

Elec 391 - 2021

Mini-Project Description

Jan –Apr 2022

Simulation

- Lookup Motor
- Design Pendulum
- Simulink Model
- SimulationX Model
- Co-Simulation

PCB

- Build Breadbord Circuit
- Design PCB

Lookup Motor

Identify motor using maxmot.p

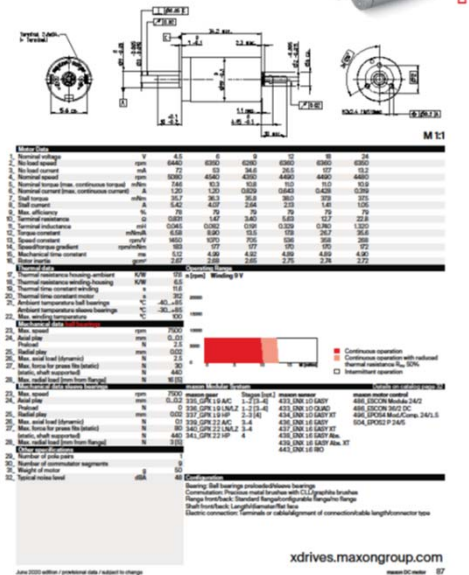
- Physical Dimensions
- Winding R & L
- Rotor Inertia

Assume worn-out bearings:

- Dynamic Friction Only
- $B = 7e-4$ (Nms)

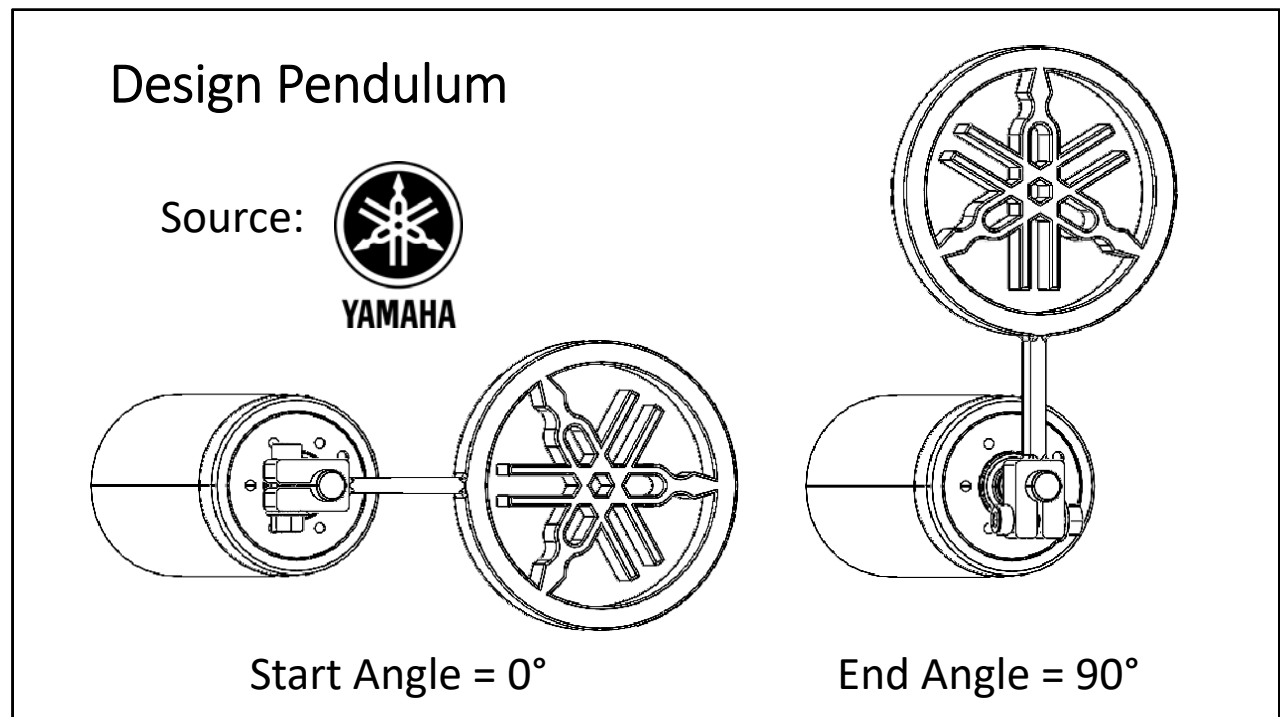
DCX 19 S Precious Metal Brushes DC motor Ø19 mm

