

The ITA-Toolbox: An Open Source MATLAB Toolbox for Acoustic Measurements and Signal Processing

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Motivation

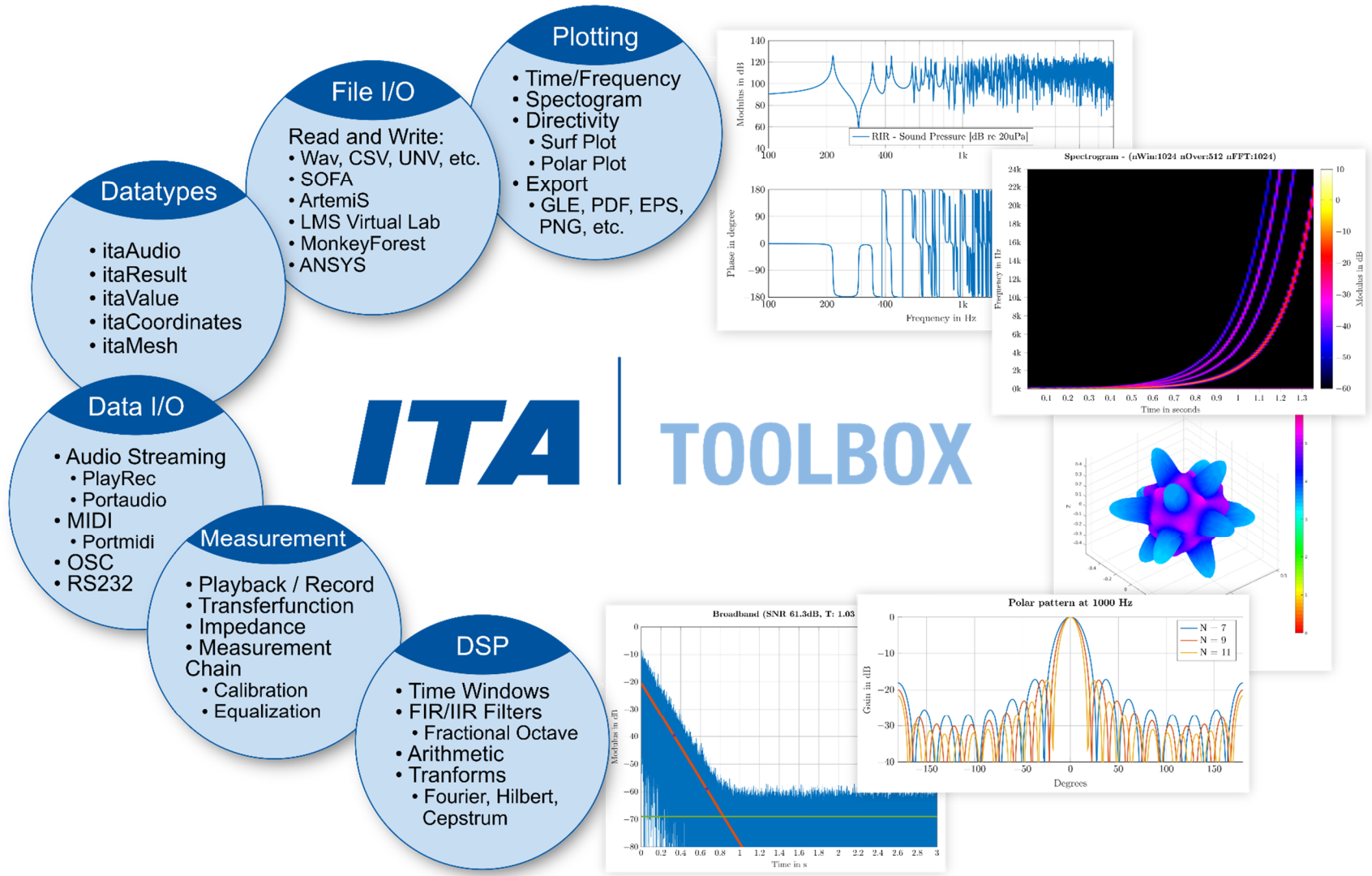
- Unified routines
- Complete workflow in MATLAB
- Cross platform

- Until 2016:
 - Developed mainly at the Institute of Technical Acoustics [1]
 - Core source code available as download
- Recently:
 - Moved development to public GitLab [2] repository
 - Development open to everyone
 - BSD-License

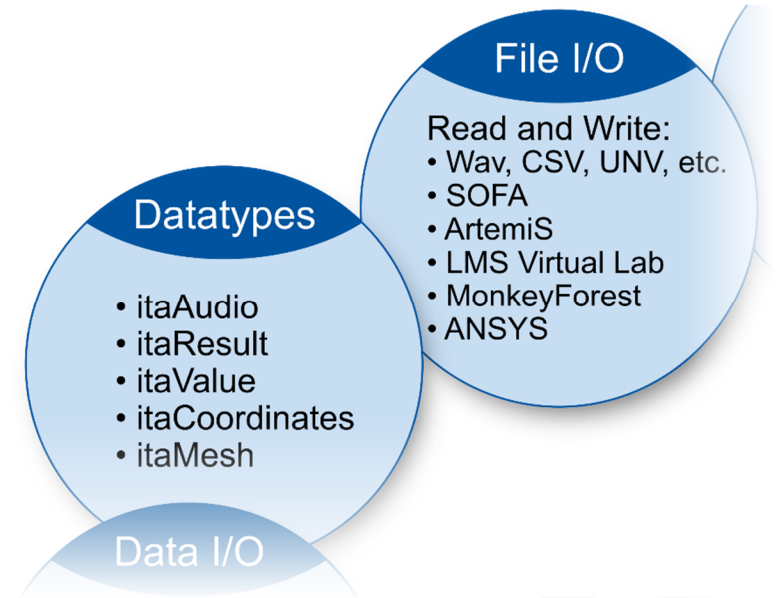
[1] – Dietrich, Masiero, Müller-Trapet, Pollow, Scharrer - MATLAB Toolbox for the Comprehension of Acoustic Measurement and Signal Processing, 2010

