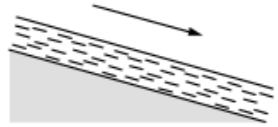
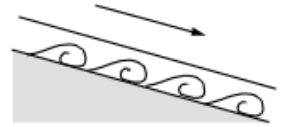
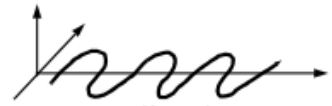
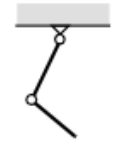
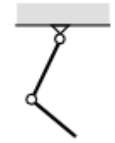
CSC 445 - Intro to Intelligent Robotics, Spring 2018

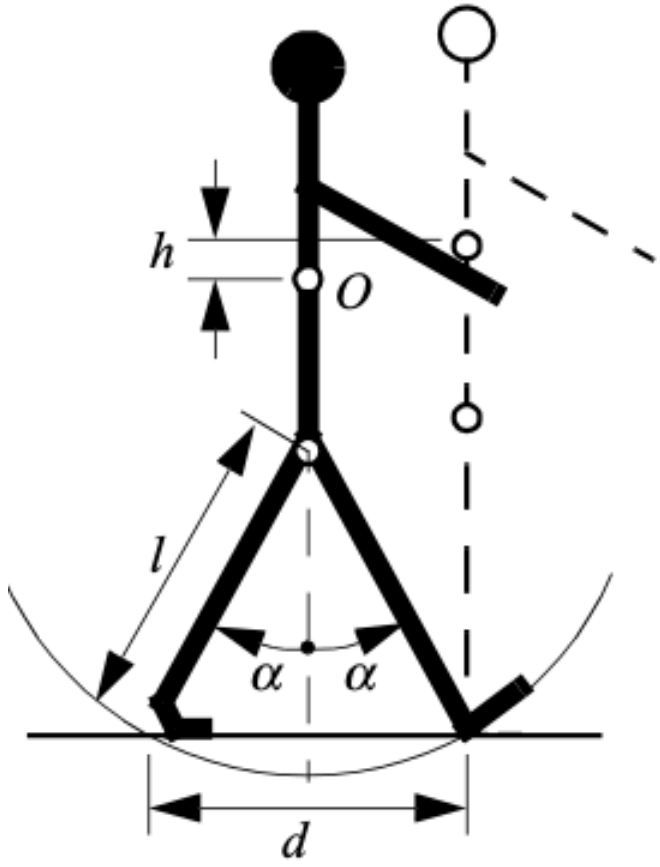
Locomotion

Locomotion

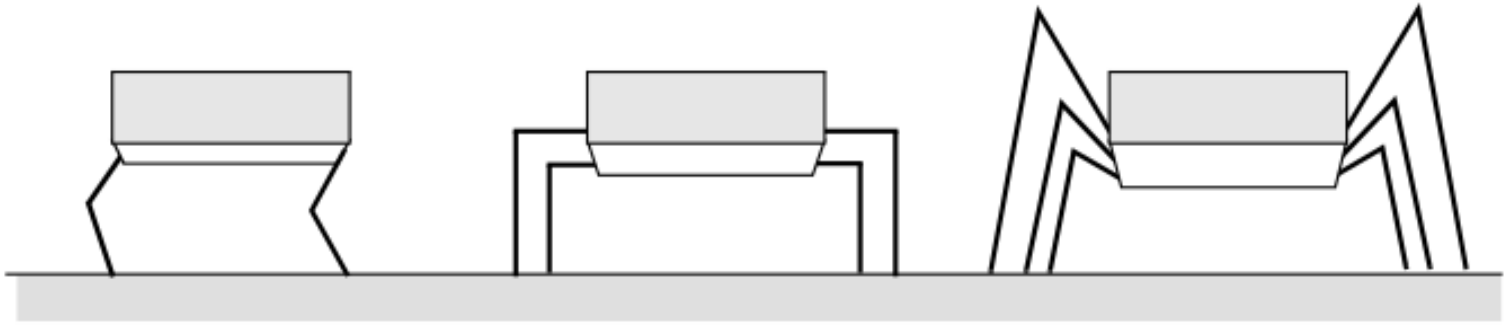
Locomotion is the power of motion from place to place.

