

Notes on this motor simulation

Table of Contents

General.....	1
Why torque as Voltage and angular velocity as current.....	1
Units for the mechanical side of things.....	1

General

the concept here is to create a motor model can be combined with a simulation of a motor drive circuit.

This sim functions but the next step will be to pick a real motor and put the sim circuit values in for that. For the torque and back emf constants (K_a and K_v) and the motor armature electrical resistance, we will just use the values given on the motor datasheet,

Units for the mechanical side of things

What are the units for the rotational resistance in the mechanical domain

we apply torque and the result is angular velocity.

so the units are torque/ angular velocity.

or Newton meters / (radians per second)

or alternatively this can be expressed as

Newton meter seconds / radian

What are the units for rotational inertia in the mechanical domain.

the mechanical units for rotational inertia are kilogramme meters sqd.

How will we represent these mechanical effects in the model that we are creating in spice.

Representing Mechanical rotational resistance

I want to represent the mechanical resistance as electrical resistance, as I think this will be easier to understand.

This means that torque has to be voltage and angular velocity has to be current.

Representing Mechanical rotational inertia

After making the above decision that mechanical resistance is electrical resistance in the model, the mechanical inertia now has to be inductance in series with this resistance as this is the only thing that works.

A quick mental verification of this model.

In the motor model, at startup all of the Voltage (torque) is applied across the inductance (inertia), then as the motors speed builds up the voltage (torque) transfers to the electrical resistance (mech resistance).