SOME D.C. MOTOR FACTS:

Back EMF is proportional to velocity.

Current is proportional to load (plus friction).

Part of the voltage drop (V_o) across the motor is due to winding resistance ($V_1 = IR$), the rest is due to back EMF ($V_2 = EMF$). $V_o = V_1 + V_2$.

To control the velocity of a D.C. motor without using a velocity transducer, measure V_o and I, then compute back EMF from $V_2 = V_o - V_1$.