Type of motion	Resistance to motion	Basic kinematics of motion
Flow in a Channel 	Hydrodynamic forces	Eddies 
Crawl 	Friction forces	Longitudinal vibration 
Sliding 	Friction forces	Transverse vibration 
Running 	Loss of kinetic energy	Oscillatory movement of a multi-link pendulum 
Jumping 	Loss of kinetic energy	Oscillatory movement of a multi-link pendulum 
Walking 	Gravitational forces	Rolling of a polygon (see figure 2.2) 

Biped Locomotion



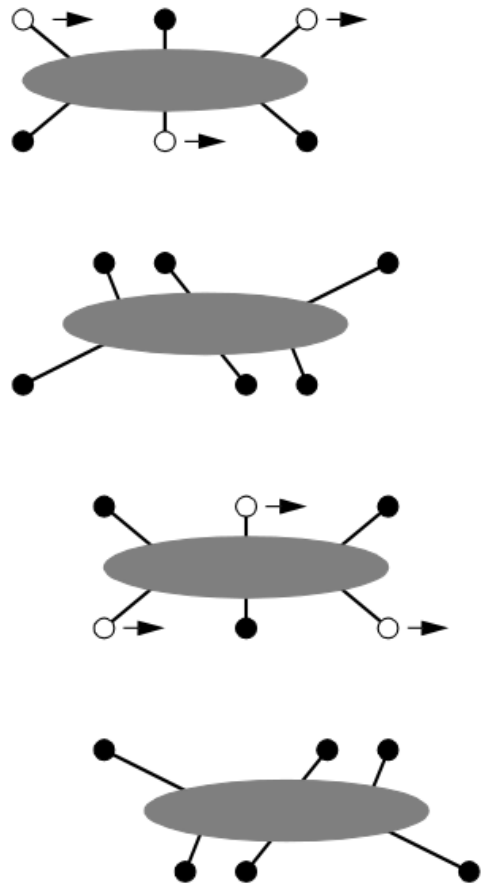
Animal Locomotion



Static and Dynamic Stability

- A statically stable robot will not fall if all of its joints freeze.
- A dynamically stable robot requires constant motion to prevent it from falling.
- Stability requires that the robot keeps its center of mass within the polygon spanned by its ground contact points.

