AB-025 : Using SPICE to Model DC Motors

http://www.precisionmicrodrives.com/application-notes-technical-guides/application-bulletins/ab-025-using-spice-to-model-dc-motors

A1 – Vibration motor model netlist

```
V_drive N001 0 PULSE(0.0 3 3m 50m 50m 200m 0 1)
L_Motor N001 N005 {L_Motor}
R_Motor N005 N007 {R_motor}
V_SENSE_1 N011 0 0 Rser=0
L_inertia N008 N009 {L_inertia_rotor} Rser=0.0 Rpar=0
R_loss N010 N012 {R_loss}
V_SENSE_2 N012 0 0 Rser=0
B§V_torque N003 0 V=I(V_SENSE_1)*K_t
Back_emf N007 N011 V=I(V_SENSE_2)*K_emf
B3 0 N002 I=I(V_SENSE_2)
C1 N002 0 1 Rser=0 Lser=0 Rpar=0 Cpar=0
R1 N002 0 1
B§V_gravity N004 N006 V= L_inertia_emass*radius * sin( V(n004) ) * 9.81
V_load_torque N006 N008 0V
L_inertia1 N009 N010 {L_inertia_emass} Rser=0.0 Rpar=0
SW1 N004 N003 A 0 turnoff
D1 N001 A turn_on
C2 A 0 1
.model D D
.lib C:\Program Files (x86)\LTC\LTspiceIV\lib\cmp\standard.dio
.tran 0 400m 0m 0.001m startup
.PARAM K_t = 900u
.PARAM K_emf  = 900u
.PARAM R_motor = 5.5
.PARAM L_Motor = 50u
.PARAM R_loss = 300n
.PARAM L_inertia_rotor = 15n
.PARAM radius = 0.002m
.PARAM L_inertia_emass = 15n
.model turnoff SW(Vt = 1u Ron = 0.000001p)
.model turn_on D( Vfwd = 0.6 Rrev = 0.0001 Ron = 0.000001)
.backanno
.end
```

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A2 - Gearmotor model netlist

```
V_drive N001 0 PULSE(0.0 3 50m 0 0m 8 0 1)
L_Motor N001 N006 {L_Motor_coil}
R_Motor N006 N008 {R_motor}
V_SENSE_1 N014 0 0
L_inertia N002 N005 {L_rotor_inertia} Rser=0.0 Rpar=0
V_SENSE_2 N013 0 0 Rser=0
B§V_torque N002 0 V=I(V_SENSE_1)*K_t
Back_emf N008 N014 V=I(V_SENSE_2)*K_emf
B3 0 N004 I=I(V_SENSE_2)
C1 N004 0 1 Rser=0 Lser=0 Rpar=0 Cpar=0
R1 N004 0 1
R_loss_1 N005 N009 {R_loss_internal}
V_Sense_3 N012 0 0 Rser=0
B1 0 N011 I=I(V_SENSE_3)
C2 N011 0 1 Rser=0 Lser=0 Rpar=0 Cpar=0
R2 N011 0 1
R_loss_external N003 N007 {R_loss_external}
L_inertia1 N007 N010 {L_load_inertia} Rser=0.0 Rpar=0
B2 0 N003 I= I(V_SENSE_2 ) / Gr
B§Shaft_feedback N009 N013 V=V(N004,n012) / Gr
V§Load_torque N010 N012 0
.tran 0 300m 0m 0.001m startup
.PARAM K_t = 0.0007
.PARAM K_emf  0.0007
.PARAM R_motor = 5.5
.PARAM L_Motor_coil = 50u
.PARAM R_loss_internal = 300n
.PARAM L_rotor_inertia = 0.00000002
.PARAM R_loss_2 = 0.0000003
.PARAM R_loss_external = 0.0000003
.PARAM L_load_inertia =  0.00000002
.PARAM Gr = 5
.backanno
.end
```