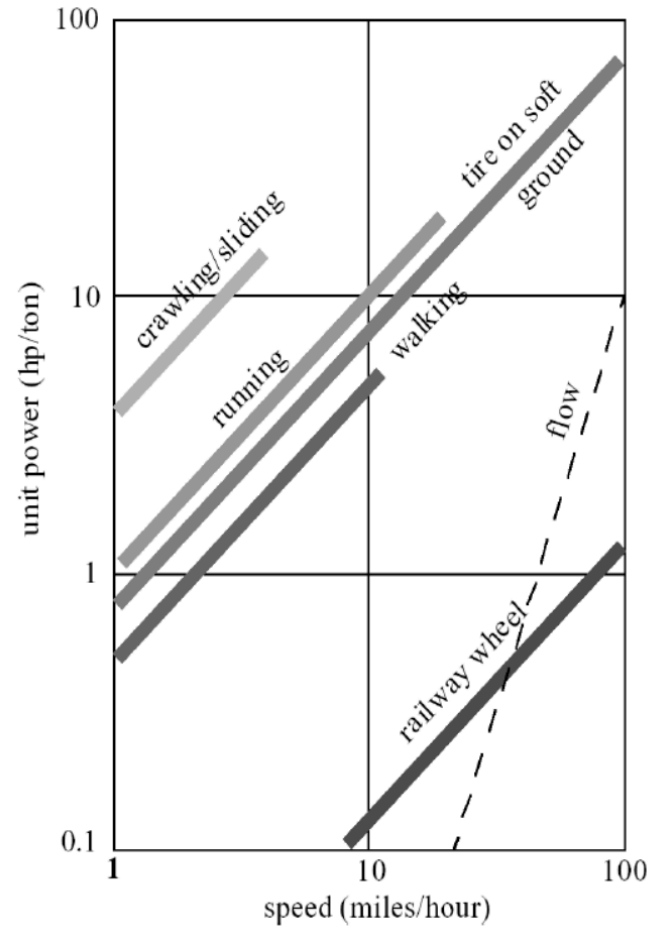


# Locomotion and Manipulation

## Chapter 2

# Locomotion

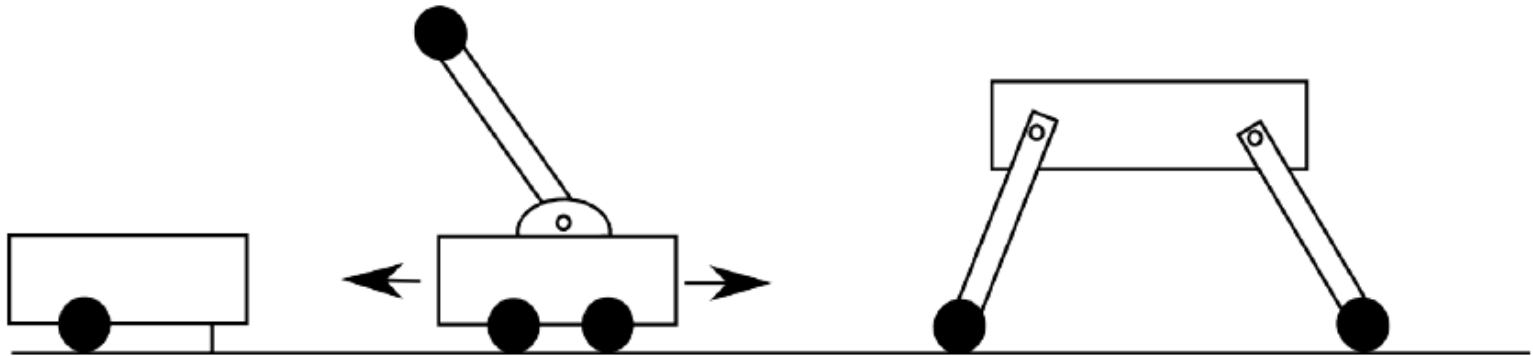
- **Rolling**
- Walking
- Running
- Jumping
- Sliding
- Crawling
- Climbing
- Swimming
- Flying



