MAV Landing Simulation

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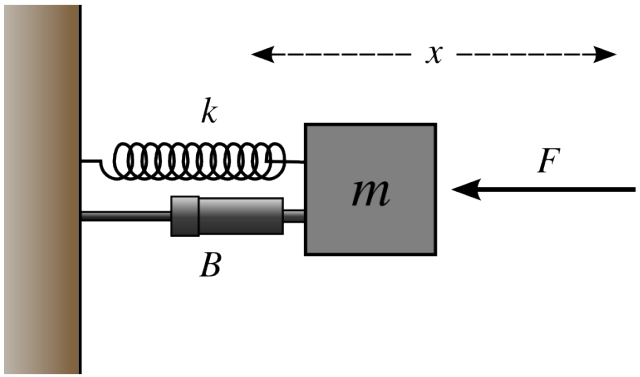
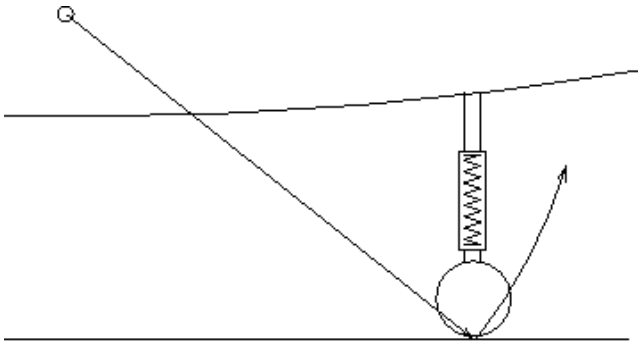
Project Goals

- Model the physics of landing gear
- Implement the model in simulation
- Create autopilot for landing

Model For Landing Gear

- 3 wheels, one in front, two in back
- Simple spring with damper in body z direction
- Compression calculated using position and attitude of aircraft
- Friction in horizontal plane split into two components
- Force from spring produces torque about and force toward center of mass



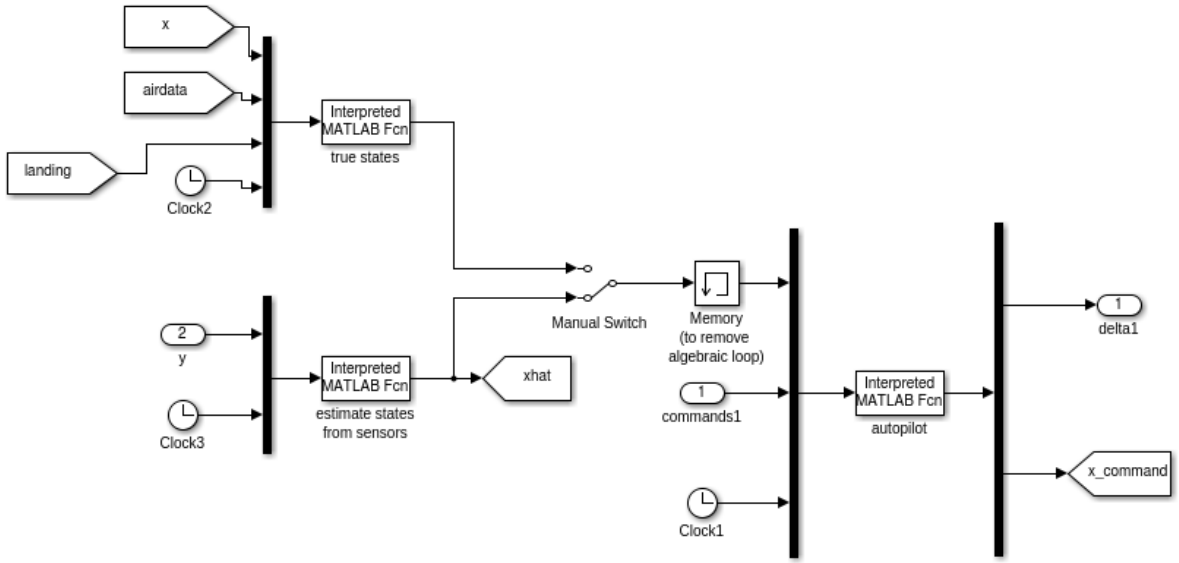


Aircraft Control

- Maintain roll and yaw at zero
- At 10 meters altitude, cut throttle and hold 10 degree pitch
- After all three wheels on the ground, start applying the brake gradually
- Can maintain control in headwind and crosswind (mostly)

Implementation of Model

- Added three states to simulation model, offsets for each landing wheel
- Added one controllable variable, the brake
- Compression calculated using position and attitude of aircraft
- Force and torque of spring and damper added to the forces and moments file
- Multiple views added to the simulation
- Crash conditions added



Simulation Videos

Challenges

- Suspension
- Damping
- Propellor model
- Low-pass filter on difference for damper
- Stable in torque and in vertical force
- Friction at low velocities