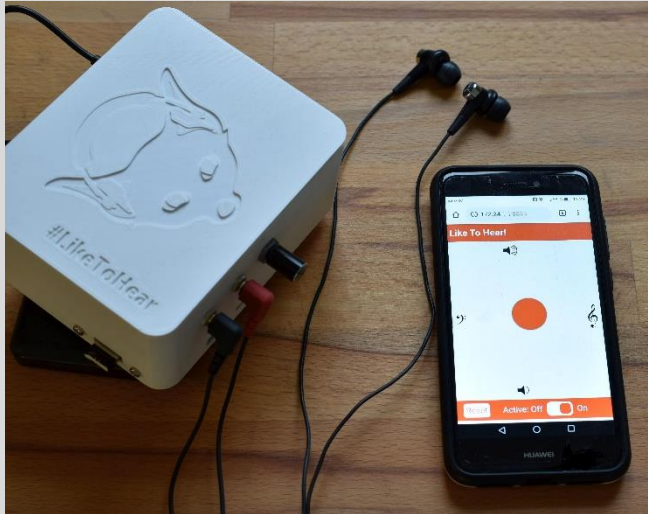

LikeToHear – Controller for openMHA

Web based control for self adjusting of hearing aid algorithms



Objectives

- Simple
 - Common python modules
 - Plain HTML and JavaScript
 - Easy to understand
- Independent
 - Very few third party components
- Open Source and DIY
 - Participation of citizens



Photo: Peggy Sylopp, CC BY-NC-SA

Hear How You Like To Hear

Citizen as Scientific Co-Researchers

- 57 Soundwalks, about 100 hour
 - Self-Adjusting in daily life
- Open Source publishing
 - Make your own liketohear box
- 2 Hack4ears Hackathons with 200 ppl
 - Participatory tech and design
- <https://www.idmt.fraunhofer.de/en/institute/projects-products/projects/liketohear.html>



Photo: Peggy Sylopp, CC BY-NC-SA

Signal Processing: openMHA

- Open Master Hearing Aid (openMHA)
- platform to simulate the hearing aid processing chain
 - HörTech gGmbH and Universität Oldenburg, 2017], [Herzke et al., 2017
 - @LAC2018: “Open Hardware Multichannel Sound Interface for Hearing Aid Research on BeagleBone Black with openMHA: Cape4all”
 - <https://lac.linuxaudio.org/2018/pdf/35-paper.pdf>
 - https://media.ccc.de/v/lac2018-35-open_hardware_multichannel_sound_interface_for_hearing_aid_research_on_beaglebone_black_with_openmha_cape4all



A mobile hearing aid prototype based on openMHA



GitHub: <https://github.com/m-r-s/hearingaid-prototype>

Marc René Schädler

Mailing list: hearingaid-prototypes@lists.uni-oldenburg.de



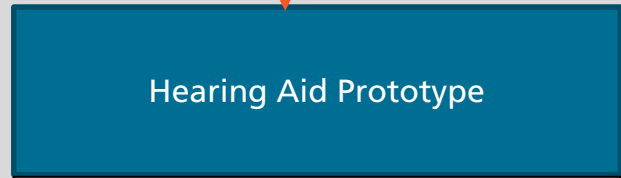
LikeToHear

- Easy to use web application on the smartphone
- hearing aid configuration user presets
- Intuitive User Interfaces
- Smart Self-Fitting approach



openMHA

- Basic Hearing Aid Features
- Research platform for novel Algorithms
- TCP/IP Interface
- Easy to configure