[2] – RWTH Aachen GitLab Server - <https://git.rwth-aachen.de/ita/toolbox>

Overview

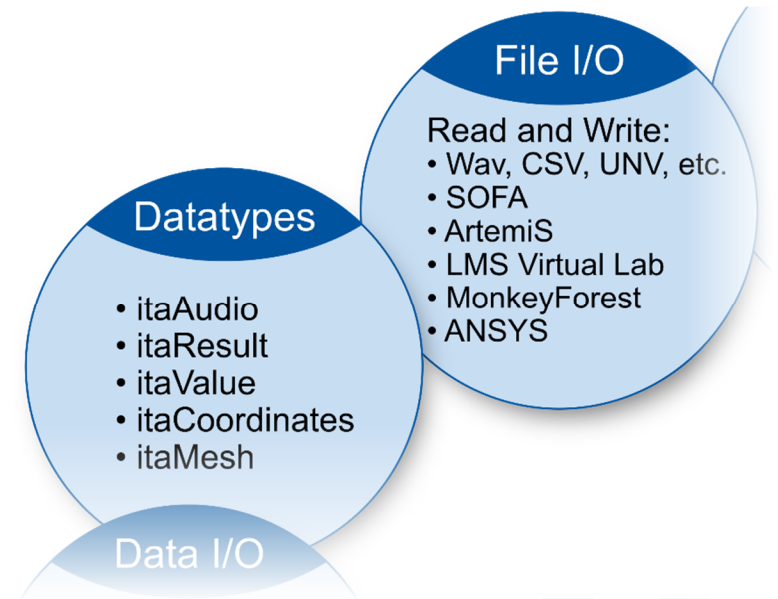
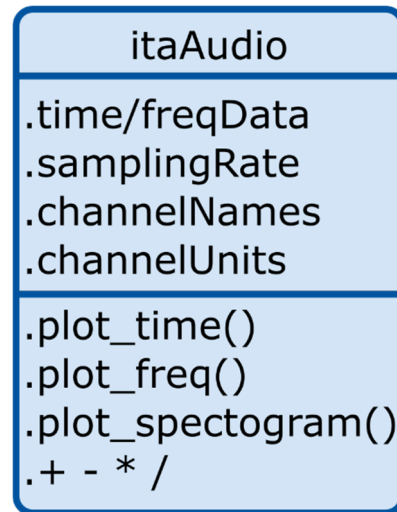
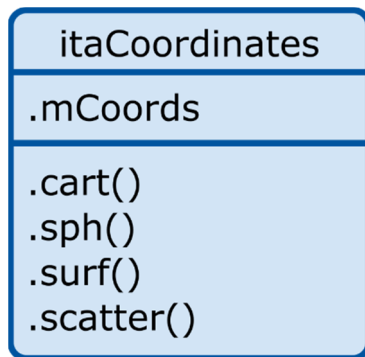


Data Formats



Data Formats

- Implemented as class objects
 - Store meta data
 - Support individual methods and operators
 - Sharing via Export/Import functions
 - Store history



Plot Functions

Plotting

- Time/Frequency
- Spectrogram
- Directivity
 - Surf Plot
 - Polar Plot
- Export
 - GLE, PDF, EPS, PNG, etc.

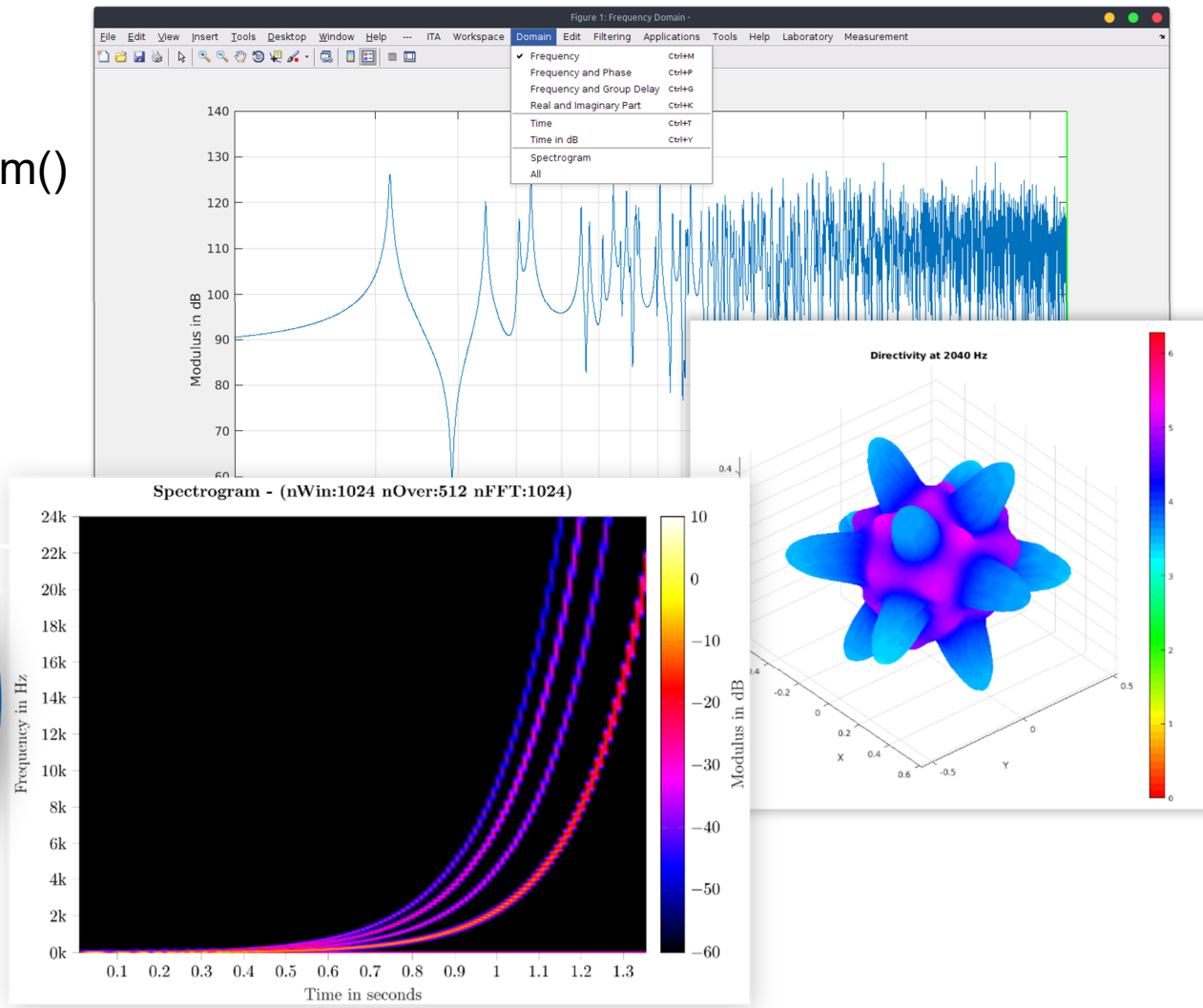
tc.

