Electric lab-assistant

Engineering Applications using Matlab
TNG016

ED3:

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1 Introduction

The personal computer is at the center of attention for a large portion of our daily lives. In electronics education and research it is used to write code, design and simulate circuits, take measurments and to write about the the results. This project focuses on the borderlands between the latter two; connecting lab equipment and results presentation.

1.1 Background

Doing lab work often includes tedious, repetitive and time-consuming tasks. Some times good solutions are lacking, for example when a large series of values need to be measured at different signal frequencies, or when students are encouraged to take photographs of the oscilloscope screen for presenting in lab reports.

1.2 Purpose

The goal of this project was to investigate weather Matlab could be used to create a common interface to speed up and streamline electronic lab tasks and documentation.

1.3 Method

Matlabs tools for graphical user interfaces were used in conjuction with the GPIB-bus to create software for controling both input and output of an experiment, aswell as

2 Lab-Assistant

The user interface of Lab-Assistant is designed to be intuitive and user-friendly. When launched the user is met by three empty columns, each with a popup-menu at the top. The columns are called *input*, *output* and *export*, each with a set of 3-4 different options. Using different combinations of these options, a variety of tasks can be performed.

2.1 Inputs

Lab Assistant supports two types of devices for input; function generators and voltage generators. The function generator can also be used to generate a frequency sweep.

Function Generator

Uses function generator to output a signal. The *waveform* popup-menu sets the signal type to sine, square, triangle or sawtooth. If no waveform is selected the current waveform of the function generator is used. *Frequency*, *amplitude* and *offset* controlls the parameters of the output. In order to establish a connection to the function generator its GPIB-address must be put into the *GPIB-address* field.

Frequency Sweep

The function generator can also be used to generate a Bode plot of a connected system. When *frequency sweep* is selected as input, output is automatically set to *bode graph* and no other outputs can be chosen. Available settings for the sweep are *start frequency*, *end frequency*, *step length* and *amplitude*. GPIB-address must allso be filled in as described above.

Voltage Generator

The other device supported is the voltage generator. Apart from *GPIB-Address* of the voltage generator, the available settings are *voltage* and *current limit*. Output can be toggled with the *output on/off* push-button.

2.2 Outputs

Two methods of gathering output data are available

Oscilloscope

The oscilloscope has two functions, picture and measurement. The picture option practicaly takes a copy of the oscilloscope screen and shows it in the panel. The measurement option is used for getting the graph and plot it without all extra information the oscilloscope shows. The plot is then displayed in the panel. After entering the *GPIB address* for the oscilloscope, the *Start* button will execute the option chosen.

Multimeter

The multimeter function is just a multimeter, that displays the value in the panel. It's not possible to store the value as it is with a picture.

Bode Graph

When the frequency sweep is chosen in the input panel it automaticaly chose the bode graph in the output panel. The Bode Graph only works with the frequency sweep as the start button is placed in the input panel. The plot is shown in the output panel.

2.3   Exports

The program has four different choices for exporting the obtained data; copy to clipboard, save as image, create LaTeX report and create Microsoft Word report.

Clipboard

Copies the figure to clipboard. Textboxes enable the user to modify title and axis labels before copying.

Image

Saves the image to disk. Textboxes enable the user to modify title and axis labels before copying.

LaTeX

Generates LaTeX report containing the figure. *Image name* textbox enables user to choose file name and format for the figure, which will be saved at the same location as the tex-file. *Caption*, *label* and *width* properties are transferred to corresponding LaTeX commands, while tite and labels are applied directly to the figure before exporting.

Word

Generates Microsoft Word report containing the figure. *Title*, *x-label* and *y-label* overrides the settings of the figure and the caption is inserted on a centred line below.

3   Examples

4   Conclusion