

WHAT IS φIDENT

φIdent lets you estimate the parameters of any dynamic multivariable system from measured input-output data.

INTRODUCTION

The main feature of the Global Identification technique is to estimate and validate models.

φIdent uses this technique to identify any parametric multi-input/multi-output model. It includes tools for loading data from disk files or from the Matlab workspace and for preprocessing measured data.

Highlights

Multi-input/multi-output model identification using time domain data; the model can be any parametric system defined by an M-file or build with SIMULINK

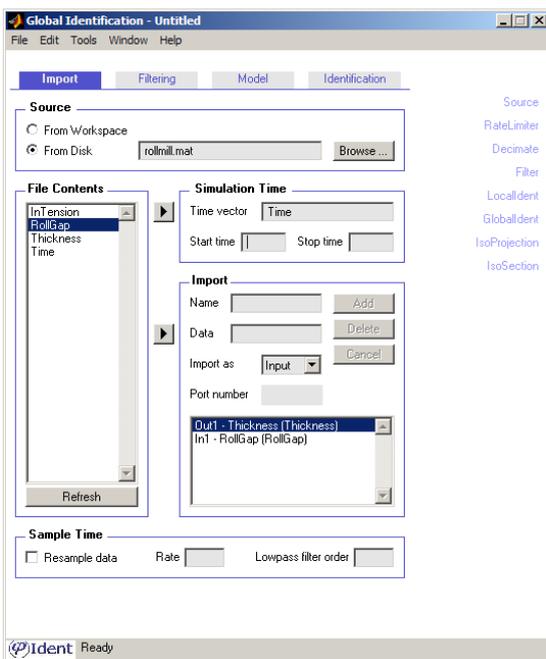
Specialized algorithms for identification of a continuous transfer function

Delay identification in continuous and discrete time

Original algorithm for validating model

Data preprocessing tools, including anomalies removal, resampling data and prefiltering

A Graphical User Interface



The graphical user interface helps you to step through the identification process. It lets you easily import, preprocess data and identify models

DATA IMPORT

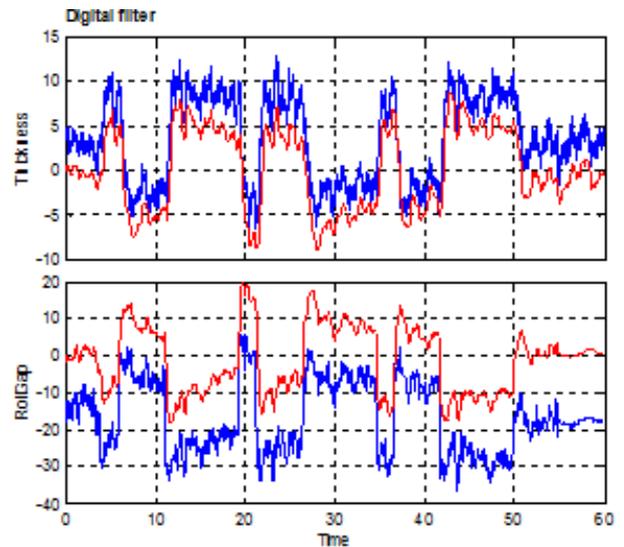
The Data Import tool helps you to import time-domain data to estimate a model. Data can be loaded from a disk file (ASCII or Mat-file) or from the MATLAB workspace. You can import data, assign names, specify start and stop times, and resample data at a lower rate to increase estimation speed and accuracy.

SIGNAL PROCESSING

Filtering is used to remove some sources of error:

- ✓ Highpass filter to remove data offset and process drift
- ✓ Lowpass filter to remove high-frequency disturbances
- ✓ Stopband filter to emphasize important frequency ranges in the data

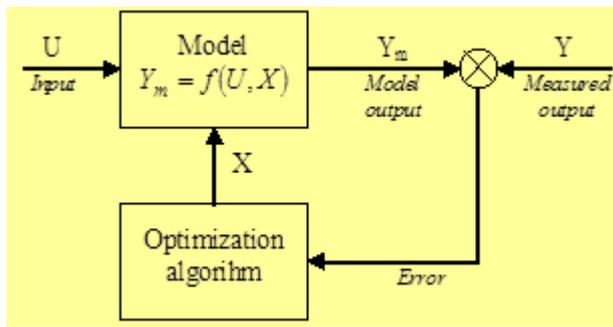
φIdent plots the results and helps you to select the best frequency range.



