eistoolbox manual v0.1
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Contents

Chapter 1

Introduction

eistoolbox is a toolbox for MATLAB® used for batch fitting Electrochemical Impedance Spectroscopy (EIS) data to equivalent circuits.
Presently it is **alpha software**, and it will evolve over time.

1.1 Current capabilities

It can accept any number of input files, both in CSV and Gamry DTA formats.
The CSV files should contain three columns with the impedance data, in the order: FREQ,REAL,IMAG.
The imaginary part can be positive or negative; the absolute value is taken inside the program before plotting.
The fitting algorithm uses the "fminsearch" function, implemented using the Zfit library from Jean-Luc Dellis.
It accepts any type of circuit model, built with serial and parallel elements, in the Zfit circuit string format.
The currently implemented elements are: resistors, capacitors, inductors and constant-phase elements (CPE).
The Warburg element can be implemented by using a CPE and setting the second parameter to 1/2.

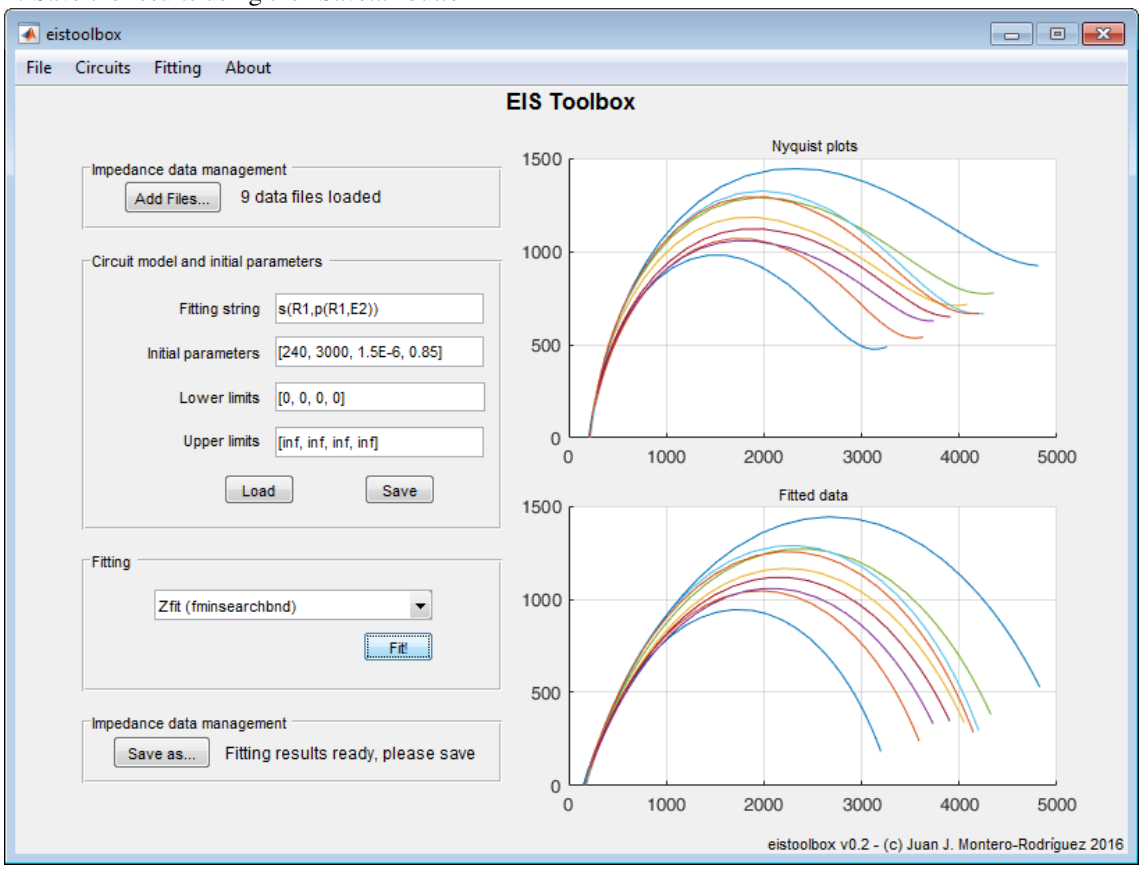
1.2 Planned updates

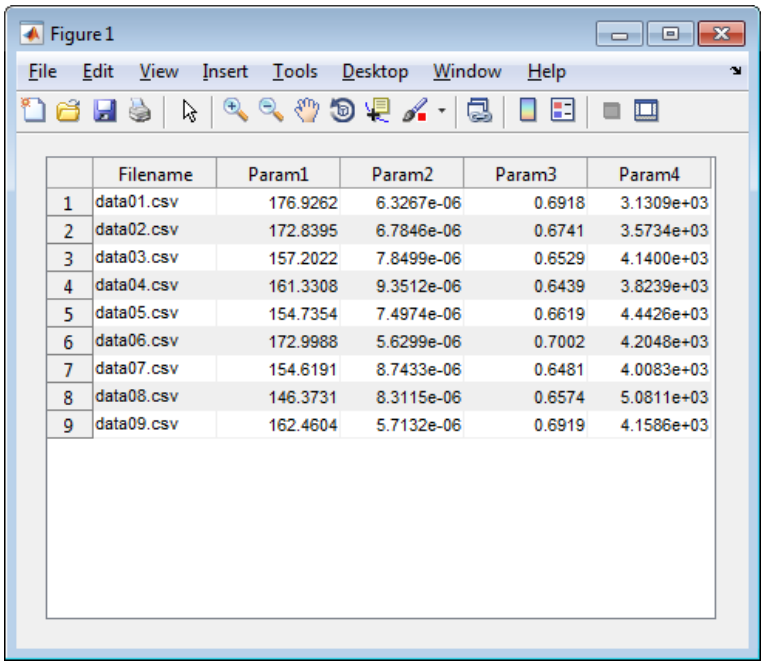
In the future it will accept Levenberg-Marquard, Nelder-Mead, BFGS and Powell algorithms.
It will also include the error percentages of every fitting parameter, as well as the Pearson coefficient and correlation plot of the fitting results.