Plot Functions

- `itaAudio.plot_freq()`
- `itaAudio.plot_spectrogram()`
- `itaCoordinates.surf()`

Plotting

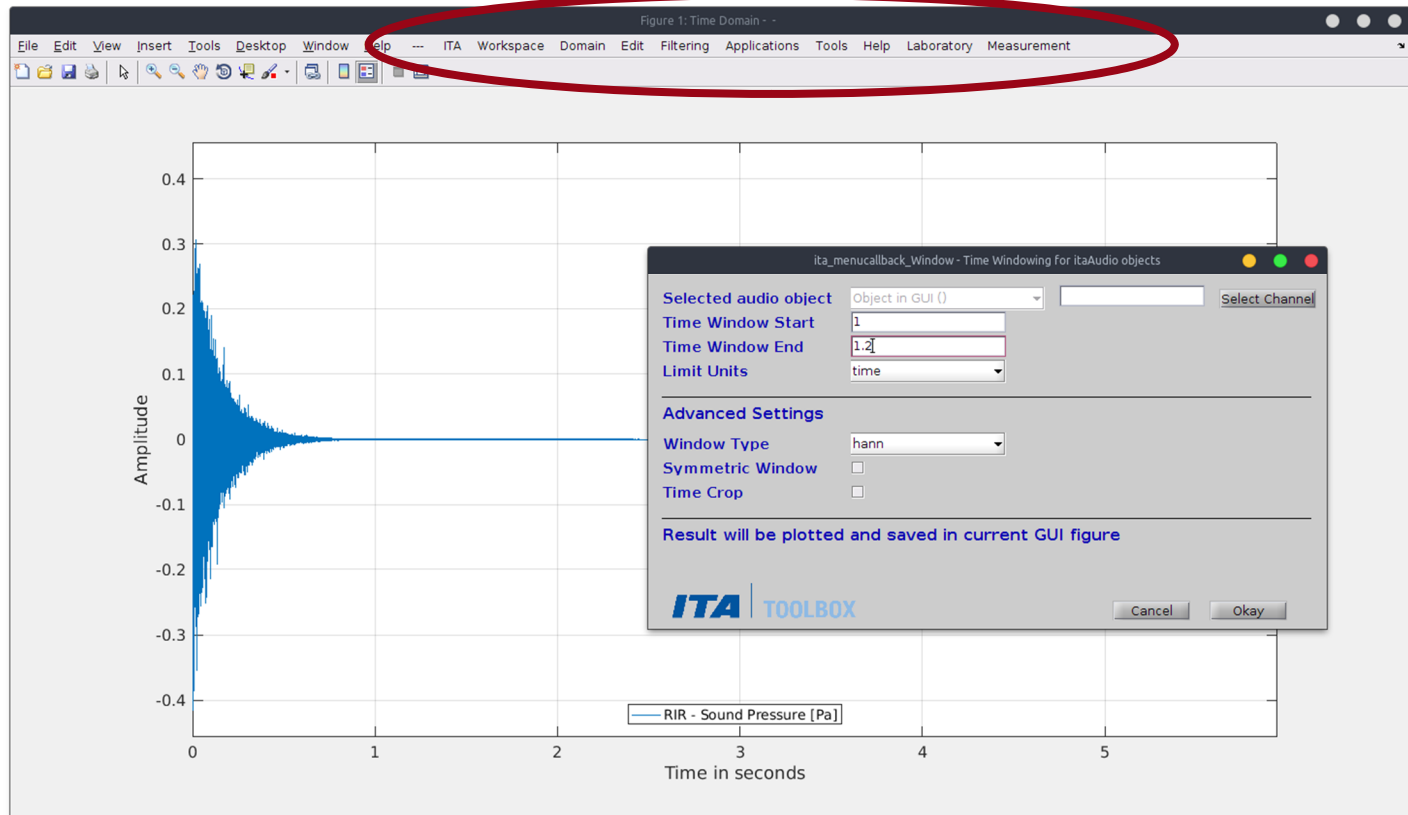
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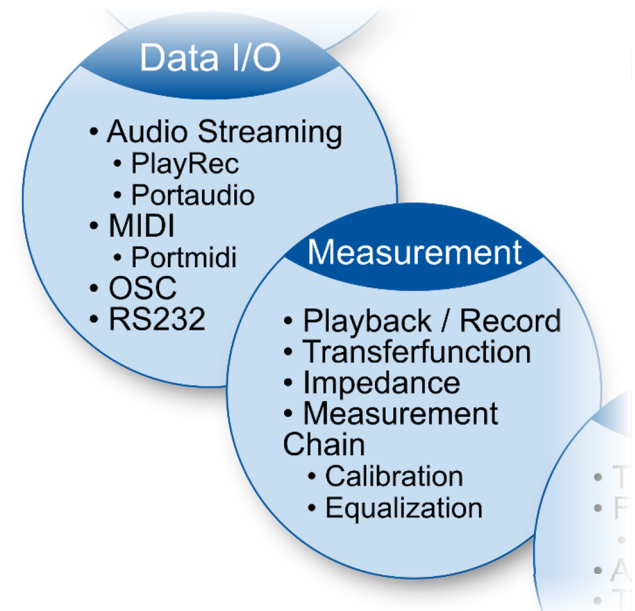
Plot Functions

GUI callbacks with hotkey support

- Step through channels
- Change domain
- Scale axes
- Set limits
- Set cursors
- Access DSP Functions



