

Message 47108 From: "mariss92705"  
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Subject: Stepper or servo?

Hi,

By special request and with apologies to David Letterman, here are some "Top 10" lists I came up with for choosing between steppers and brush DC servos.

#### Top Ten Stepper Advantages:

- 1) Stable. Can drive a wide range of frictional and inertial loads.
- 2) Needs no feedback. The motor is also the position transducer.
- 3) Inexpensive relative to other motion control systems.
- 4) Standardized frame size and performance.
- 5) Plug and play. Easy to setup and use.
- 6) Safe. If anything breaks, the motor stops.
- 7) Long life. Bearings are the only wear-out mechanism.
- 8) Excellent low speed torque. Can drive many loads without gearing.
- 9) Excellent repeatability. Returns to the same location accurately.
- 10) Overload safe. Motor cannot be damaged by mechanical overload.

#### Top Ten DC Servo Advantages:

- 1) High output power relative to motor size and weight.
- 2) Encoder determines accuracy and resolution.
- 3) High efficiency. Can approach 90% at light loads.
- 4) High torque to inertia ratio. Can rapidly accelerate loads.
- 5) Has "reserve" power. 2-3 times continuous power for short periods.
- 6) Has "reserve" torque. 5-10 times rated torque for short periods.
- 7) Motor stays cool. Current draw proportional to load.
- 8) Usable high speed torque. Maintains rated torque to 90% of NL RPM
- 9) Audibly quiet at high speeds.
- 10) Resonance and vibration free operation.

### Top Ten Stepper Disadvantages:

- 1) Low efficiency. Motor draws substantial power regardless of load.
- 2) Torque drops rapidly with speed (torque is the inverse of speed).
- 3) Low accuracy. 1:200 at full load, 1:2000 at light loads.
- 4) Prone to resonances. Requires microstepping to move smoothly.
- 5) No feedback to indicate missed steps.
- 6) Low torque to inertia ratio. Cannot accelerate loads very rapidly.
- 7) Motor gets very hot in high performance configurations.
- 8) Motor will not "pick up" after momentary overload.
- 9) Motor is audibly very noisy at moderate to high speeds.
- 10) Low output power for size and weight.

### Top Ten DC Servo Disadvantages:

- 1) Requires "tuning" to stabilize feedback loop.
- 2) Motor "runs away" when something breaks. Safety circuits required.
- 3) Complex. Requires encoder.
- 4) Brush wearout limits life to 2,000 hrs. Service is then required.
- 5) Peak torque is limited to a 1% duty cycle.
- 6) Motor can be damaged by sustained overload.
- 7) Bewildering choice of motors, encoders, servodrives.
- 8) Power supply current 10 times average to use peak torque. See (5).
- 9) Motor develops peak power at higher speeds. Gearing often required.
- 10) Poor motor cooling. Ventilated motors are easily contaminated.

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