Finally, the H-bridge chip should be heat-sinked to prevent overheating. The heat sink dissipates heat due to MOSFET switching and MOSFET output resistance (on the order of hundreds of mΩ for the DRV8835).

27.2 Motion Control of a DC Motor

An example block diagram for control of a DC motor is shown in Figure 27.7.[2] A trajectory generator creates a reference position as a function of time. To drive the motor to follow this reference trajectory, we use two nested control loops: an outer motion control loop and an inner current control loop. These two loops are roughly motivated by the two time scales of the system: the mechanical time constant of the motor and load and the electrical time constant of the motor.

- **Outer motion control loop.** This outer loop runs at a lower frequency, typically a few hundred Hz to a few kHz. The motion controller takes as input the desired position and/or velocity, as well as the motor's current position, as measured by an encoder or potentiometer, and possibly the motor's current velocity, as measured by a tachometer. The output of the controller is a commanded current I_c. The current is directly proportional to the torque. Thus the motion control loop treats the mechanical system as if it has direct control of motor torque.
- **Inner current control loop.** This inner loop typically runs at a higher frequency, from a few kHz to tens of kHz, but no higher than the PWM frequency. The purpose of the current controller is to deliver the current requested by the motion controller. To do this, it

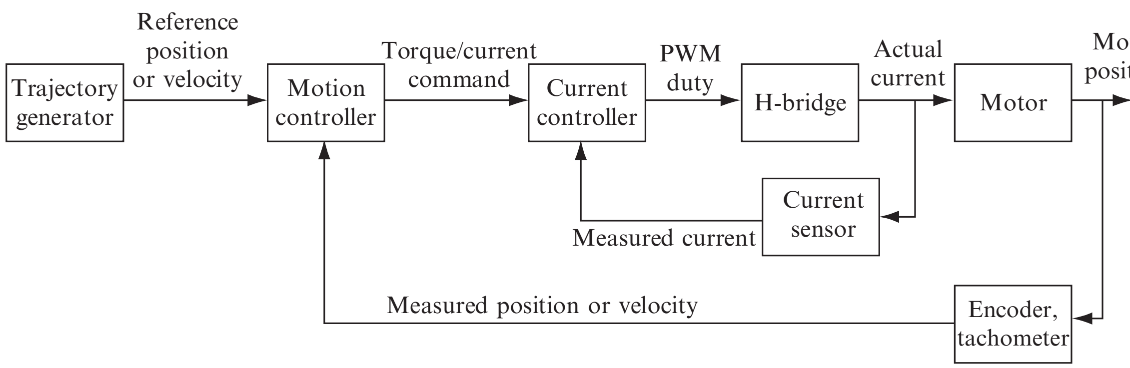

Figure 27.7
A block diagram for motion control.

2 A simpler block diagram would have the motion controller block directly output a PWM duty cycle to an H-bridge, with no inner-loop control of the actual motor current, which would be sufficient for many applications. However, the block diagram in Figure 27.7 is more typical of industrial implementations.