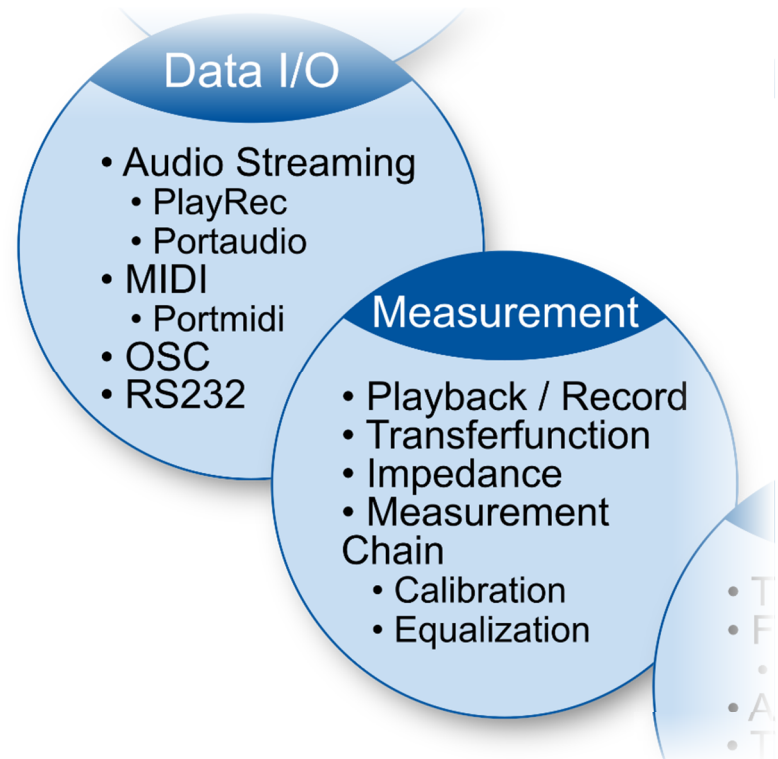
The Measurement Objects



The Measurement Objects

Measurement Classes

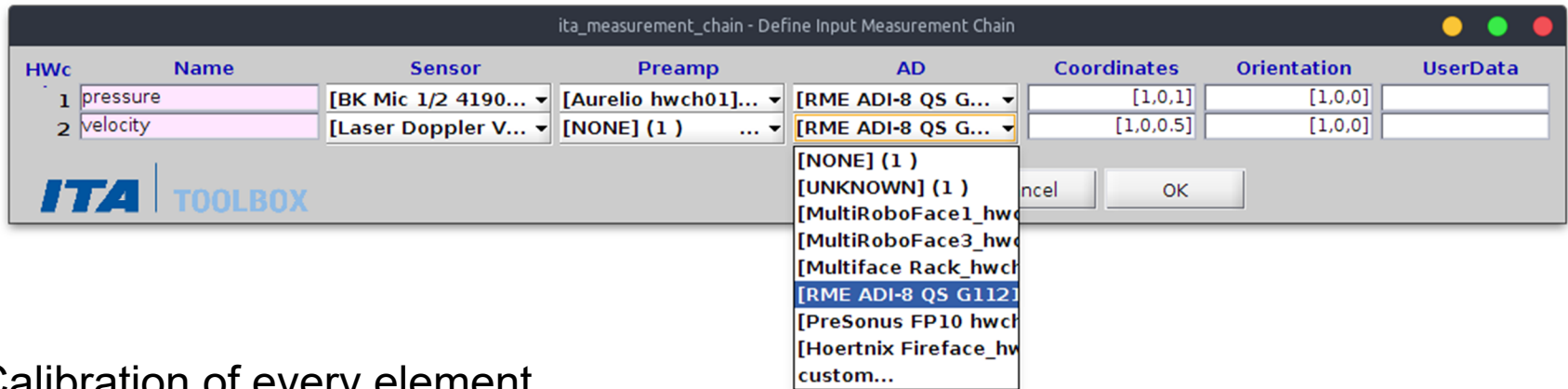
- Playback / Record
- Transfer function
- Instrument control
- Interleaved sweeps
- Supports:
 - Excitation signal generation
 - Custom excitation signals
 - Compensation signal generation with regularization
- Communication with audio interfaces via PlayRec [1] / Portaudio [2]



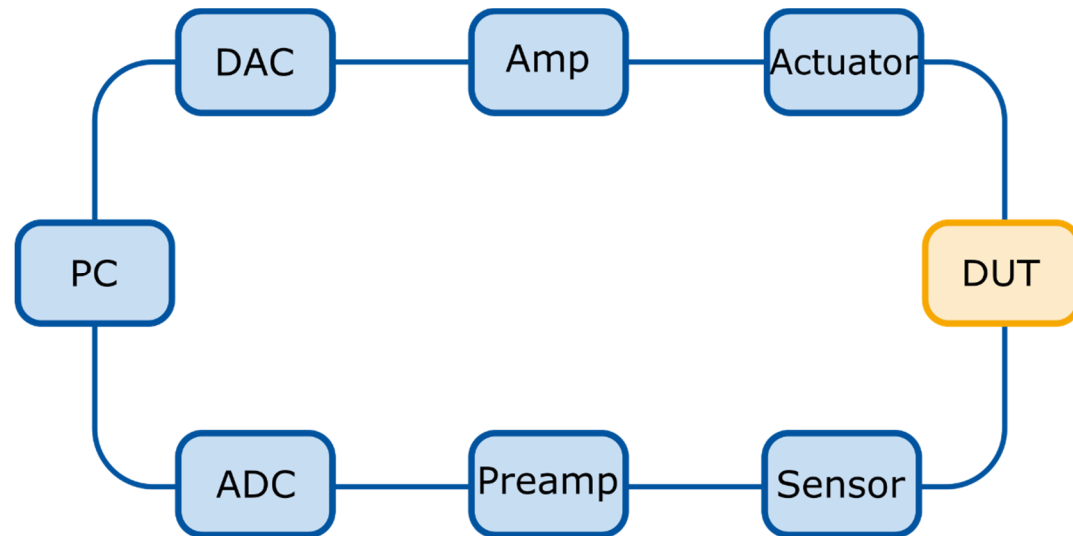
[1] – PlayRec – <http://www.playrec.co.uk/>

