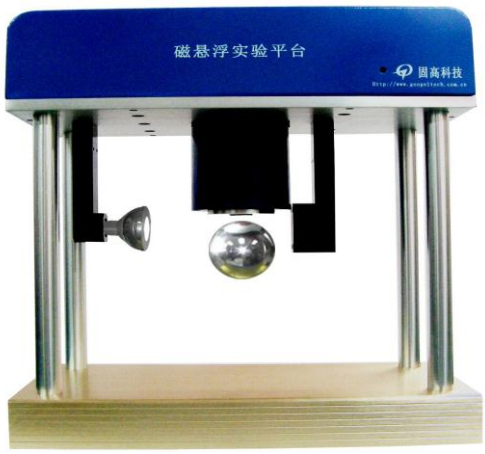
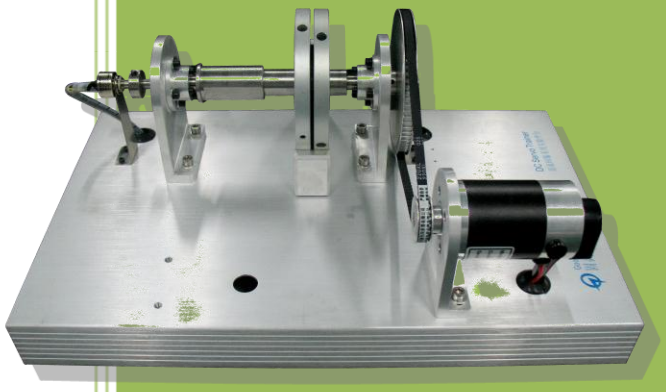
Googoltech

Standard Educational Products Experimental Guide





Googol Technology Ltd.

2013

GOOGOL TECHNOLOGY

Overview

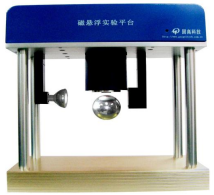
Automatic Control Theory is a compulsory and major foundation course for Automation Control and mechatronics related majors. Automatic Control Theory experiment is one of the efficient ways to master control system analysis and design methods.

Control system analysis is the comparison between the system simulation and the actual performance index that are consistent within a certain range of error. One of the standards of control system design is to ensure the optimized performance index of the system via selection of control algorithm.

Automatic Control Theory experiments require that the experiment equipment possess the following characteristics: classic control objects, low level and high linearity; experiment phenomena are straightforward and conspicuous. Googoltech aims at the Automatic Control Theory undergraduate education characteristics with the objective of cultivating students' control system analysis and design capability and recently upgrades Linear One-stage Inverted Pendulum, Sliding Cart, Ball & Beam System, DC Servo Platform and Magnetic Levitation System. Students can learn control theory design and analysis via interesting phenomena and rich experiment content.

Affiliated Teaching and Experiment Materials

1. Introduction to Feedback Control, Prentice Hall, Li Qiu and Kemin Zhou, Upper Saddle River, 2009
2. Modern Control Engineering (Fifth Edition) , Prentice Hall, Katsuhiko Ogata 2010
3. Modern Control Systems (Twelfth Edition) Prentice Hall, Richard C.Dorf Robert H.Bishop 2010
4. Automatic Control Theory (Fifth Edition - Chinese) Wu, Science Publication 2009
5. Linear One Stage Inverted Pendulum Experiment Guide, Googoltech 2012
6. Integrator Simulation and Modeling Base on Rail Trolley, Googoltech 2012
7. Ball and Beam Experiment Guide, Googoltech 2012
8. DC Servo System Experiment Guide, Googoltech 2012
9. Magnetic Levitation System Experiment Guide, Googoltech 2012

Content \ Device	Linear one-stage inverted pendulum	Sliding cart (inverted pendulum)	Ball & beam system	DC servo system control platform	Magnetic levitation system	Remark
Device example						
Mathematical model	$\begin{cases} \frac{x(s)}{u(s)} = \frac{1}{s^2} \\ \frac{\theta(s)}{u(s)} = \frac{k}{s^2 - a} \end{cases}$	$\frac{x(s)}{u(s)} = \frac{1}{s}$	$\frac{x(s)}{u(s)} = \frac{k}{s^2}$	$\frac{n(s)}{u(s)} = \frac{k}{Ts+1}$	$\frac{x(s)}{u(s)} = \frac{k}{s^2 - c}$	n : speed x : position θ : angle
Ordering Model No.	**GLIP2001**		**GBB2004**	**GSMT2014**	**GML1001**	

	Experiment content \ System type	Single input dual output system	Single input single output system				
1	Mechanism method modeling	◆	◆	◆		◆	Validated experiment
2	Experiment method modeling				◆		Validated experiment
3	Time domain analysis		◆		◆		Validated experiment
4	Root locus method analysis		◆		◆		Validated experiment
5	Frequency domain method analysis	◆	◆		◆		Validated experiment
6	PID correction	◆	◆	◆	◆	◆	*Designed experiment*
7	Root locus method correction	◆	◆	◆	◆	◆	*Designed experiment*

8	Frequency domain method correction	◆	◆	◆	◆	◆	*Designed experiment*
9	PID Compound correction	◆					*Designed experiment*
10	Root locus compound correction	◆					*Designed experiment*
11	Frequency domain method compound correction	◆					*Designed experiment*
12	Comparison of compound correction	◆					Comprehensive experiment
13	State feedback	◆	◆	◆	◆	◆	*Designed experiment*
14	Comparison of various states feedback	◆					Comprehensive experiment
15	LQR control	◆					*Designed experiment*

Note: ◆ denotes that the experiment can be supported.

GBB2004 requires MATLAB™ version R2012b or above, while the other systems support up to MATLAB™ version R14.

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