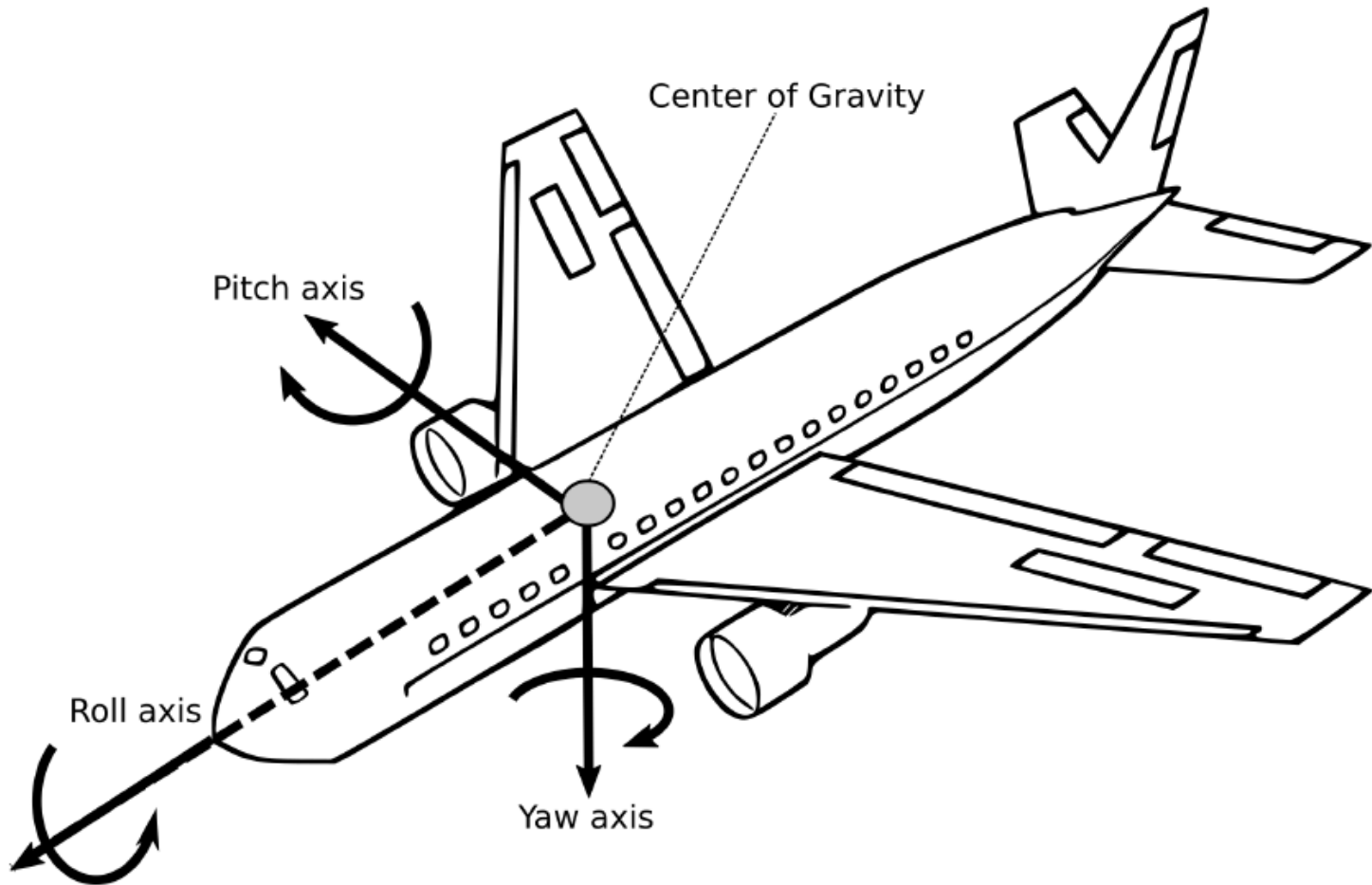
# Kinematics and Dynamics

- Kinematics
  - Position and speed ( $x, x'$ )
- Dynamics
  - Acceleration and jerk ( $x'', x'''$ )

