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% VEX robot with PID controller

R = 1;    % armature resistance
L = 1;    % armature inductance
Kb = 1;   % armature back emf constant
Km = 1;   % motor torque constant
B = 1;    % rotor viscous drag coefficient
J = 1;     % rotor moment of inertial

KP = 1.5; % PID controller constant, KI = KD = 0

M = 2;    % mass of kart in kg.
r = .02;  % kart wheel radius, 2 cm.

ia(1) = 0;    % initial armature current
theta(1)=0;   % initial rotor angle
omega(1)=0;   % initial rotor angle rate
t(1)=0;

N = 100;
dt = 0.1;

for i=1:N
    t(i+1)=t(i)+dt;
    % compute control voltage, 1 radian is the goal for theta
    va(i) = (1 - theta(i))*KP;
    ia(i+1) = ia(i) + dt*(va(i) - R*ia(i) - Kb*omega(i))/L;
    theta(i+1) = theta(i) + dt*omega(i);
    omega(i) + dt*(Km*ia(i) - B*omega(i)) / (J + M*r^2);

end
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