

# Instructions for Hooke\_Jeeves\_Student3 method of FM signal analysis

Original LabWindows CVI version by Gregory Kyriazis, InMETRO

## Citation:

Kyriazis G. A., "Estimating parameters of complex modulated signals from prior information about their arbitrary waveform components," IEEE Trans. Instrum. Meas., v. 62, no. 6, pp. 1681-1686, June 2013.

## Citation:

Kyriazis G. A., "A Cartesian method to improve the results and save computation time in Bayesian signal analysis," in Advanced Mathematical and Computational Tools in Metrology and Testing X (AMCTM X), Series on Advances in Mathematics for Applied Sciences, vol. 86, F. Pavese; W. Bremser; A.G. Chunovkina; N. Fischer; A.B. Forbes (eds.), World Scientific, 2015, pp. 229-240.

Ported to MATLAB by Allen R Goldstein, NIST

This software was developed by employees of the National Institute of Standards and Technology (NIST), an agency of the Federal Government and is being made available as a public service. Pursuant to title 17 United States Code Section 105, works of NIST employees are not subject to copyright protection in the United States. This software may be subject to foreign copyright. Permission in the United States and in foreign countries, to the extent that NIST may hold copyright, to use, copy, modify, create derivative works, and distribute this software and its documentation without fee is hereby granted on a non-exclusive basis, provided that this notice and disclaimer of warranty appears in all copies.

THE SOFTWARE IS PROVIDED 'AS IS' WITHOUT ANY WARRANTY OF ANY KIND, EITHER EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY THAT THE SOFTWARE WILL CONFORM TO SPECIFICATIONS, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND FREEDOM FROM INFRINGEMENT, AND ANY WARRANTY THAT THE DOCUMENTATION WILL CONFORM TO THE SOFTWARE, OR ANY WARRANTY THAT THE SOFTWARE WILL BE ERROR FREE. IN NO EVENT SHALL NIST BE LIABLE FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, ARISING OUT OF, RESULTING FROM, OR IN ANY WAY CONNECTED WITH THIS SOFTWARE, WHETHER OR NOT BASED UPON WARRANTY, CONTRACT, TORT, OR OTHERWISE, WHETHER OR NOT INJURY WAS SUSTAINED BY PERSONS OR PROPERTY OR OTHERWISE, AND WHETHER OR NOT LOSS WAS SUSTAINED FROM, OR AROSE OUT OF THE RESULTS OF, OR USE OF, THE SOFTWARE OR SERVICES PROVIDED HEREUNDER.

## First use: Test script Hooke\_Jeeves\_Student3.m

1. Open Matlab and navigate to the working folder F:\Projects\SpectralToolkit\Sandbox\FM\_Kyriazis\Matlab
2. Add the folder to the MATLAB path if not already added
3. Run the script: Hooke\_Jeeves\_Student3.m which contains the following function calls
  - a. `HJS = FM_HJS_Class()` % Instantiate the class
  - b. `HJS.configure()` % Configure the properties
  - c. `HJS.mod_Freq_NLS()` % NLS analysis of modulating signal Frequency
  - d. `HJS.mod_Amp_NLS()` % Modulating signal Amplitude and Phase from NLS
  - e. `HJS.plot('NLS')` % Plots the NLS analysis results
  - f. `HJS.Freq_BSA()` % BSA analysis of modulated signal
  - g. `HJS.Ampl_BSA()` % Modulated signal amplitudes and phase from BSA
  - h. `HJS.plot('BSA')` % Plots the BSA analysis results

## [Read the FM\\_HJS class documentation](#)

The class is fully documented. On the MATLAB command line, type “doc FM\_HJS\_Class”.

The documentation will open. In the documentation are links for all properties and methods of the class. Click on each of those for documentation of the property or method.

For example, the class constructor accepts a set of name,value pair arguments. If the argument is not included in the call to the constructor, then the default settings will apply: in the MATLAB documentation on the class, click on the Constructor Summary FM\_HJS\_Class to see full documentation of the arguments as follows:

The constructor accepts name,value pair arguments. If the argument is not included in the constructor call the default value will ne used. the arguments and their default values are shown here:

Example: FM\_HJS\_Class(Name1,Value1,Name2,Value2,...NameN,ValueN,)

| Argument           | Name | , type                    | , default value   | % comment  |
|--------------------|------|---------------------------|---|--|
| 'Name'             |      | , char                    | , 'default FM_HJS'  | %  |
| 'SampleRate'       |      | , double                  | , 1/.00006520   | %  |
| 'Duration'         |      | , double                  | , 8000/defaultSampleRate  | % signal duration in seconds   |
| 'SignalParams'     |      | , 15 x 1 array of doubles | , [1,49.9876543210,0,0,0,0,4.9876543210,5,0,0,0,0,0,0]                                      | % See the SignalParams property description                                |
| 'PhaseNoiseParams' |      | , struct                  | , struct('NoiseUniformLow',0,'NoiseUniformHi',0,'NoiseGaussMean',0,'NoiseGaussSD',0.000001) | %  |
| 'AmplNoiseParams'  |      | , struct                  | , struct('NoiseUniformLow',0,'NoiseUniformHi',0,'NoiseGaussMean',0,'NoiseGaussSD',0.000001) | %  |
| 'ModNoise'         |      | , logical                 | , 'true'  | % if true, phase noise will be added to the simulated modulating signal    |
| 'SigNoise'         |      | , logical                 | , 'true'  | % if true, Amplitude noise will be added to the simulated modulated signal |
| 'NumHarm'          |      |                           | , 3   | % Number of harmonics to use during NLS and BSA analysis                   |
| 'GenModData'       |      |                           | , []  | % Uploaded modulating signal. If empty, a simulated signal will be created |
| 'GenData'          |      |                           | , []  | % Uploaded modulated signal. If empty, a simulated signal will be created  |
| 'Verbose'          |      |                           | , 'true   | % If true, computed values will be displayed in the console                |