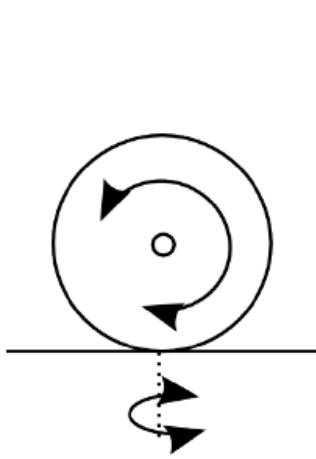
# Static and Dynamic Stability



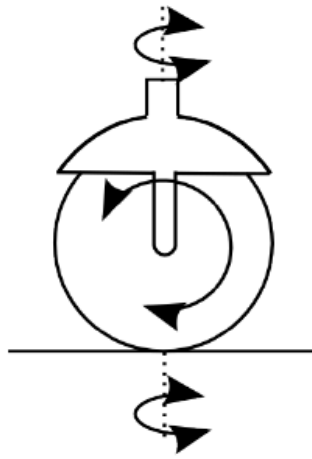
# Pitch, Yaw, and Roll



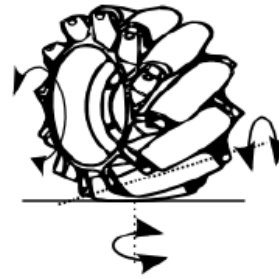
# Standard Wheels



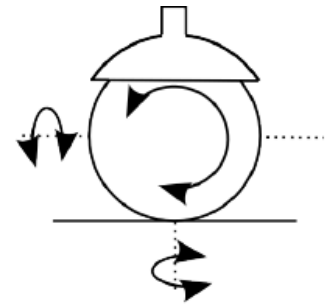
Standard Wheel



