ACROME

BALL BALANCING TABLE

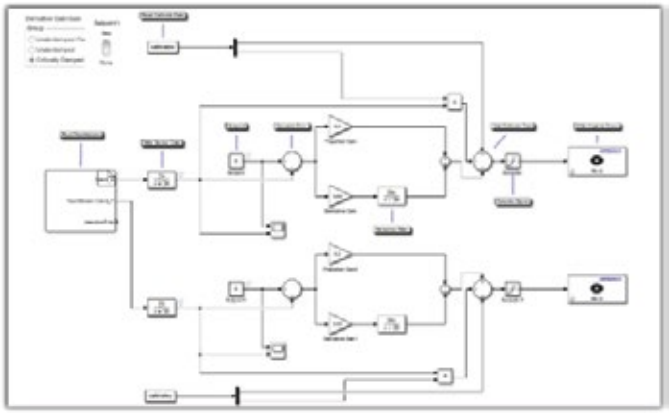
A ball placed on a table does not fall on the ground because it is stabilized with this table and your control algorithm.

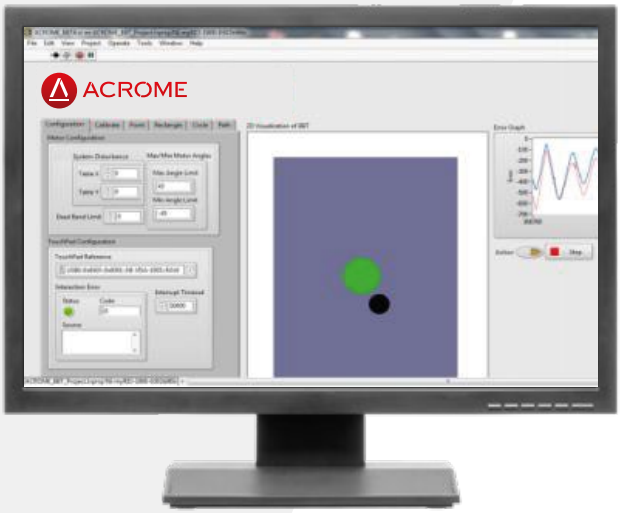
OVERVIEW

Balancing a ball on a table in a desired position is one of the most important and classical problems of control engineering. Advanced control techniques are used for the stability of the ball, which are very essential techniques in modern industrial control processes. Students have the opportunity to conveniently learn the essential aspects of control theory by experimenting.

OPEN-SOURCE CONTROLLER SOFTWARE

Ball Balancing Table is fully compatible with NI myRIO and Arduino. Completely open source system software makes it possible that students can modify and test their own developed control algorithms. Students can understand the effects of controller types on the system and can easily cover concepts of controller design. The system is also suitable for graduate studies for designing advanced controller types such as robust control, adaptive control and etc.





INTUITIVE SOFTWARE AND INTERFACE

The user interface allows students to understand the advanced control techniques for balancing problem easily. Beside the position control of the ball, students have the option to make the ball follow rectangular and circular paths. As a patented method students also have the option to draw their own paths on the table and make the ball follow the drown path.

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FEATURES

- Compatible with NI myRIO and Arduino
- Assembled and ready to control plant with the integrated power unit
- Implementation of advanced digital control techniques.
- Position feedback using a high precision touch surface (Camera based feedback is also possible)
- Actuating the table by RC servo motors, which are familiar to students
- Rectangular and circular path options are integrated into the software
- Enables students to create their own real-time algorithms.
- Open architecture with extensive courseware, suitable for undergraduate courses for engineering disciplines related to control systems
- Available in NI LabVIEW or Matlab/Simulink

CURRICULUM

COMPONENTS OF BALL BALANCING TABLE
RC Servo Motors
Touch Screen and Sensor
Microcontroller
Power Supply Box
Mechanics of the System

FUNDAMENTALS OF PWM
PWM Signaling Theory
Generating PWM Signals
Driving RC Servos with PWM Signals

SYSTEM MODELING
Lagrangian Method
Newton's Law of Motion
Modeling of Actuator
Obtaining Transfer Function

FEEDBACK IN CONTROL SYSTEMS
Reading Ball Position from Touch Screen
Derivative Filtering

PERFORMANCE MEASURES
Time Domain Characteristics
Steady State Response and Steady State Error

CONTROL SYSTEM DESIGN
Design of Linear Controllers
PID controller and Fuzzy Logic Controller
Comparing the Simulation and Real System *Responses for Different Controllers*

CONTROL SYSTEM VERIFICATION
Frequency response analysis
Experimental Bode Diagram
Cut-Off Frequency Determination

For more information on the solutions Acrome Offers, please visit the web site at: http://www.acrome.net