Key Data: 5/8 W, 11.0 mNm, 7500 rpm



maxmot.p

- Download from Canvas
- Enter Student Number
- Look up Page & Voltage from DCX catalog



Download motor model

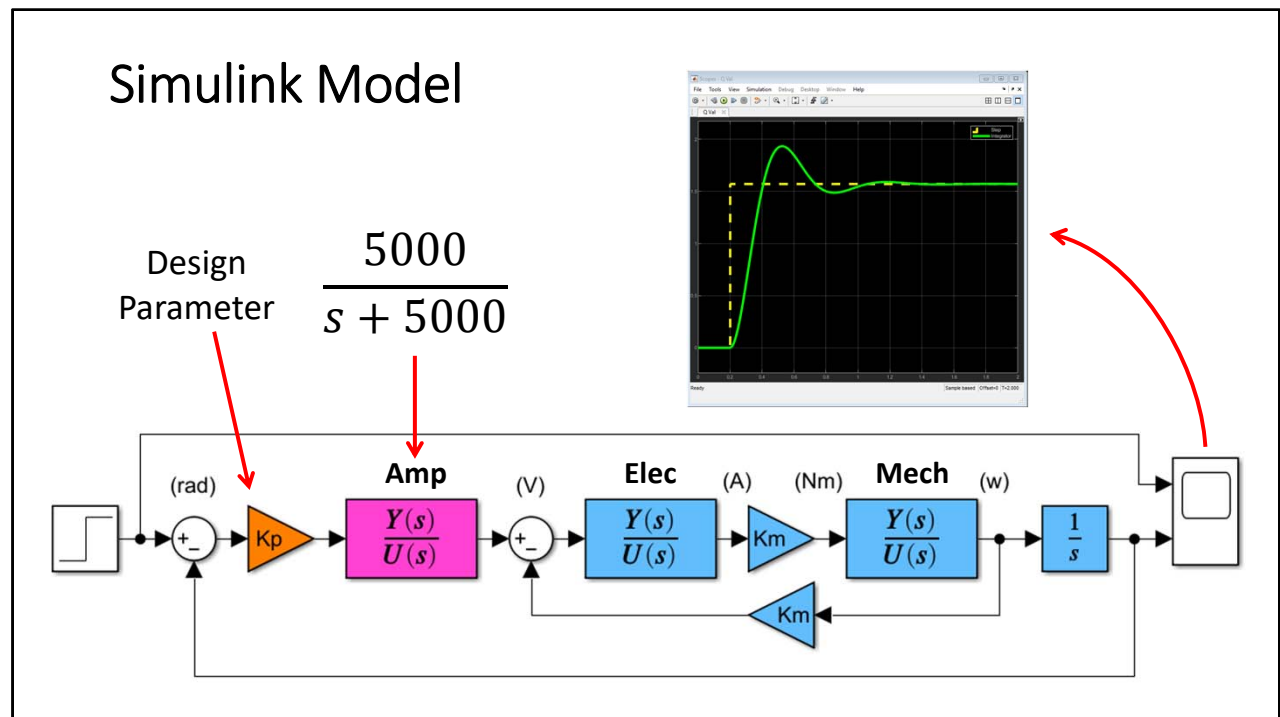
- maxongroup .com
- Brushed DC motor
- STEP file

SolidWorks Part File

- Pendulum contains logo of your choice
- Show source where you copied Logo
- Fits motor shaft
- Reasonable length
- 3003 Aluminum
- Compute Mass, Mass Centre, Inertia

SolidWorks Assembly File

- Motor (from Maxon)
- Pendulum
- Fasteners (from McMaster Carr)