Caster wheel

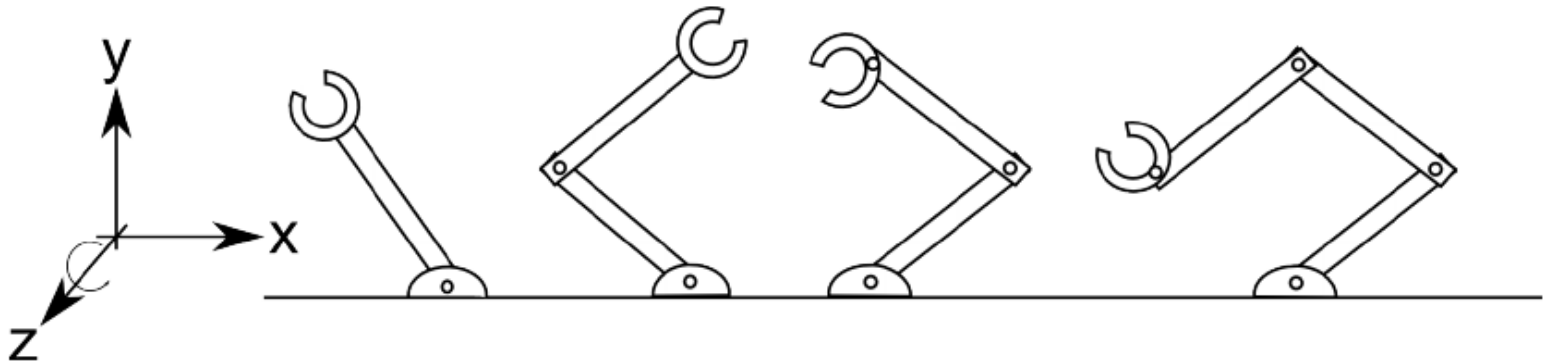


Swedish wheel

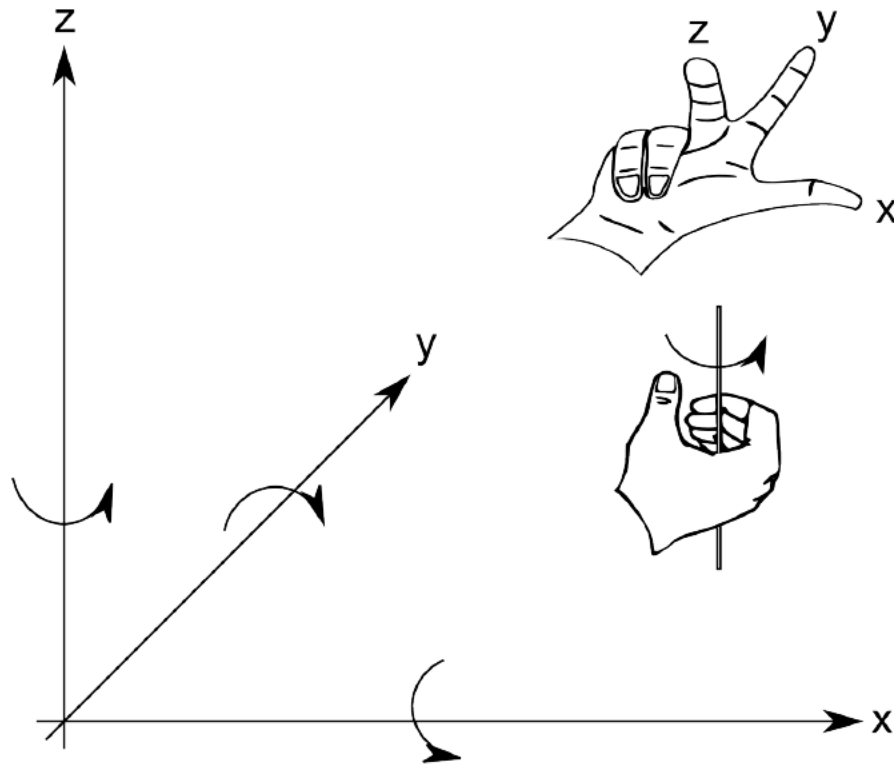


Wheel with cap

# Manipulators

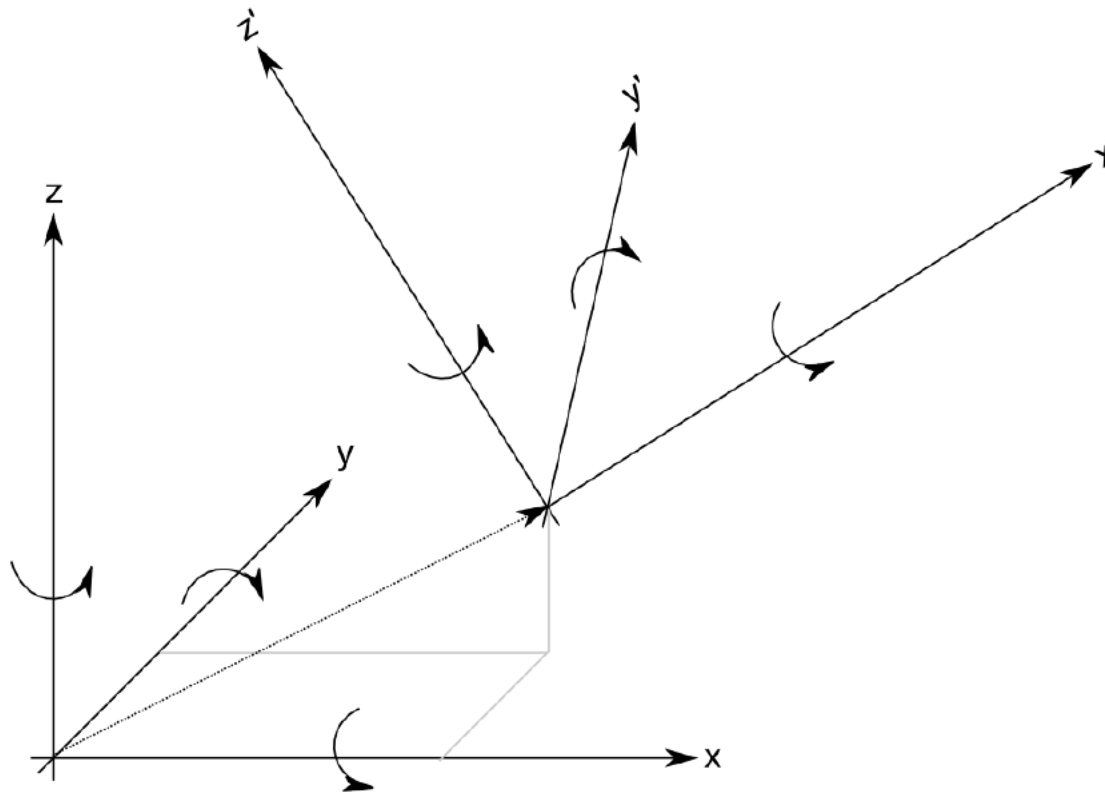


# Coordinate System





# Nested Coordinate Systems



# Expressing rotations