[2] – Portaudio – <http://www.portaudio.com/>

The Measurement Chain

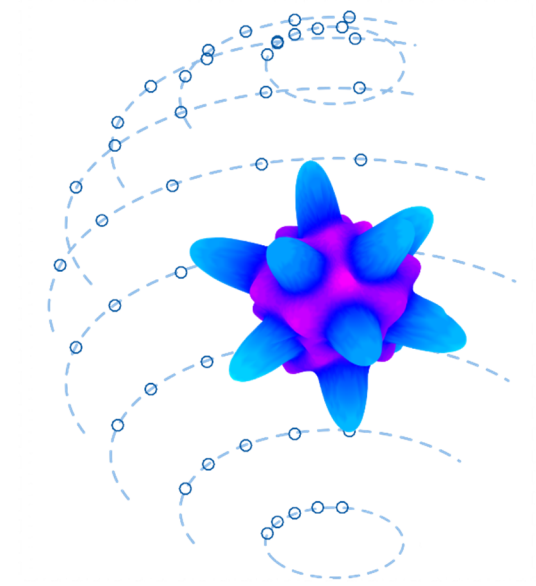


- Calibration of every element
- Metadata
 - Units
 - Names
 - Coordinates & Orientation
- List of known devices with their sensitivity values



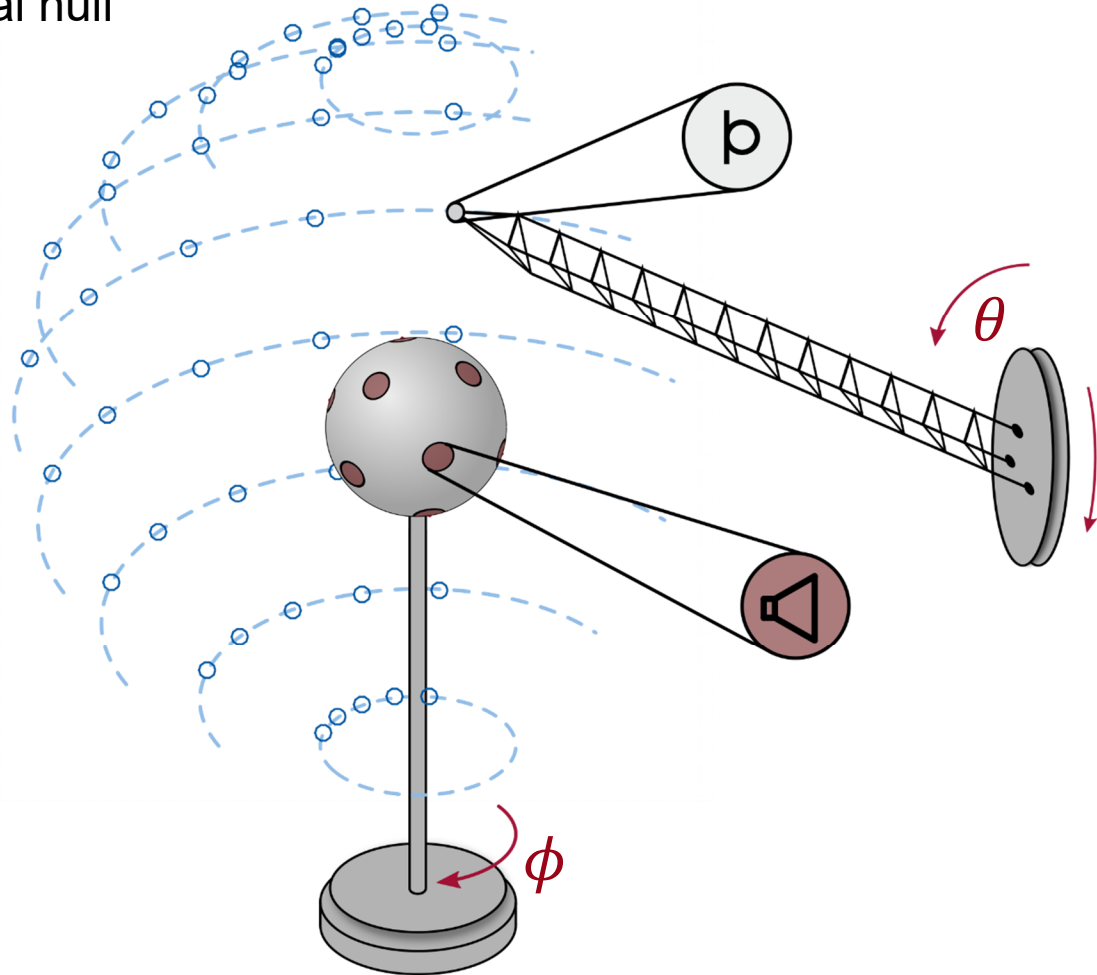
Example: Directivity Measurement

