

Twin Rotor MIMO System TRMS



Key Features:

- MIMO system for real-time experiments
- Integration with MATLAB and Simulink for real-time controller generation
- The software enables rapid prototyping of real time control algorithms:
- Method of rapid prototyping of user-defined controllers
- Library of basic controllers and getting started teaching manual

The Twin Rotor MIMO System (TRMS) behaviour resembles that of a helicopter. From the control point of view it illustrates a high order nonlinear system with significant cross-couplings. A mathematical model design of TRMS needs knowledge of aero dynamical physical laws. The TRMS system has been designed to operate with a PC-based digital controller that communicates with the position, speed sensors and motors by a dedicated I/O. The I/O board is controlled by the real-time software which operates in the MATLAB / Simulink RTW/RTWT environment.

The TRMS consists of a beam pivoted on its base so that it can rotate freely both in the horizontal and vertical planes. At both ends of the beam there are rotors driven by DC motors. A counterbalance arm with a weight at its end is fixed to the beam at the pivot. The state of the beam is described by four process variables: horizontal and vertical angles measured by encoders fitted at the pivot, and two corresponding angular velocities.

Two additional state variables are the angular velocities of the rotors, measured by speed sensors coupled with the driving DC motors. In a real helicopter the aerodynamic force is controlled by changing the angle of attack. In the TRMS the angle of attack is fixed. The aerodynamic force is controlled by varying the speed of rotors. Significant cross-couplings are observed between actions of the rotors. Each rotor influences both position angles. A design of stabilising controllers for TRMS is based on decoupling.

Curriculum Coverage

- Step-by-step development of TRMS system nonlinear
- Linear and digital models
- Functionality of the Simulink models
- Digital real-time control principles
- Identification procedures
- Design and operation of linear controllers (PID, LQ, 1DOF and 2DOF)
- Non-linear control methods.

Labworks

A pre-programmed library of controllers and Simulink models supports the TRMS system

Specification

Motors	2 x 12V d.c. PWM controlled
Sensors	Beam position sensors : incremental encoders Rotor velocity sensors
Interface	I/O internal PCI or external USB board

Required

A suitable PC with minimum; Pentium processor, 1GB RAM, 20GB HDD, CDROM Drive, USB Interface and Windows XP or above

Ordering Information

Model Number:	MLS
<i>Consists of:</i>	1 x Twin rotor MIMO unit 1 x I/O board 1 x Manual 1 x Software CD with toolbox for MATLAB/Simulink

Weights and Dimensions

Un-Packed		Packed	
Approximate Dimensions (mm)	500W x 500D x 650H	Approximate Dimensions (mm)	600W x 600D x 800H
Approximate Weights	10Kg	Approximate Weights	15Kg

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