

Direct Drive Inverted Pendulum System



Introduction:

The Inverted Pendulum System (IP) is a classical experiment device for undergraduate and graduate students for learning control algorithm. Rotary motor is usually used and linear motion is achieved by indirect conversion of synchronous belt.

The all new Direct Drive Motor Inverted Pendulum System by Googoltech using advanced cylindrical linear motor for direct driving. It gets rid of intermediate transformation segment of indirect control mode. The modeling process is thus more accurate and reliable. This new type of direct drive mode is modern and can stimulate the curiosity as well as learning passion of the students.

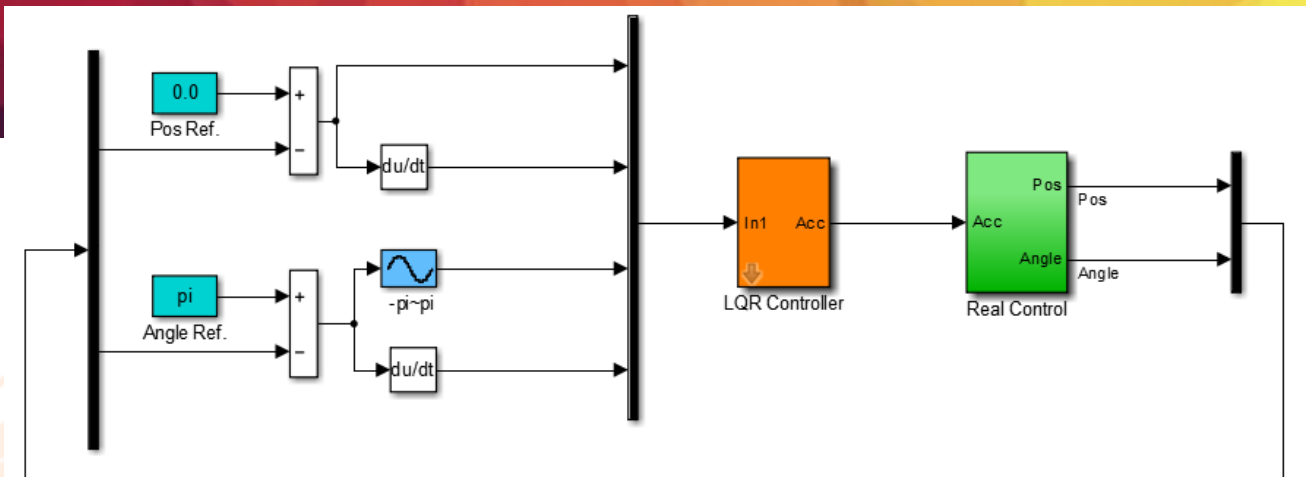


System Characteristics:

- Cylindrical linear motor and advanced position detection technology are adopted so that the system structure is simple. Students can better understand the motion principle of electromechanical system through learning.
- Students can carry out PID, root locus, LQR and other controller design with the attached Matlab examples. They can feel the enchantment of automatic control technology.
- When implementation of control algorithm in Matlab environment is completed, students can set up their own DSP, ARM, FPGA, MCU and other platforms for higher efficiency real-time control of the inverted pendulum.

Control Principle:

DDR Linear Inverted Pendulum is a typical single input double output system with acceleration of motor as input, swinging rod angle and motor position as outputs. By detecting and sending back angle of swinging rod and motor position to the controller, a suitable acceleration control generated by the controller is transferred to the motor to keep the swinging rod in vertical upward state. The motor is also kept stably within the set balanced position. The below diagram is the system diagram of the DDR IP based on LQR control algorithm.



LQR Control of the system in Matlab Simulink

Experiment Content:

- System modeling
- PID controller design, Root locus controller design
- Frequency domain model controller design
- State space model controller design, etc.

Specifications:

Item	Parameter	Item	Parameter
Dimensions	620 x 95 x 415mm	Swinging rod length	400 mm
Gliding block mass	1.7 kg	Swinging rod mass	0.105 kg
Linear motor encoder resolution	10,000 pulse/pitch	Maximum acceleration	$10m/s^2$
Rotary encoder resolution	2400 pulse/r	Maximum speed	$1.5m/s$
Control refresh rate	200 μs	Pitch	10 mm

Ordering Guide:

Model No.	Product Name	Standard Package
GLIP3001	Direct Drive Inverted Pendulum System	<ul style="list-style-type: none"> ◆ Direct Drive Inverted Pendulum system main body ◆ GT-400 PCI motion control card ◆ Electric control module ◆ Googol Simulink experiment platform ◆ User manual CD and connecting cables

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