Let's put some things together

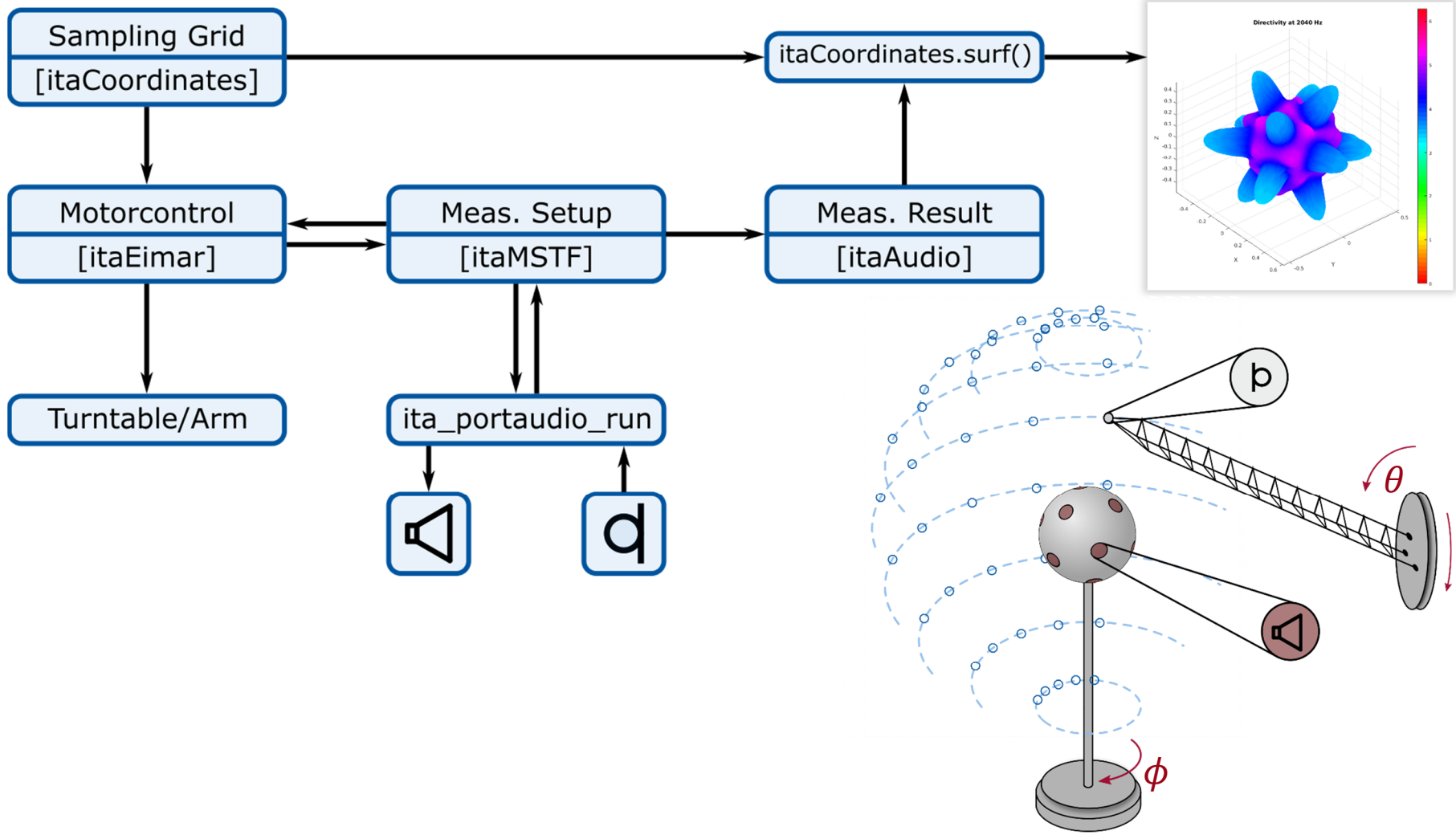


Example: Directivity Measurement

- Sample directivity on a spherical hull
- Control additional equipment
- Measure transfer function



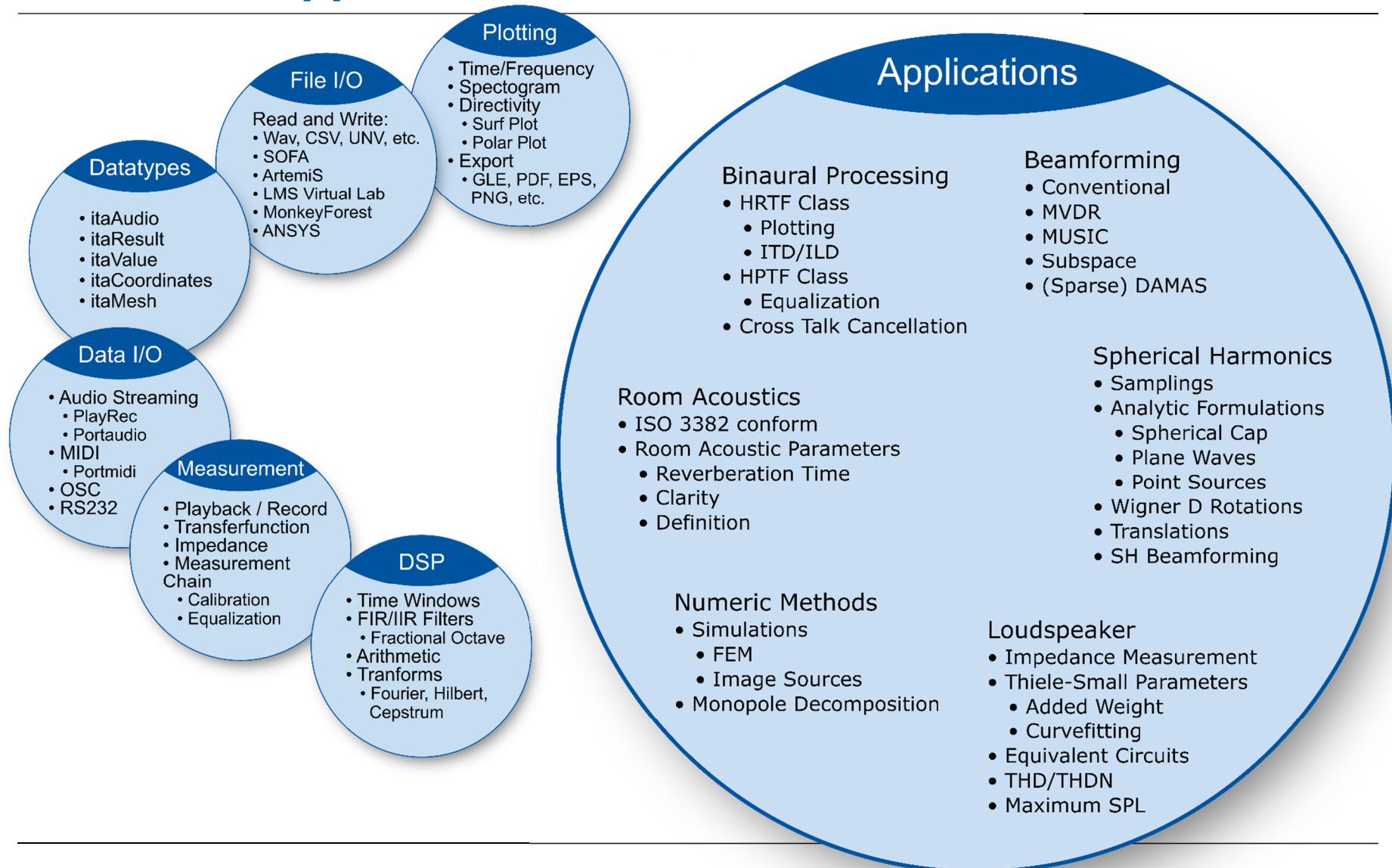
Example: Directivity Measurement



Additional Applications

That's all pretty nice. Is there more?

