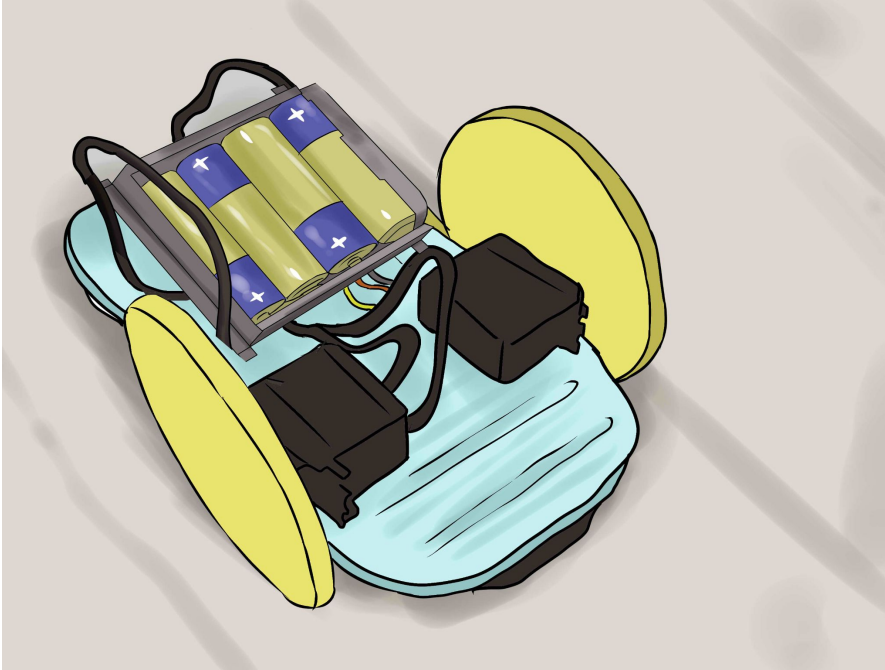


Origins of Robotics : Automaton

In **automaton** is a self-operating machine, or control mechanism designed to automatically follow a predetermined sequence of operations, or respond to predetermined instructions.



Modern Simple Robots



These are simple robots that have actuators (like motors, pistons, etc) connected to a power supply.

They are controlled by manipulating the connection of power supply to motors using

1. Switches(On/Off control)
2. Potentiometers (Speed Control)

An example would be RC toys that children play with. These are dumb devices that do exactly what we tell them to.

Smart Robots (Analog Electronics)

We can add mix components like

Input: Light Sensors, Hall sensors(Magnet Sensors), Color Sensors

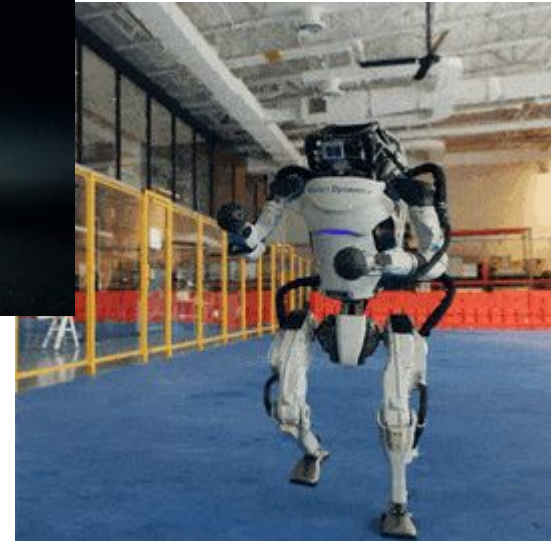
Processing: Digital Logic Gate chips(74hc Series) , Op Amps(and other analog chips)

Output: Motors, Pistons, Speaker, Electro Magnets

And make a robot that can in limited manner react to its environment. An example would be **Line Sensing Robots**. Some other examples would be household appliances like Fridges, Induction Cooker that were made in before computers become placed in every single thing

The Limits of Dumb Robots

Robotics + Computers



Adding Microcontrollers to the Robot makes it capable of following instructions, and most importantly have a memory or state.

A memory for storing what has happened, and what actions need to be done in the future according to the internal state

A simple example would be a badminton robot.

It needs to remember what the scores are, which side of the field to shoot from, when the game is over, etc.

This is where Computer Programming excels. We can write algorithms(instructions) for robot that can handle any expected situation

Coding for Robots

In Robocon, this is mainly done in 2 languages

1. Arduino(C/C++)
2. Python

In this session, we will look into how we use python in Robocon to detect objects in images and then have some follow up activities to help you familiarize yourself with the flow.

Don't worry if you are unfamiliar with Python, we will have a sort of Python primer.