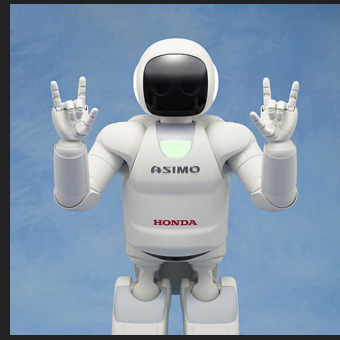
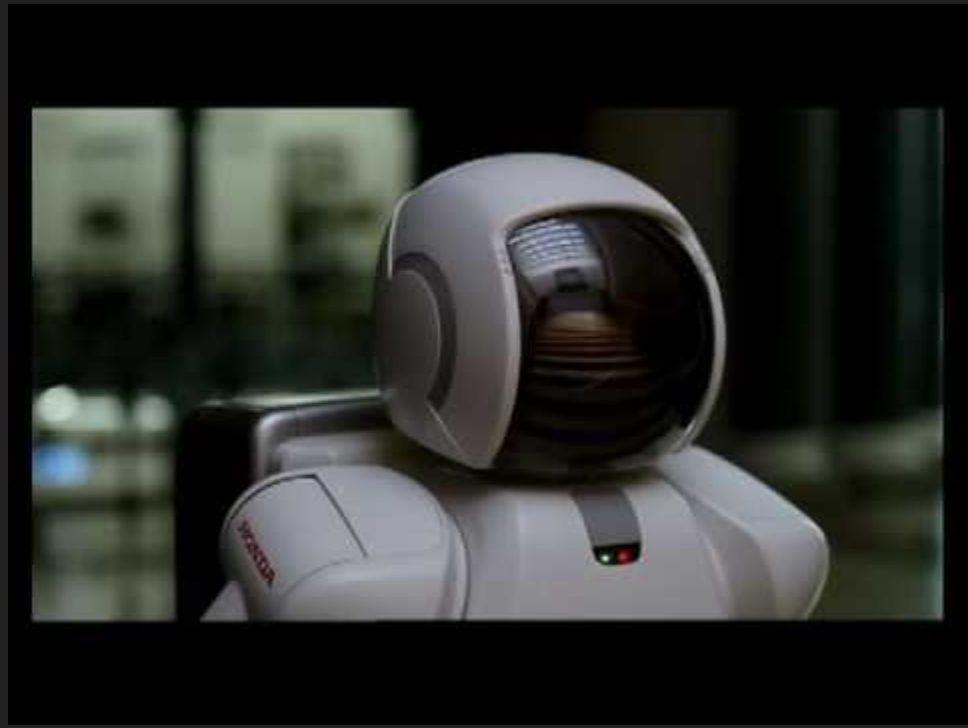
Humaniod robots

Honda Asimo



- emloys *active dynamic walking system*
- Atlas from Boston Dynamics
  - similar
- the problem
  - bipedals walk / run faster
  - balance itself well with different weights
  - uneven / slippery / difficult terrains