Closed Loop System

- Proportional Controller
- Amplifier
- Motor & Pendulum
- Integrator

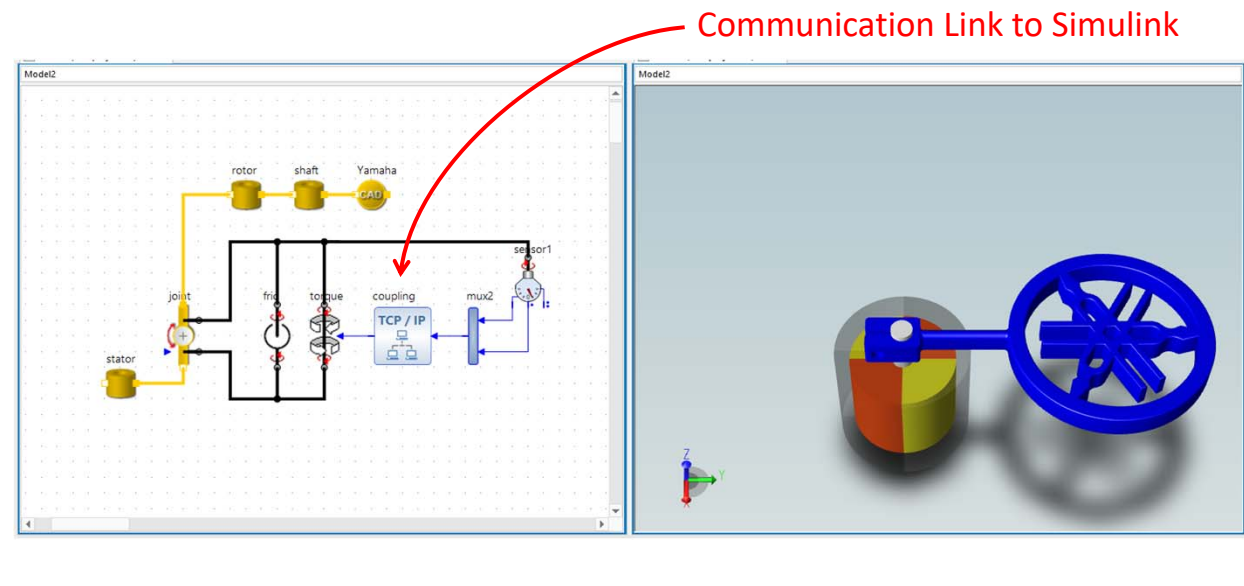
Motor & Pendulum

- Motor parameters from data-sheet
- Pendulum Inertia from SolidWorks

Controller

- Settles in ~2 sec

SimulationX Model



Motor

- Geometry from data-sheet
- Inertia Tensor from data-sheet
- Transparent stator
- 2-Tone rotor
- Estimate rotor dimensions
- Torque from Simulink