Hearing Aid Prototype

- openMHA control
- Feedback Reduction
- Text to Speech
- Bluetooth controller



JACK Audio Connection Kit

- Connection to ALSA
- Transfer audio between applications

Webpage concept

■ Landing page with

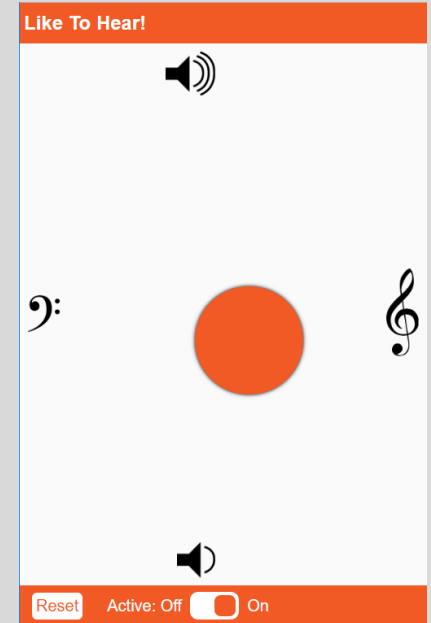
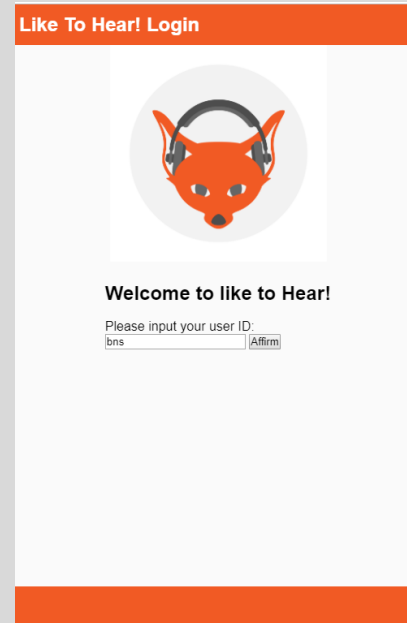
- Post request of user ID
- standard input form
- standard submit button

■ Control UI Page

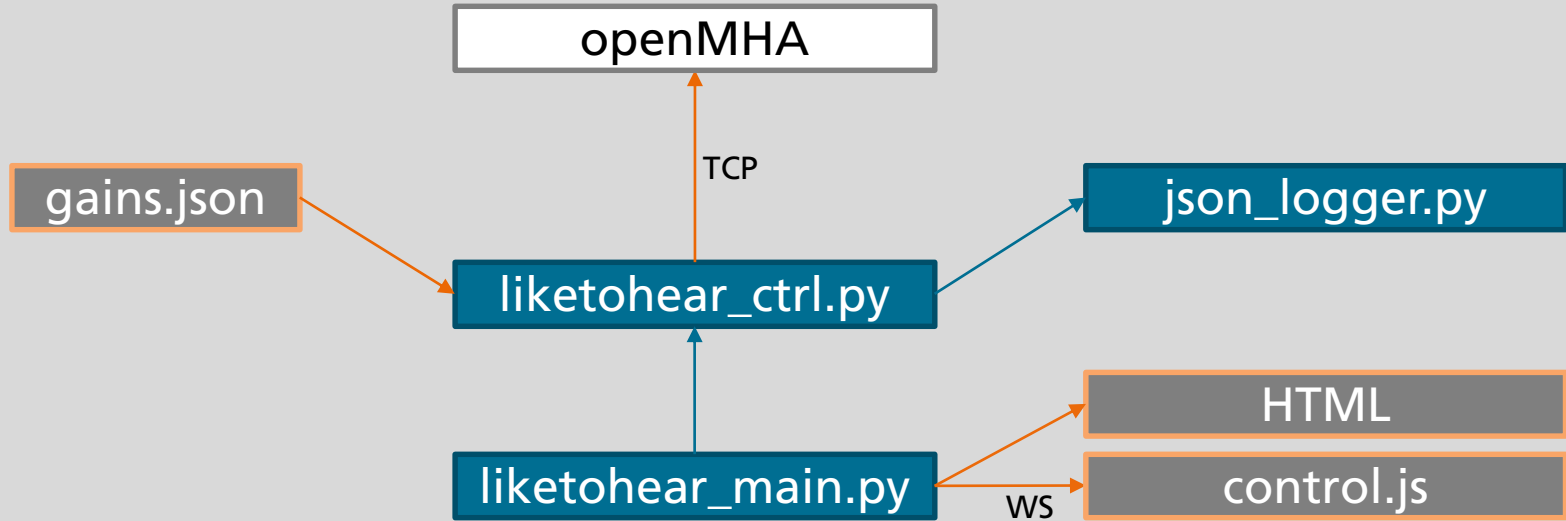
- standard button for reset
- standard checkbox for on/off
- control ball as <div>