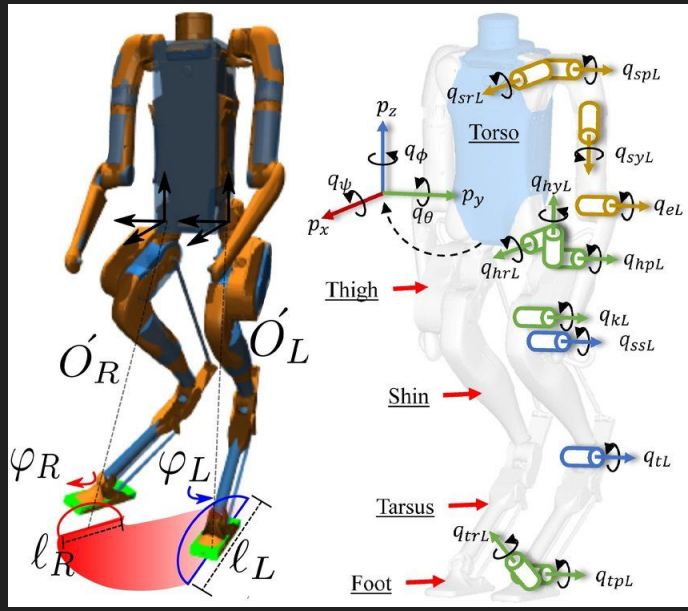


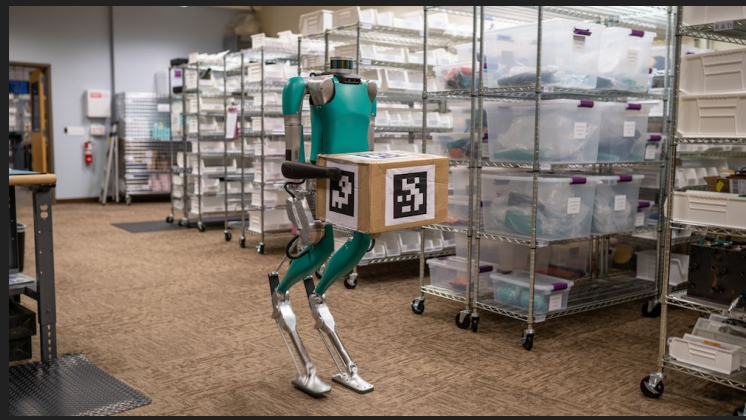
Active dynamic walking system

- It requires active control over every joint
- every joint requires an actuator
  - not energy efficient

Digit from Agility Robotics

- energy efficient
- leveraging a passive dynamic walking design
- Each leg consists of eight joints
  - three actuated hip joints (hip roll, yaw, and pitch)
  - one actuated knee joint
  - two actuated ankle joints (toe pitch and roll)
  - and three **passive joints**
    - shin-spring
    - tarsus
    - heel-spring joints

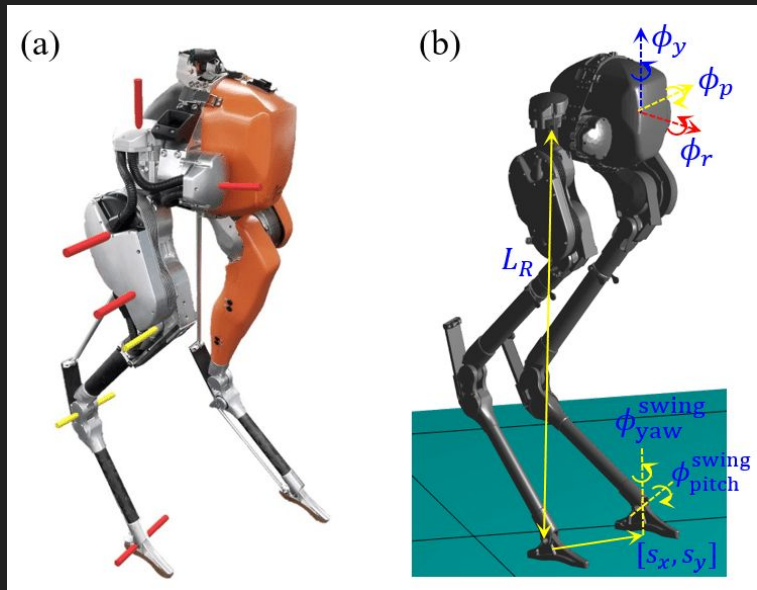





AGILITY ROBOTICS

Agility Robotics Cassie bipedal

- focused on the last mile
  - competition for autonomous vehicles and quadcopters
- more open
  - released models for MuJoCo



UBTech Walker X

- Chinese version of Asimo

Controlling the robot

- robot dynamics is hard
- Moravec’s paradox
  - https://en.wikipedia.org/wiki/Moravec%27s_paradox
  - reasoning requires very little computation, but sensorimotor and perception skills require enormous computational resources
  - difficult human skills to reverse engineer are those that are below the level of conscious awareness

Reinforcement learning