Parallel filtering is automatically done. This procedure preserves causal relation between input and output data.

A specific tool is used for the nonlinear systems.

ESTIMATING MODELS

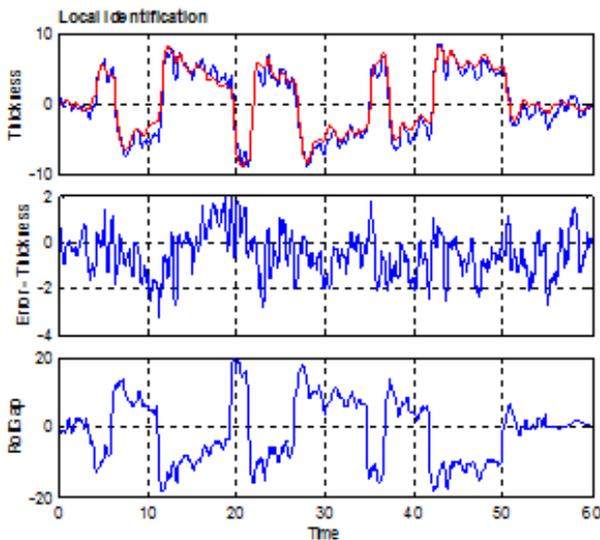


The Model Error Method (MEM), based on the analysis of the difference between model and measured outputs, can be used for any parametric multi-input/multi-output (MIMO) model.

With ϕ Ident you can identify several types of models:

- ✓ A continuous transfer function with time delay; also available for MIMO systems;
- ✓ A parametric model defined by an M-file;
- ✓ A dynamic system built with SIMULINK.

You can try different model structures to estimate the dynamic of the system. ϕ Ident helps you to validate the model by comparing the simulated output against measured output.



Parametric estimation uses nonlinear optimization algorithms such as Least Squares, Simplex Search Method, Gauss-Newton algorithm ... You can also create your own custom algorithm.

VALIDATING MODELS

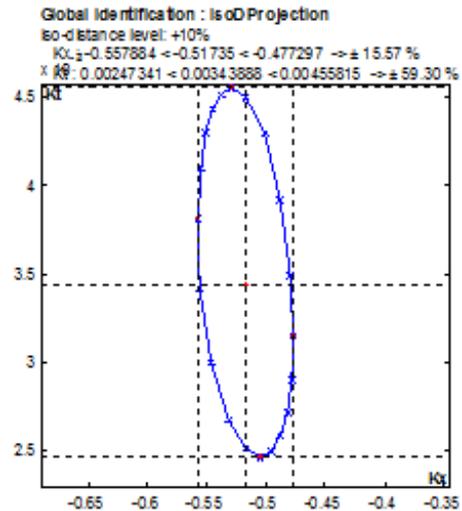
ϕ Ident provides two ways to determine the fitness of the identified model:

- ✓ Model output: indicates how well the model behavior was identified by comparing the model output against the measured output
- ✓ Global Identification: estimates the accuracy of the parameters

Parametric estimation yields a solution represented by a point in the parametric space. The aim of the *Global*

Identification is to find the uncertainty intervals for a given error level. The iso-distance (elliptic form) gives an indication of the relative distribution of information brought by the data on the parameters to identify.

Global Identification indicates if the experimental data are sufficient or not to identify the parametric model. ϕ Ident is a fundamental step in the design of experiments process.



GLOBAL IDENTIFICATION TOOLBOX

ϕ Ident is based on the *Global Identification Toolbox* developed on MATLAB.

It is an open and extensible toolbox, letting you create custom algorithms and models for your specific application.

REFERENCES

The *Global Identification* technique and all toolbox algorithms used by ϕ Ident are described in *Pratique de l'Identification*, Pr. Jacques Richalet, Hermès, 1991.



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