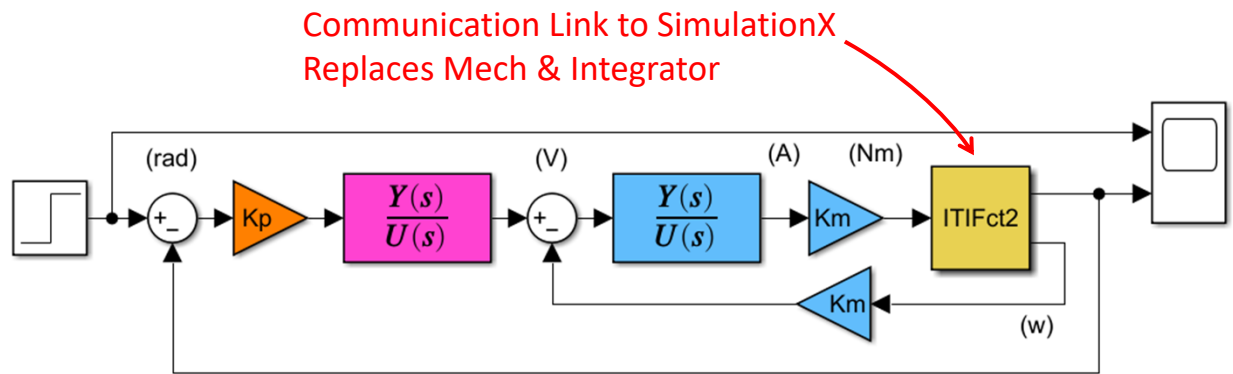
Pendulum

- STL File from SolidWorks
- Mass or density from SolidWorks

Communication Block

- In = Angle & Speed sensor readings
- Out = Motor Torque

Co-Simulation

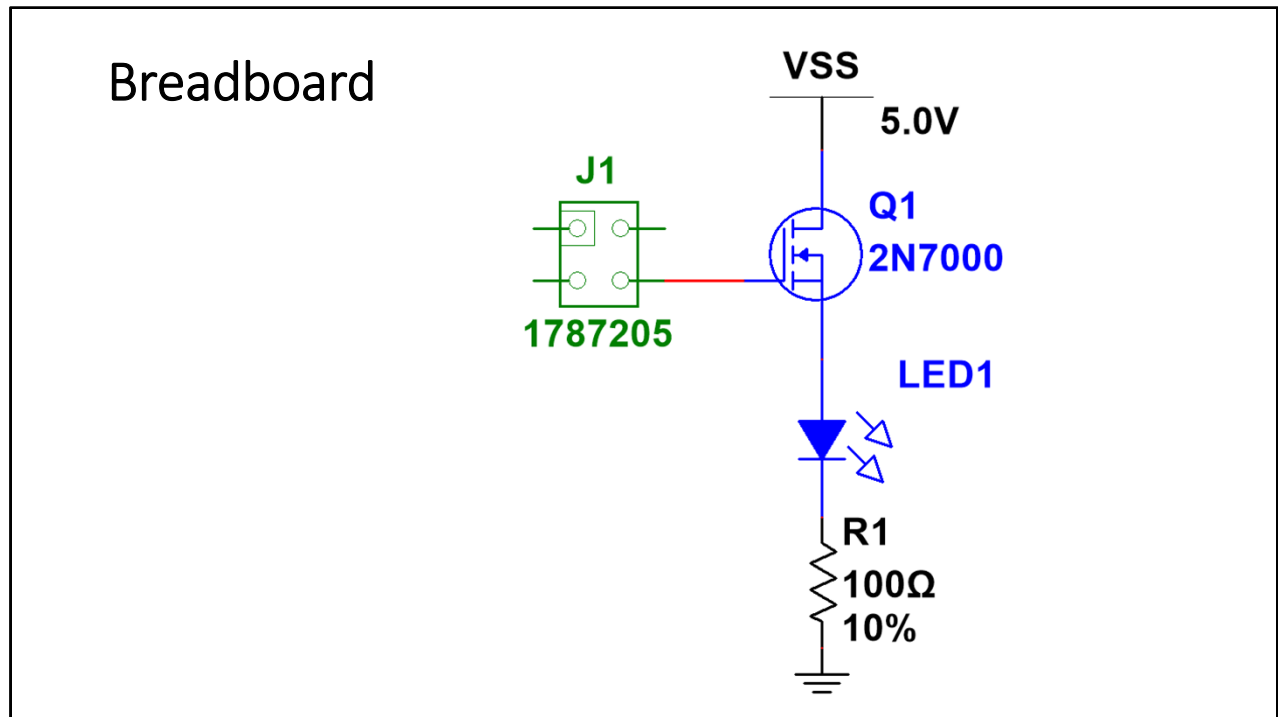


Mech & Integrator

- Replace with Link to SimulationX

Communication Block

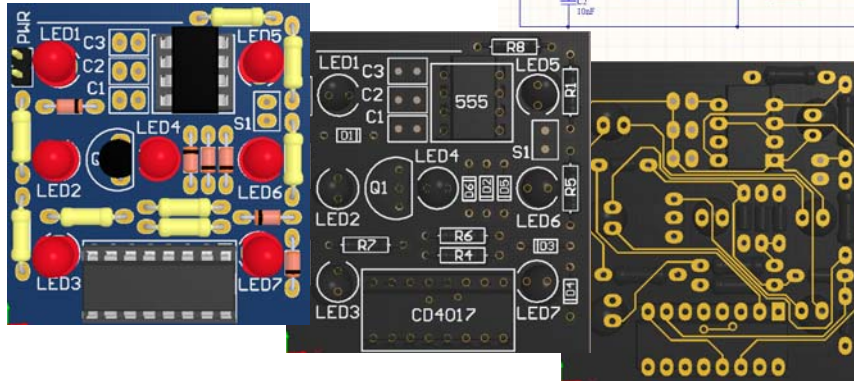
- In = Motor Torque
- Out = Angle & Speed sensor readings



MultiSim Circuit

- Logic 1 = ON
- Logic 0 = OFF
- External power source

Design PCB



UltiBoard

- Layout PCB
- 2-Sided
- No wasted space
- Labels (silk screen layer)
- Connectors
- Mounting holes