Considerations and Tradeoffs between Stepper Motors and DC Motors

Stepper Motors

Advantages
- Simple, open loop control (just count steps!)
- Low cost
- Simple construction
- Rugged
- No maintenance (brushless)
- High reliability
- Inherently failsafe (no runaway)
- Automatic braking
- High continuous torque at low speeds

Disadvantages
- Care needed in acceleration and deceleration to avoid missing steps
- Relatively low speed (<3 kRPM)
- Not smooth
- Tend to run hot (some windings are always energized)
- May jump 1 step after power on

DC Motor

Advantages
- High speed capable
- Higher torque at high speed
- Torque speed curve more linear
- Better dynamic response
- Smoothness of motion
- No maintenance (for brushless)
- More efficient

Disadvantages
- Encoder or resolver needed to control position (adds complexity and cost)
- Cost
- Not smooth
- Control is more complicated
- Brush types are electrically noise
- Not inherently failsafe (if encoder signal drops out, could run away)
- No inherent braking

Other Actuators to Know About
- Linear motors (servo or stepper)
- Linear actuators (PMDC or stepper driving a leadscrew)
- SmartMotors
- Piezo
- Pneumatics
- Hydraulics
### Other Actuators to Know About

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