Chapter 2

Quick start guide

1. Add files using the "Add file..." button
2. Write the circuit string and fitting parameters
3. Click the "Fit" button
4. Save the results using the "Save..." button





	Filename	Param1	Param2	Param3	Param4
1	data01.csv	176.9262	6.3267e-06	0.6918	3.1309e+03
2	data02.csv	172.8395	6.7846e-06	0.6741	3.5734e+03
3	data03.csv	157.2022	7.8499e-06	0.6529	4.1400e+03
4	data04.csv	161.3308	9.3512e-06	0.6439	3.8239e+03
5	data05.csv	154.7354	7.4974e-06	0.6619	4.4426e+03
6	data06.csv	172.9988	5.6299e-06	0.7002	4.2048e+03
7	data07.csv	154.6191	8.7433e-06	0.6481	4.0083e+03
8	data08.csv	146.3731	8.3115e-06	0.6574	5.0811e+03
9	data09.csv	162.4604	5.7132e-06	0.6919	4.1586e+03

Chapter 3

Algorithms

3.1 fminsearchbnd

Currently it supports only the fminsearchbnd function from Zfit.m

Chapter 4

Statistics

The program computes the following statistical parameters:

4.1 Linear regressions

Real of fitted vs Real of measured
Imag of fitted vs Imag of measured
MAG of fitted vs MAG of measured

4.2 Chi-square goodness of fit

$$\chi^2 = \sum_i^n \frac{(Observed_i - Expected_i)^2}{Expected_i}$$

Observed= fitted data
Expected= measured data

4.3 Error estimates for individual parameters

ToDo

Chapter 5

Licenses for included software

5.1 Zfit

The original file was released in 2005 and it is available here:

https://de.mathworks.com/matlabcentral/fileexchange/19460-zfit