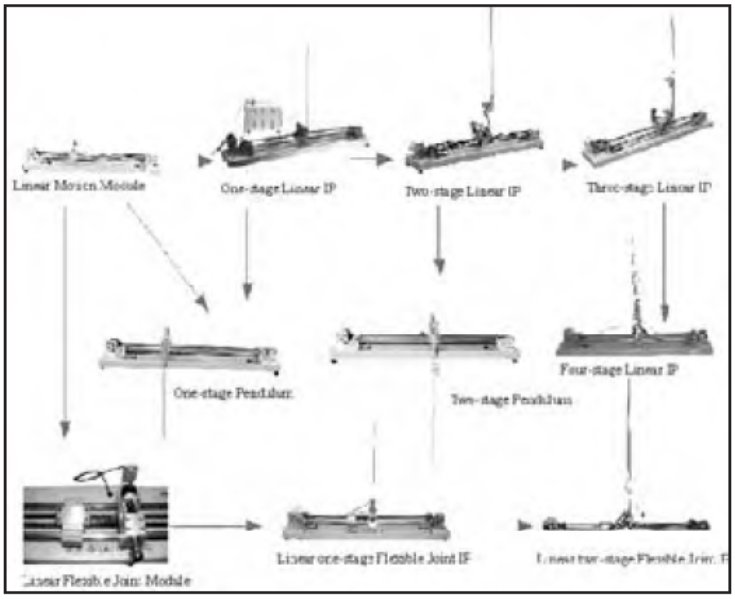
Linear Inverted Pendulum

The inverted pendulum system is a nonlinear unstable system. It is an ideal experiment platform for teaching control theories and conducting various control experiments. Many abstract control concepts, such as the stability and the controllability of a control system, can all be shown visually through the inverted pendulum system. In addition to educational purposes, an inverted pendulum is also an excellent tool for researchers of modern control theories. Through continuous research, researchers have developed new control theories. They have been applied to areas such as aeronautical engineering and robotics because the system is a high-order, unstable, highly coupled multi-variables and non-linear control target.

The linear inverted pendulum series adopt an open control solution and a modularized experiment platform. With the linear motion module as the base platform, it is easy to build more than 10 teaching and experiment control platforms to satisfy the various needs for control teaching and research.

Modularized Platform



Main Features

Industrial Grade Components:

- All the modules are designed and manufactured with industrial components. For example, the sliding guides are made of precision stainless steel; the synchronization belt is a timing belt of industrial grade; the base platform has the vibration absorption function.
- Industrial grade encoder, AC servo motor and drive to ensure best quality and reliability. Compared with similar products of other brands using DC motors, the AC servomotor offers the additional advantage of no maintenance on brushes and longer service life.
- Limit switches, anti-collision buffer device, as well as the unique structure design provide excellent system safety, especially suitable for students.

Open Architecture:

- Hardware platform is based on PC and DSP-based motion controller.
- MATLAB experiment program with SIMULINK toolbox. Performing simulation and analysis to evaluate the performance of controller and to improve control system directly.
- Experiment verification and demonstration program of DOS version, with source codes provided.
- Comprehensive experiment kit, covering the dynamic modeling, classic control experiment, modern control experiment, optimized control experiment and intelligent control experiment. Users can select relevant material for teaching and experiment.

User Creativity:

- Flexible configuration of customized experiment platform.
- Develop and verify one's own control algorithm.
- Tackle the challenging control problems related to three- and four-stage inverted pendulum.

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GOOGOL TECHNOLOGY

Technical Specifications

Name	Dimension (L x W x H)(mm)	Rod Length (mm)	Rod Weight (Kg)	Rotating Range
Linear 1-stage IP	1000 x 279 x 708	500	0.13	360°
Linear 2-stage IP	1000 x 305 x 910	Rod 1: 200 Rod 2: 500	Rod 1: 0.06 Rod 2: 0.13	360°
Linear 2-stage IP Type R	1200 x 305 x 910	Rod 1: 200 Rod 2: 500	Rod 1: 0.06 Rod 2: 0.13	360°
Linear 3-stage IP	1000 x 330 x 1057	Rod 1: 155 Rod 2: 200 Rod 3: 500	Rod 1: 0.05 Rod 2: 0.06 Rod 3: 0.13	360°
Linear 3-stage IP Type R	1500 x 330 x 1057	Rod 1: 155 Rod 2: 200 Rod 3: 500	Rod 1: 0.05 Rod 2: 0.06 Rod 3: 0.13	360°

Ordering Guide

Model Number	Model Name	Description
GLIP2001	Linear 1-Stage Inverted Pendulum	• Linear motion module • 1-stage pendulum module • GT-400-SV motion controller • Linear 1-stage IP electric control module • Linear 1-stage IP DOS experiment software (include source code) • Googol Simulink software experiment platform
GLIP2101	Network control linear 1-stage Inverted Pendulum (Ethernet)	• GLIP2001 • Network experiment software in Windows (source code not included)
GLIP2002	Linear 2-Stage Inverted Pendulum	• GLIP2001 • 2-stage pendulum module • Linear 2-stage IP electric control module • Linear 2-stage IP DOS experiment software (include source code)
GLIP2022(R)	Linear 2-Stage Inverted Pendulum for swing up research	• GLIP2002 • (R) with rectangular linear motion module • Extended linear motion module • Extended 2-stage pendulum module • Swing up control software
GLIP2003 (R)	Linear 3-Stage Inverted Pendulum	• GLIP2002 • (R) with rectangular linear motion module • 3-stage pendulum module • Linear 3-stage IP electric control module
GLIP2004 (R)	Linear 4-Stage Inverted Pendulum	• GLIP2002 • (R) with rectangular linear motion module • 4-stage pendulum module • Linear 4-stage IP electric control module
GLIP2011	Linear flexible 1-Stage Inverted Pendulum	• GLIP2001 • Flexible module • Flexible 1-stage pendulum electric control module
GLIP2012	Linear flexible 2-Stage Inverted Pendulum	• GLIP2002 • Flexible module • Flexible 2-stage pendulum electric control module

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