Topic 2
Signal Pre-Processing

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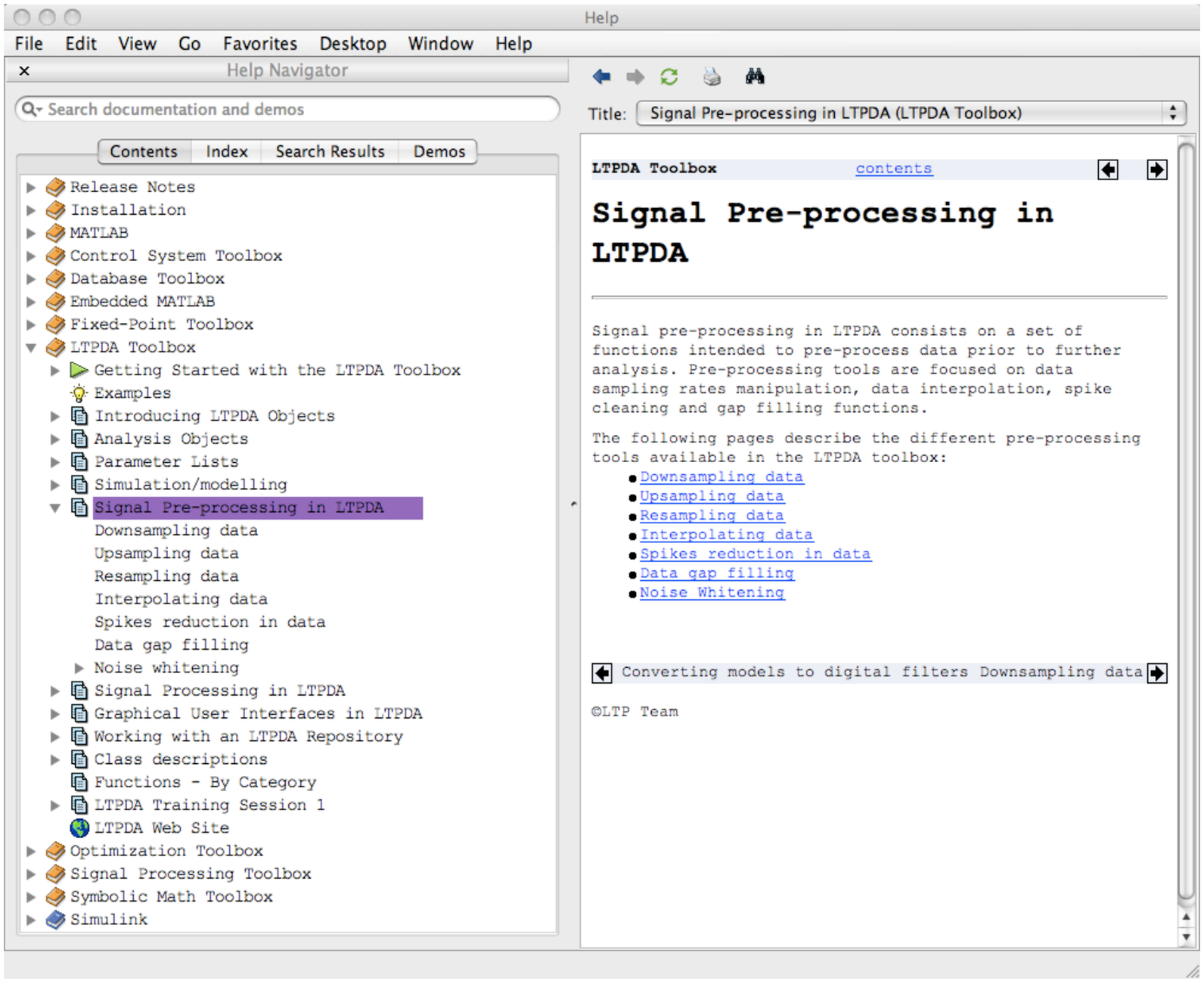
Data Pre-processing

- data preparation for further analysis
- toolbox preserves a bunch of function for
  - resampling
  - interpolation
  - basic fitting routines (detrend)
  - noise whitening
  - selecting methods

