



Control Engineering

CE151

Ball and Plate

Demonstrates advanced two-dimensional control with visual feedback



- Two-dimensional system with second-order astaticity designed for studying system dynamics based on classical and modern control theory
- Compact, bench-top configuration designed for on-line digital control by computer
- High levels of in-built safety combined with ease of operation
- Intelligent ball-position sensor represented by vision system based on digital camera and real-time image processing software
- Control tasks simulate various problems from robotics (path planning and tracking) taking advantage of visual feedback
- Interface library and interactive software package including PID controller – polynomial and fuzzy logic controllers can be developed
- System accessible directly from MATLAB®/Simulink® environment in real time
- Includes comprehensive Educational Manual

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- An ISO 9001 certified company

CE151

Ball and Plate

Description

The Ball and Plate Apparatus shows the problems of the control of an unstable system. The apparatus consists of a plate pivoted at its centre so the plate can tilt in two directions.

Stepper motors tilt the plate. A servo system with a stepper motor control card controls the motors. A camera with an intelligent vision system measures the ball position. The basic control task is to control the ball position. The ball is free to roll on the plate.

The equipment includes:

- Ball and plate model
- Power supply
- A data acquisition board for your computer
- Camera with USB connection

The data acquisition board fits into a suitable computer (not included) to link with the Ball and Plate Apparatus and control its motors.

Software (included):

- Demonstration program with PID controllers
- Interface library for programming at the system level
- Example Simulink® models for real-time control experiments

Essential Ancillaries

(Not supplied by TecEquipment)

- Suitable computer with a spare PCIe (PCI Express) slot and Microsoft® Windows® XP, Vista, 7 or 8 operating system. 32-bit and 64-bit.

Note: If you have an older computer with only PCI slots, please contact our sales department.

- Software:
 - MATLAB®
 - Simulink®
 - Real-Time Windows® Target
 - Image Processing Toolbox
 - Image Acquisition Toolbox (recommended)
 - Computer Vision System Toolbox (recommended)

Standard Features

- Supplied with comprehensive user guide and educational manual
- Five-year warranty
- Made in accordance with the latest European Union directives

Experiments

- Real-time digital image processing
- Digital PID controller design for ball position stabilisation and trajectory following
- LQ/LQG controller design based on state and I/O model
- Fuzzy controller design
- Adaptive controller design
- Path planning for moving the ball between obstacles

Essential Services

Electrical supply:

110/220/240 VAC, 50 W, 50/60 Hz, with earth
Specify your voltage on order

Bench space needed:

0.6 m x 1000 mm

Operating Conditions

Operating environment:

Laboratory

Storage temperature range:

–25°C to +55°C (when packed for transport)

Operating temperature range:

+5°C to +40°C

Operating relative humidity range:

80% at temperatures < 31°C decreasing linearly to 50% at 40°C

Sound Levels

Less than 70 dB(A)

Specifications

Main body:

430 x 430 x 200 mm

Camera is mounted on a support attached to the rear of the main body, length 1100 mm

Plate:

400 x 400 mm

Nett Weight:

9 kg

Data Acquisition Board:

PCIe x1

Approximate packed dimensions and weight:

0.3 m³ and 15 kg

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