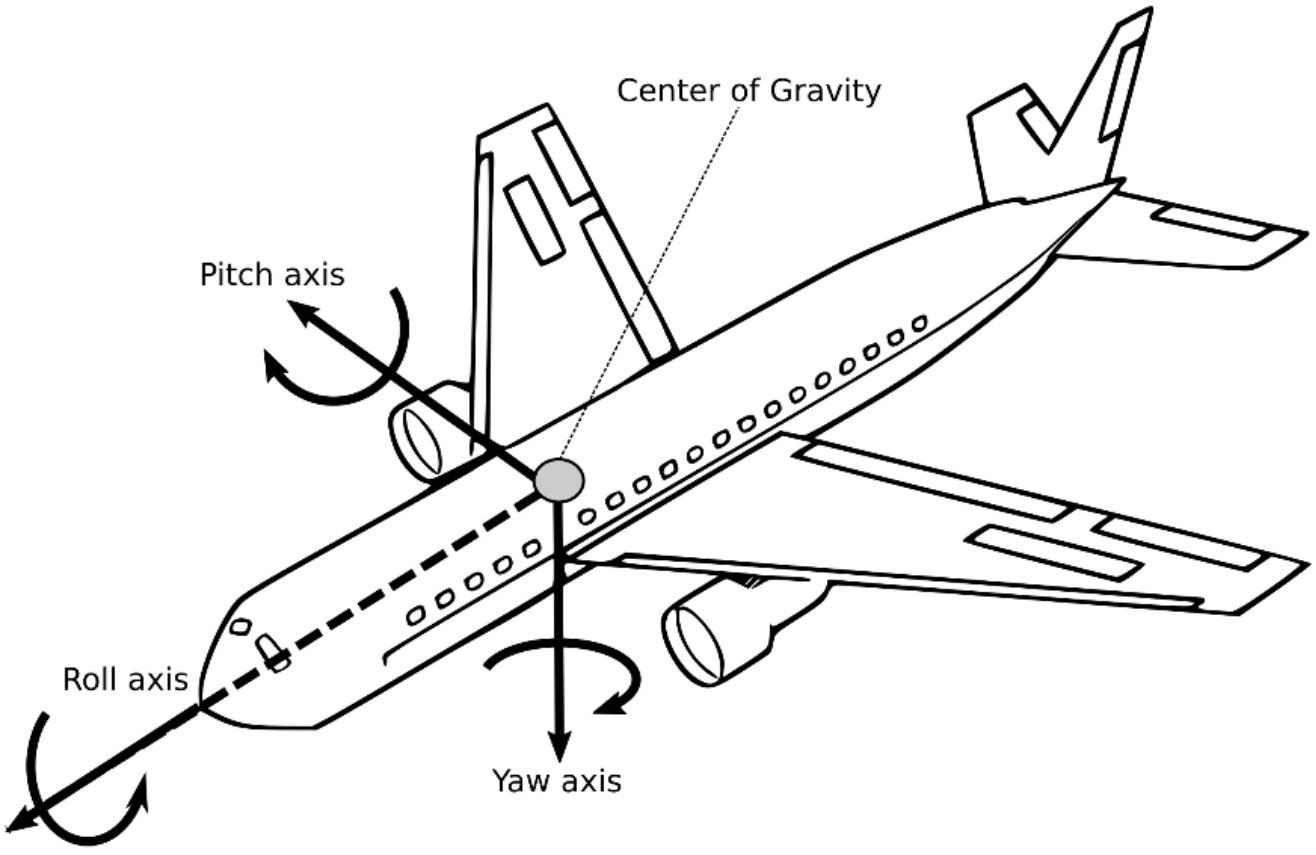
Six Legged Stable Locomotion



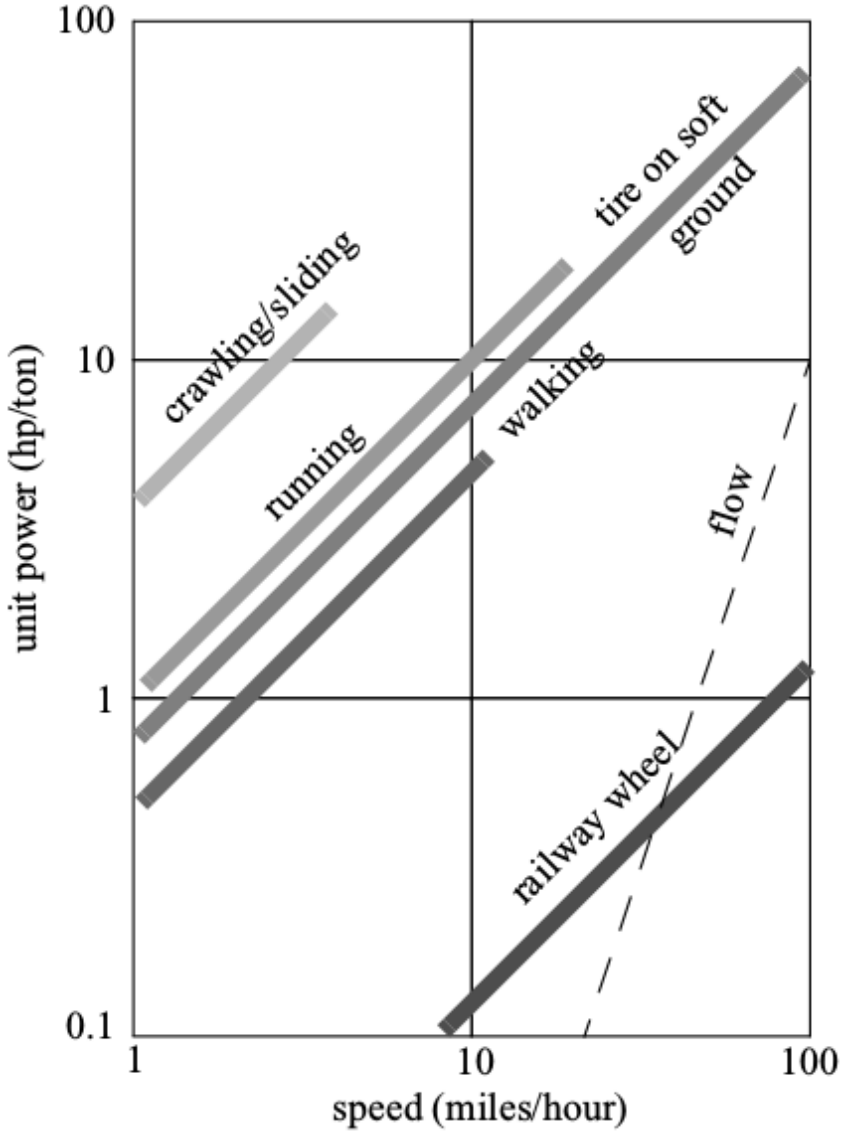
Degrees-of-Freedom

- Degrees-of-freedom (DOF) defines the possible positions and orientations that a robot can achieve.
- An object in the physical world can have up to six DOF.