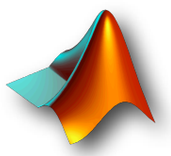
Documentation

LTPDA Toolbox - Signal Pre-processing in LTPDA



Changing the sample rate

- Integer factor
  - Down-sample - to reduce data load
  - Up-sample - to match sample rates
- Re-sample
  - fs_out = P/Q * fs_in (P and Q are integers)



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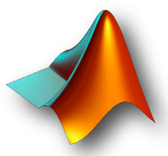
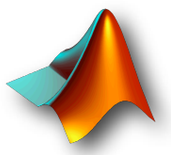
Parameters

Downsample	Upsample	Resample
offset	delay	filter

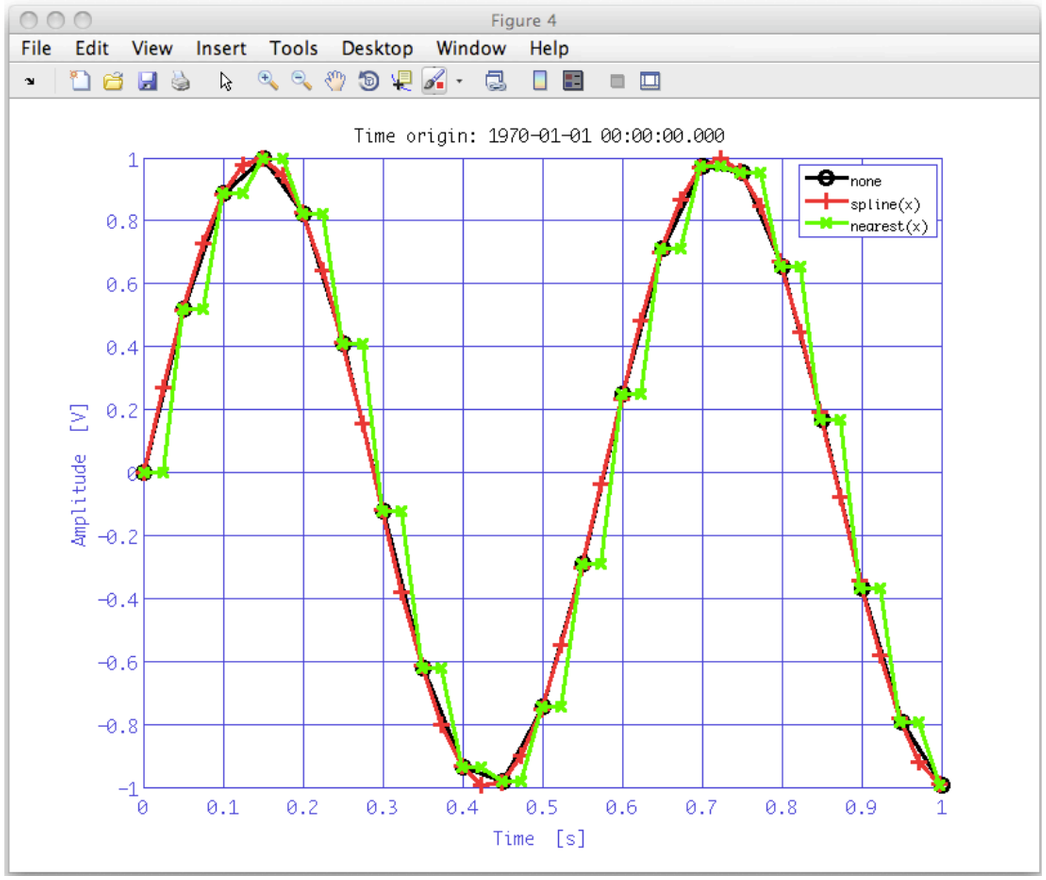


Topic 2
Exercises 1,2,3

- Open MATLAB documentation
  - In the MATLAB terminal
    - >> doc
  - “Help -> Product Help>”
- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - Downsampling
    - Upsampling
    - Resampling