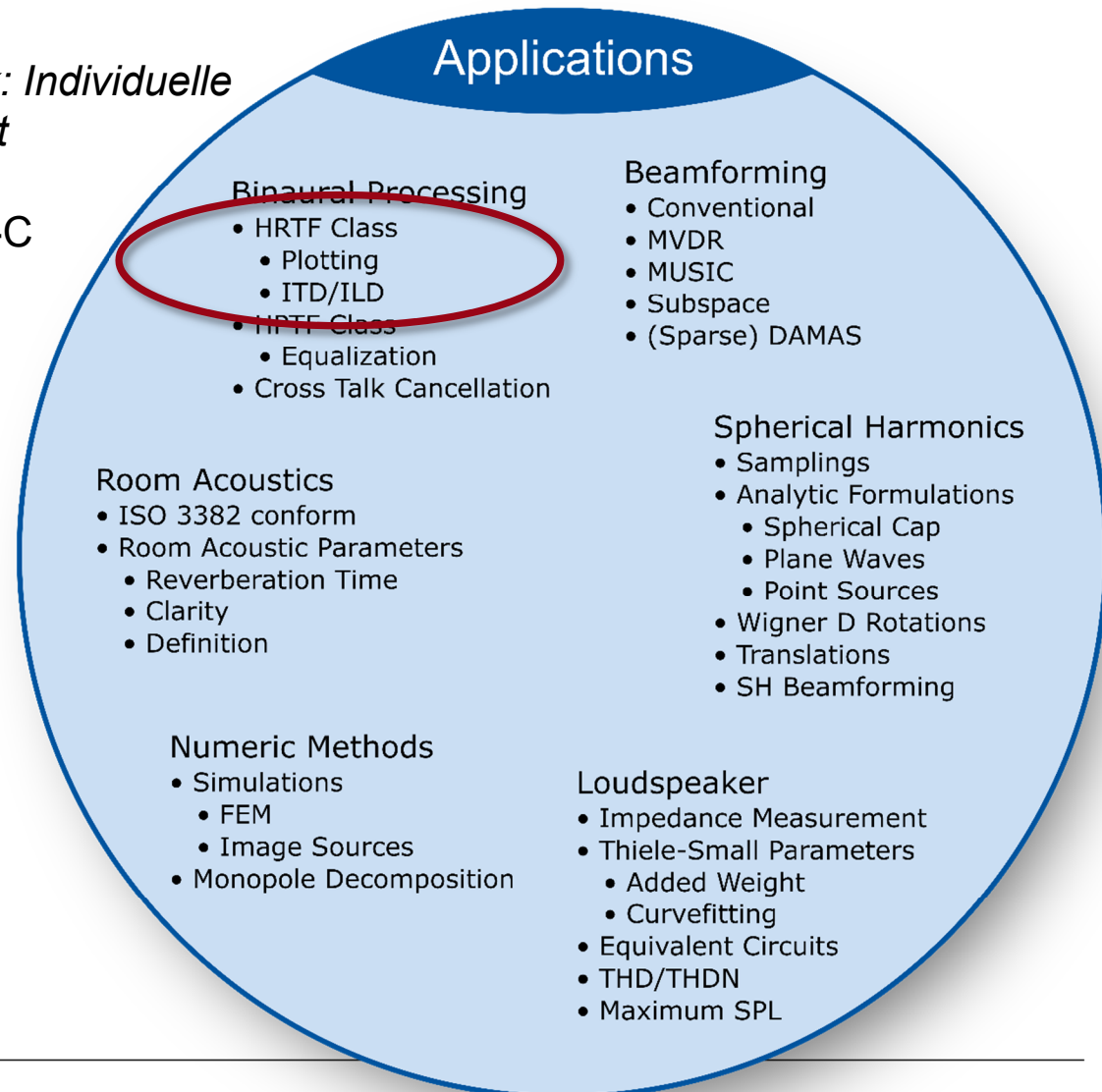
Additional Applications



Additional Applications

Bomhardt: *Die ITA-HRTF-Datenbank: Individuelle Außenohrübertragungsfunktionen mit anthropometrischen Daten*

Tuesday 07.03., 17:00, Room CAP2-C



Getting Involved

Using the ITA-Toolbox

Get it from:

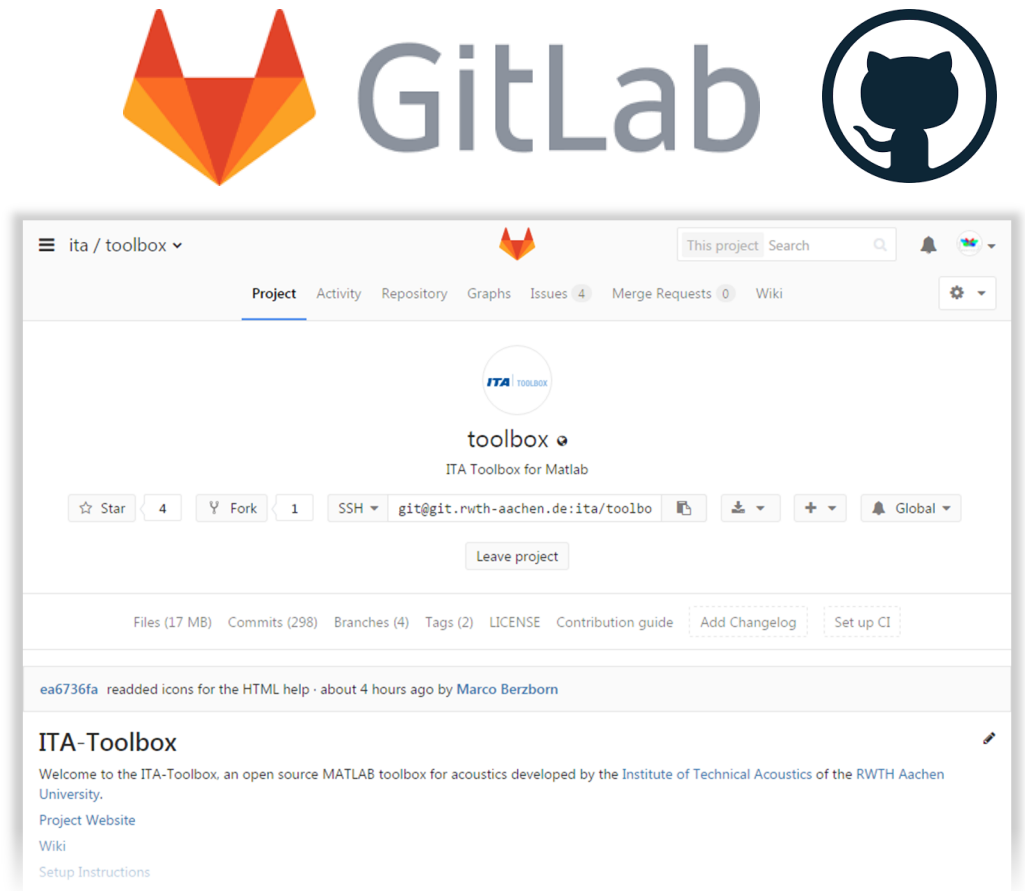
- Project homepage www.ita-toolbox.org
- Git repository git.rwth-aachen.de/ita/toolbox