- The DOF of a wheeled platform are defined by the types and orientations of the wheels.
- Robots that do not have wheels with 3-DOF have constraints that prevent them from reaching every possible point at every possible orientation.

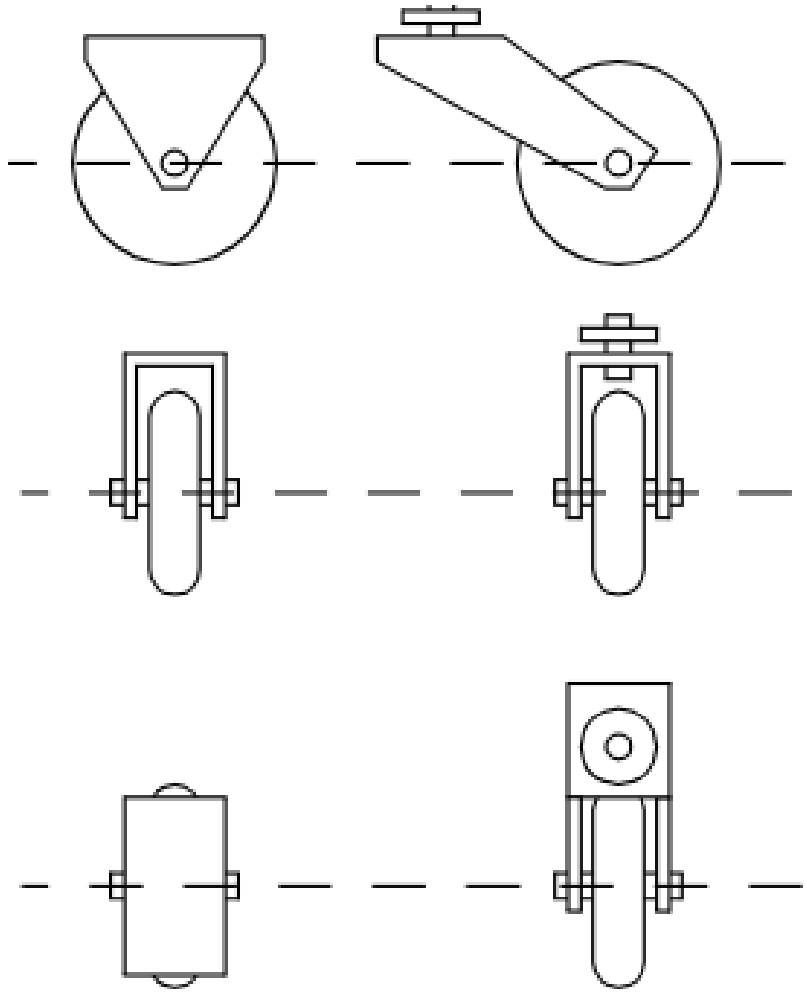
Degrees-of-Freedom



Wheeled Locomotion



Basic Wheel Types



Wheel Constraints