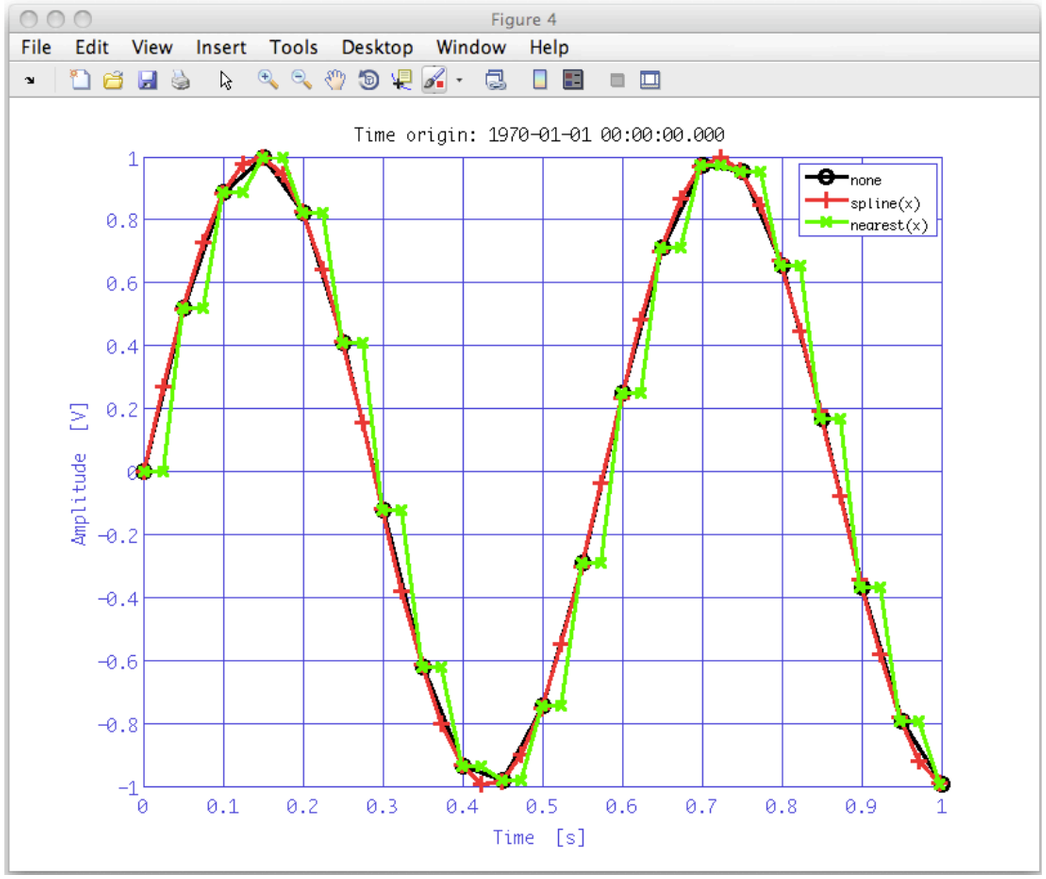
Interpolation



- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - Interpolation

Interpolation

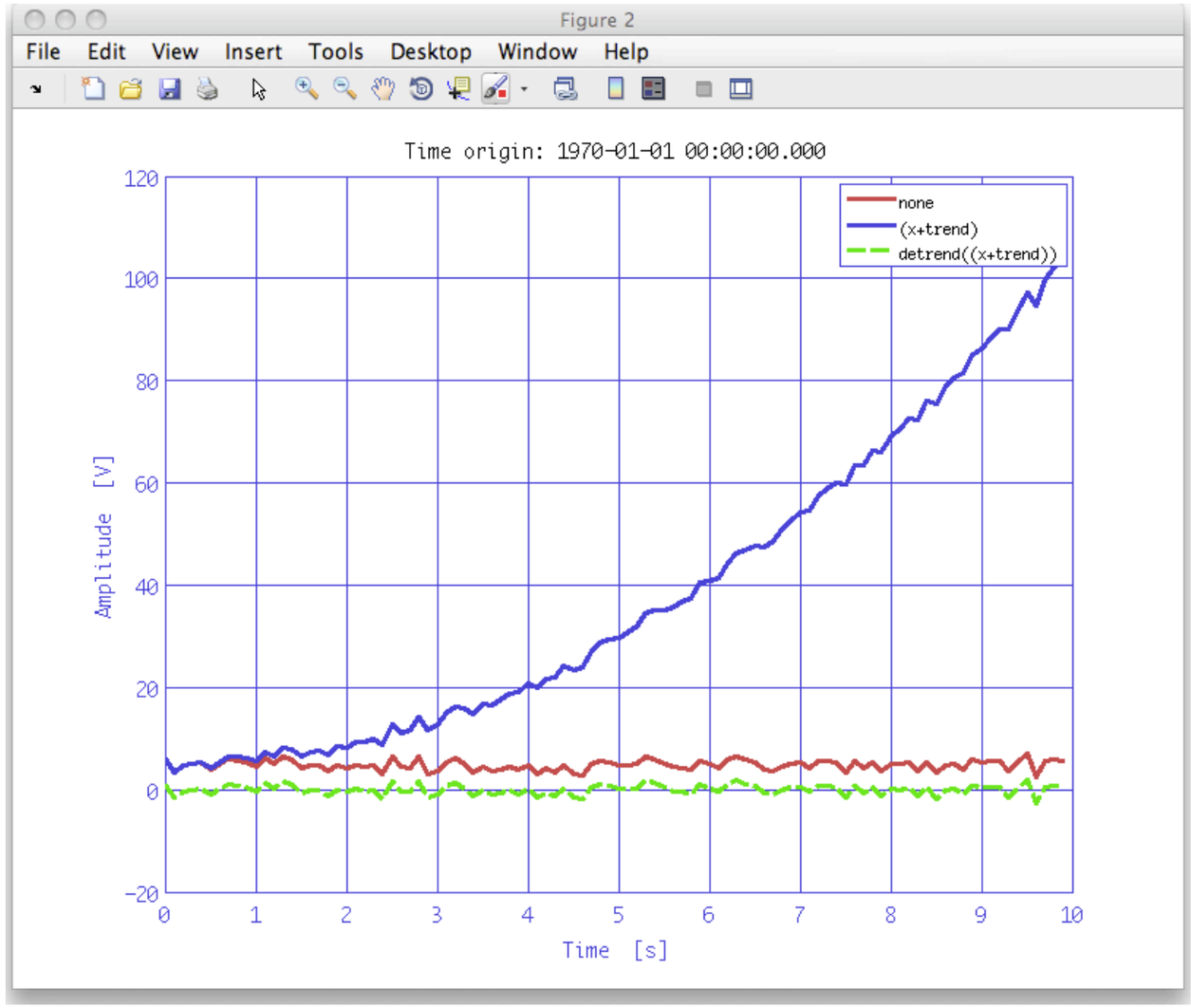
‘vertices’	new time grid
interpolation methods	
‘linear’	linear
‘spline’	spline
‘cubic’	cubic
‘nearest’	nearest



- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - Interpolation

Detrending

- Remove trends by
  - subtracting polynomial fit from data
- ao/detrend calls MATLABs polyfit
- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - Interpolation



Whitening

- The LTDA Toolbox offers various ways to white your data
  - with a known filter
    - build filter and apply it to your data
  - with a known model of spectral content
    - use whiten1D
      - for single, uncorrelated data streams
    - whiten2D
      - for a pair of correlated data streams
  - without model (Exercise)
    - let whiten1D fit a model to the spectrum of your data

- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - whitening

Select & find/ split & join

- Chose the samples you want to analyse
  - find/select data samples by its properties
    - sample numbers - ‘select’
    - query for x and y values - ‘find’
  - split data by
    - intervals, times, frequencies, samples
- Group of functions helps you to
  - for find and select exactly the data you want split your data into pieces and eventually
  - join them back together

- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - select and find
    - split and join

Pre-processing the IFO/Temp example

- One function that combines all necessary operations
  - consolidate
- consolidate fixes our two data streams such that
  - they start at the same time
  - they have the same sampling rate
  - are evenly sample on the same grid

- work through
  - LTPDA Toolbox - LTPDA Training Session 1 Topic 2
    - IFO/Temp example