

DEMONSTRATION PROGRAMS

for

Figliola and Beasley,
Theory and Design for Mechanical Measurements,
Third Edition

SYSTEM REQUIREMENTS

These programs are Matlab m-files, requiring at minimum either the Student Edition of Matlab version 5.0 or regular Matlab version 5.0, installed on either Windows PC or Macintosh. Either installation should include the standard package of Matlab toolboxes, which includes the User Interface Toolbox. Macintosh users will need Stuffit Expander to complete installation of these Demonstration Programs. Most of these m-files should be portable to other platforms (except the sound feature of DataSpect may be problematic), but this was not tested.

PC INSTALL

Create a new directory on your hard drive, "C:\Book_m" for instance.

Copy the contents of the "PC" subdirectory on this CD to your new directory.

In Matlab, use the path browser to add your new directory to the Matlab search path and save the new path. Otherwise these programs will not work if you use any working directory other than your install directory. This is particularly important when you use the DataSpect program and import your experimental data sets from other directories.

If you are using Matlab in a network environment, you may find that the search path reverts to a network default each time you log on, so your path changes are lost. In that case you will have to repeat the add path operation each time. Your network administrator may be able to overcome this problem.

Macintosh INSTALL

Create a new folder on your Mac hard drive, "Mac HD:Book_m" for instance, and copy the two files from the "Mac" subdirectory on this CD to your new folder. One file is just the Mac-formatted version of this ReadMe file. The other is "BOOKCD.SIT," a Stuffit archive. Use Stuffit Expander to unpack this file into your new folder.

In Matlab, add your new folder to the search path as described above for PC installation.

CONTENTS

There are seven functions to demonstrate concepts of signal characteristics and measurement system response dynamics. Most of these functions have one or more command-line options to accommodate custom inputs, but all can be invoked by simply typing the function name on the command line.

MainSwitch.m Opens a window that summarizes the seven functions and provides buttons to activate them. Select "help" from the MainSwitch menu for more information on the operation of these programs, and how to change display fonts.

FourCoef.m Demonstrates the calculation of Fourier sine and cosine coefficients for several periodic wave-forms, and displays the partial Fourier series sum.

FunSpect.m Takes samples from one of the functions provided, and displays the spectrum of the sample set. Function bandwidth and sample number are limited to prevent aliasing and spectral leakage.

DataSpect.m Takes an experimentally sampled data set and displays the spectrum. Matlab variable data, ASCII text data files, and Microsoft .WAV files are supported.

FirstOrd.m Displays the time-response of a first-order measurement system to several forcing functions, including thermal step and the start-up transient and steady responses to a simple harmonic input.

SecondOrd.m Displays the time-response of a second-order measurement system to several forcing functions, including mechanical step and the start-up transient and steady responses to a simple harmonic input.

MultiSys.m Displays the intermediate responses and the output response of multiple first- and/or second-order systems coupled in series. The start-up transient response to a square wave forcing function is shown, and also a generic step and the steady response to a simple harmonic input. In Design mode all the system parameters can be adjusted, and the frequency-domain response plots for the system are shown.

Sampling.m Takes samples from a function, and displays the spectrum of the sample set. Multiperiodic, broad-band, and user-defined functions are available, and the user has full control of sampling frequency and sample number.

Data files Several example data files for DataSpect are included (in the \Data directory) and also some example wave functions for use with Sampling.

HELP

Each of the functions follows the Matlab convention, that a brief function summary is available by typing "help functionname" on the command line.

If your "Book_m" directory is added to the Matlab search path, these summaries will also be indexed through the Matlab help window. In addition, more extensive documentation of each function is available by typing "functionname help" on the command line, or by selecting the "functionname" menu - "help" submenu when the function window is active.

If an error occurs, the displays may become very slow. This seems to be due to an error-checking process within Matlab, particularly in the Macintosh version. If this happens, bring the offending window to the front and then push control-c several

times, until the Matlab Command Window is brought to the front. This should restore fast performance.