The screenshot shows the ITA-Toolbox website. At the top, the logo 'ITA | TOOLBOX' is displayed in blue. Below it, the text 'A MATLAB Toolbox for Acoustics' is centered. A navigation bar contains three buttons: 'About', 'Download', and 'Contact'. The 'About the ITA-Toolbox' section lists three bullet points: 'Open source MATLAB toolbox for acoustics developed by the Institute of Technical Acoustics of the RWTH Aachen University.', 'Object-oriented programming concepts for the facilitated handling and acquisition of audio and simulation data.', and 'Includes graphical user interfaces and various plot routines for the graphical output of all kind of relevant acoustic data.' Below this, there are three overlapping circles representing different toolboxes: 'Datatypes' (containing 'itaAudio' and 'itaIO'), 'File I/O' (containing 'Read and Write' with sub-points like 'Wav, CSV, UNV, etc.', 'SOFA', 'ArtemiS', 'LMS Virtual Lab', 'MonkeyForest', and 'MATLAB'), and 'Plotting' (containing 'Time/Frequency', 'Spectrogram', 'Directivity', 'Balloon Plot', 'Polar Plot', 'Export', and 'GLE, PDF, EPS, PNG, etc.'). To the right of these circles are three small plots: a time-domain waveform, a frequency spectrum, and a spectrogram.

Contributing to the ITA-Toolbox

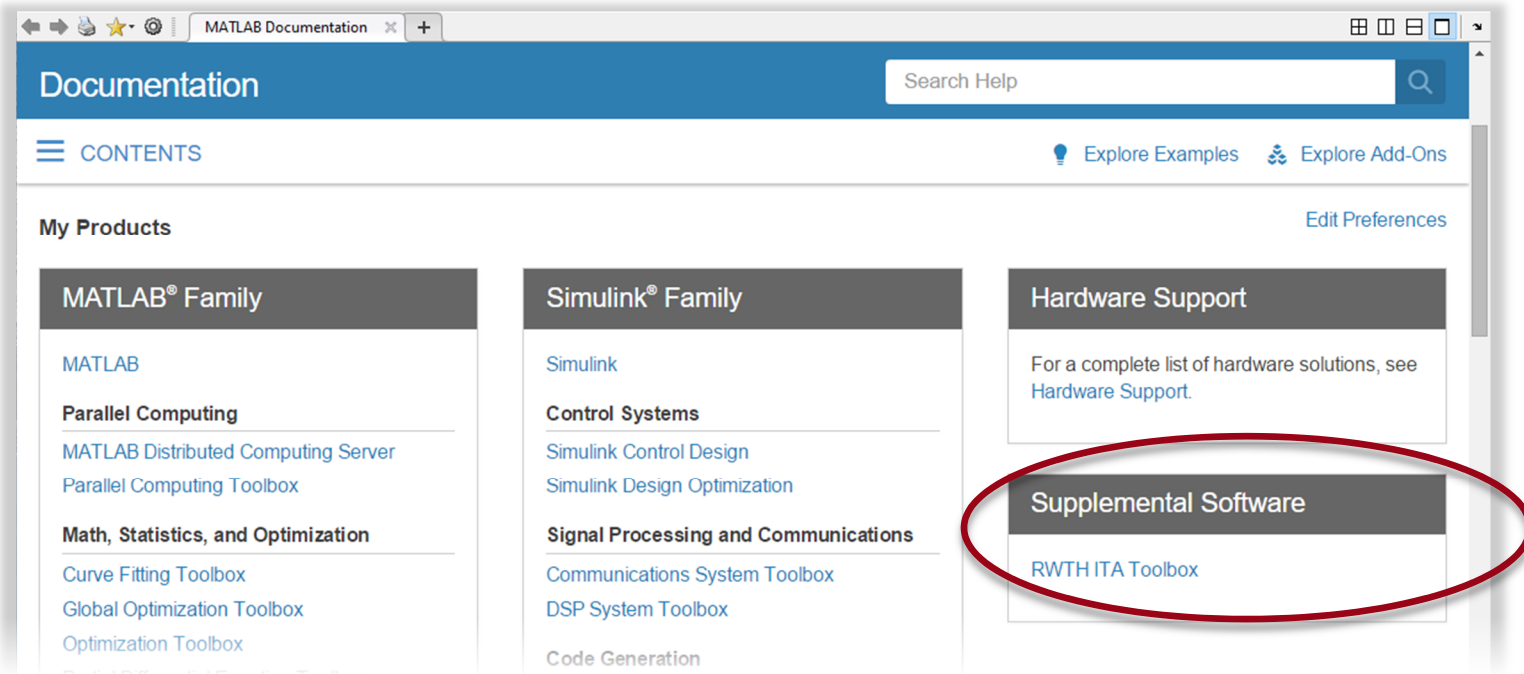
Git Repository git.rwth-aachen.de/ita/toolbox

- Sign-in with GitHub Account
- Feel free to contribute by:
 - Reporting bugs
 - Fixing bugs
 - Suggesting features
 - Developing features
 - Improving features
- Contribution Guidelines in the GitLab Repository



Documentation

- Wiki section on GitLab Repository
- HTML documentation integrated in MATLAB help browser
- Step by step tutorial scripts to get started
- See FAQ on homepage on how to build and access the documentation



Thank you for your attention.

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git.rwth-aachen.de/ita/toolbox

