Aerial Robot Locomotion – Quick Intro

September 2, 2014
Reading Assignments

- Today: Finishing up Ch. 2; beginning Ch. 3
- Next time:
  - Continue Ch. 3
Aerial Robots – Applications

- **Remote sensing:** pipeline spotting, powerline monitoring, volcanic sampling, mapping, meteorology, geology, agriculture, etc.
- **Disaster response:** chemical sensing, flood monitoring, wildfire management
- **Surveillance:** law enforcement, traffic monitoring, coastal and maritime patrol, border patrols
- **Search and rescue:** especially in low-density or hard-to-reach areas
- **Transportation:** small and large cargo, passenger transport
- **Communications:** permanent or ad hoc communication relays
- **Payload delivery:** firefighting, crop dusting
- **Image acquisition:** Cinematography, entertainment
Aerial Robot Application Example
Another Aerial Robot Example
Another Aerial Robot Example
Flight Vehicle Types & Flight Regimes

- Types:
  - Fixed-wing
  - Flapping wing
  - Combinations

- Regimes:
  - Hover (i.e., speed of vehicle relative to surrounding air is small)
  - Cruising (i.e., significant relative speed between vehicle and surrounding air)

- Lighter-than-air systems (e.g., blimps)
Taxonomy of Aerial Vehicles

- Vast number of UAVs
- Most are fixed wing
- Are available at wide range of altitudes
Technical challenges

- Regulations and certification
- Human-Machine interfaces
- Navigation
- Agile flight and fault tolerance
- Obstacle avoidance
- Landing
- Multi-vehicle coordination
Inner-Loop Control: Sensing and Estimation

- Sensing for aerial vehicles:
  - Inertial navigation systems
  - Global navigation satellite systems
  - Terrestrial radio navigation systems
  - Air data probes and altimeters
  - Radar and passive vision sensors
  - Magnetic compasses
  - Distance measuring