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ROTARY CONTROL CHALLENGE

SRV02-Series Rotary Servo Experiment

Product Information Sheet R1 - 1 - rev. C

Description

The SRV02 series of servo plants is ideally suited to introduce fundamental control concepts and theories on an easy-to-use and intuitive platform. The plant consists of a DC motor in a solid aluminum frame. The motor is equipped with a gearbox that drives external gears. All SRV02 models are equipped with a potentiometer to measure the output/load angular position. Additional sensors available include high-resolution optical encoders and tachometers.

Key Features

- Fully compatible with MATLAB/Simulink & LabVIEW
- Modular design (components are easily interchangeable)
- High quality DC servo motor and gearbox
- High resolution optical encoders to sense position
- Continuous turn potentiometer to sense position
- Tachometer to sense motor speed
- Robust machined aluminum casing with stainless steel gears
- Fully documented system models & parameters provided for MATLAB, Simulink & Maple
- Variable loads and gear ratios
- Open architecture design
- Optional slipring for continuous measurement from instrumented modules.

Curriculum Topics

- Position & Speed Control
- Disturbance Rejection
- Tracking Control & Regulation
- PID Controller Design
- Lead / Lag Compensation
- State-Feedback
- System Modeling & Simulation
- Frequency Analysis
- Phase & Gain Margin
- Root Locus Design
- Nyquist Stability
- Real-Time Control
- Discrete Time Sampling
- System Identification
- Multivariable Control Design

Range of SRV02 Challenges

The SRV02 series serves as the base of Quanser's Rotary Control Challenges.Quanser's modular design approach allows you to readily interchange additional modules, transforming the SRV02 into a multitude of different configurations.

SISO Configurations ***(Single Input, Single Output)***

SRV02: Position Control
SRV02-T: Rate Control
BB01: Ball & Beam
ROTFLEX: Rotary Flexible Joint
FLEXGAGE: Rotary Flexible Link
ROTPEN: Rotary Gantry
ROTPEN: Rotary Inverted Pendulum
ROTPEN-SE: Rotary Self-Erecting Inverted Pendulum
DBPEN: Double Inverted Pendulum

MIMO Configurations (***Multiple Input, Multiple Output***)

2D ROBOT: 2 SRV02 modules coupled together to control 2 axis
2D GANTRY: Use the 2D ROBOT to control the position of the gantry in 2 planes
2D PENDULUM: Control the Inverted Pendulum with 2 degrees of freedom
2D BALL BALANCER: Control the position of the ball on a plate moving with 2 degrees of freedom

Some configurations require specific SRV02 model, please confirm at time of order

SRV02 Model Range

All SRV02 models are supplied with additional gears to configure the required ratio as well as an extra set of external loads to vary the inertia. The following models are available:

Model	Description
SRV02	Standard Servo plant. Instrumented with a continuous turn potentiometer to measure output/load angular position.
SRV02-E	Same as the SRV02 with an optical encoder measuring the output shaft position.
SRV02-EHR	Same as the SRV02 model equipped with a high resolution optical encoder to acquire high precision position data.
SRV02-ET	Same as the SRV02-E with a tachometer attached to measure the speed of the motor.
SRV02-ETS	Same as the SRV02-ET but with a slip-ring mounted to the load gear allowing a continuous 360° motion.

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Typical Response

The following graph demonstrates the effect of derivative gain on damping.

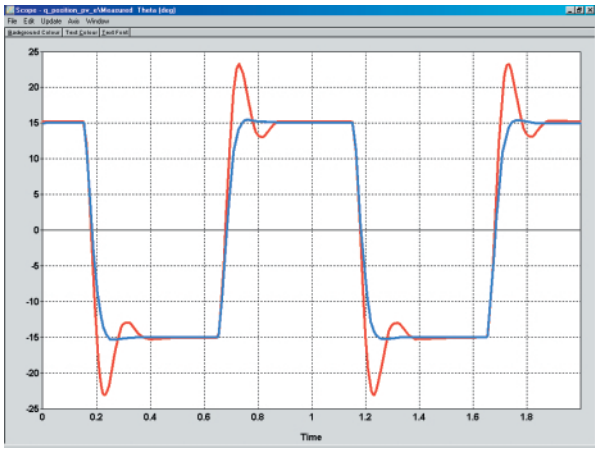

Figure 1 A system is damped using derivative gain

System Requirements

While all SRV02 plants are designed to be used with Quanser's UPM series Power Modules, Data Acquisition boards and Control Software, our unique open architecture design allows you to easily integrate with a wide variety of alternative solutions.

Component	Quanser Recommended (Common Configuration)	Alternative
Power Module	Quanser UPM 1503/2405	Alternate Power Amplifier (Minimum requirements: +/- 12V, 3A)
Control Hardware	Quanser Q4, Q8 Series Quanser Q3 ControlPaQ-FW*	dSPACE DS1104** National Instruments E- or M-Series DAQs**
Control Software	Quanser QuaRC	The Mathworks – RTWT, xPC dSPACE – ControlDesk National Instruments – LabVIEW

* configuration with Q3 ControlPaQ-FW amplifier-on-board control unit does not require UPM power module
** Quanser offers interface boards for NI E- and M- series & dSPACE DS1104 boards.

System Specifications

Specification	Value	Units
Plant Dimensions	15 x 15 x 18	cm^3
Plant Weight	1.2	kg
Rated Voltage	6	Volts
Maximum Continuous Current	1	A
Maximum Speed (recommended)	6000	r.p.m.
Operating Temperature	-30 to +85	°C
Potentiometer Bias Power	±12	Volts
Potentiometer Measurement Range	±5	Volts
Tachometer Bias Power	±12	Volts
Tachometer Measurement Range	±5	Volts
Tachometer Sensitivity	1.5	mV / r.p.m.
Encoder Resolution (E – option)	4096	Counts / Rev.
	0.0879	Deg / Count
Encoder Resolution (EHR – option)	8192	Counts / Rev.
	0.0439	Deg / Count