■ Control.js

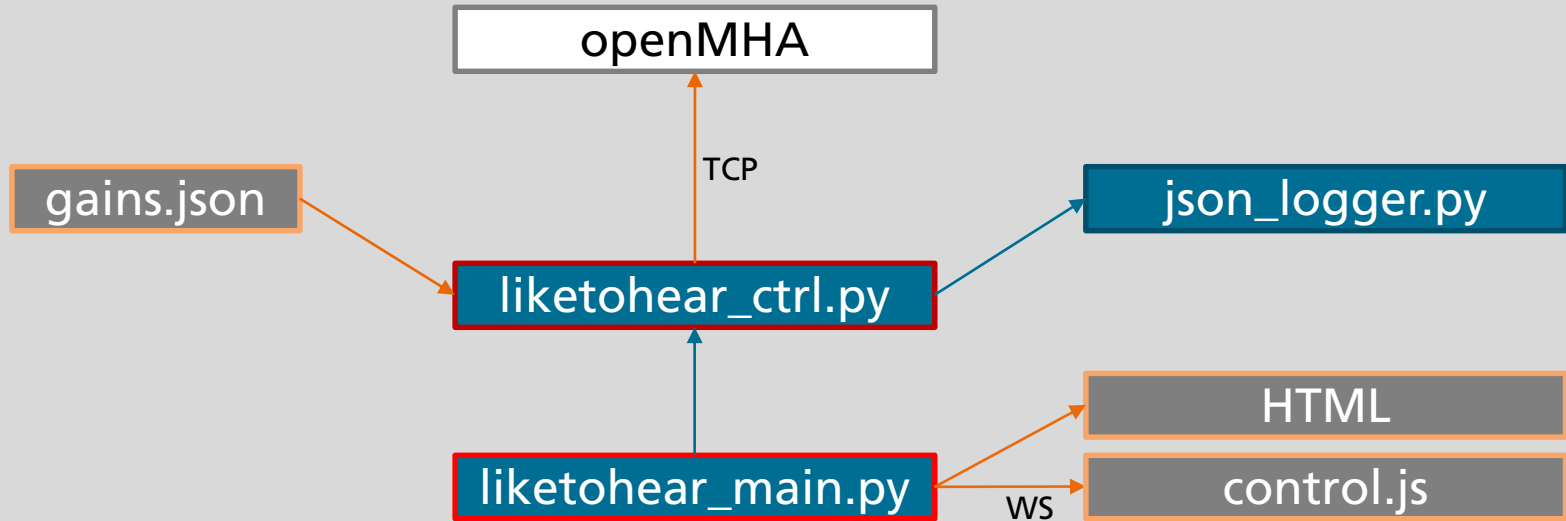
- Simple java class for control & web socket communication



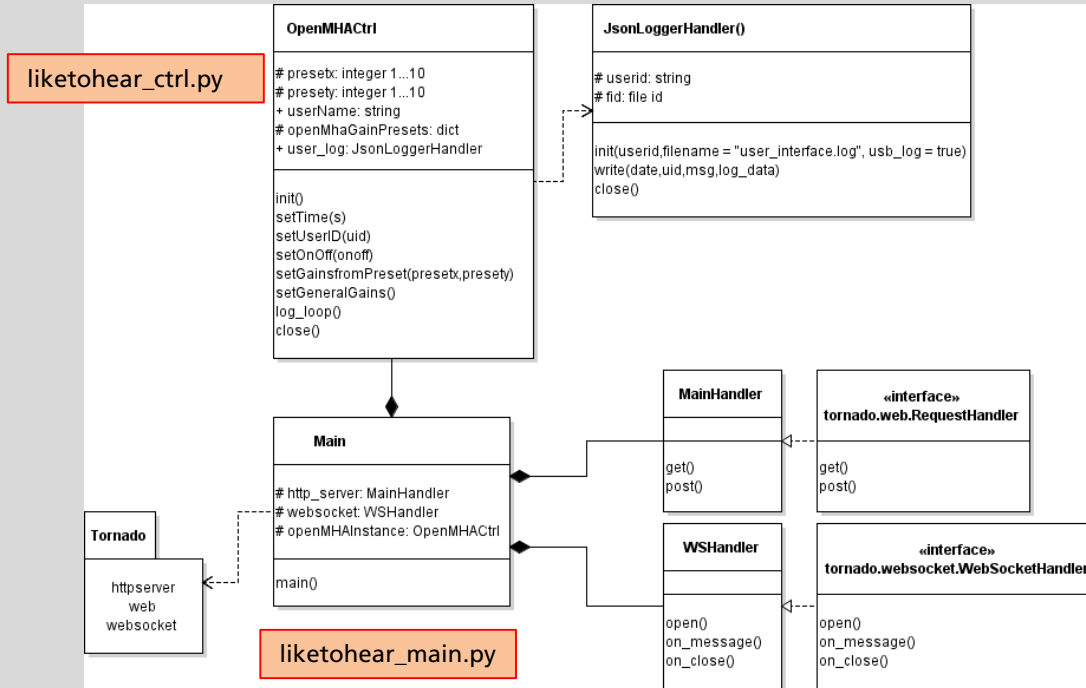
Components



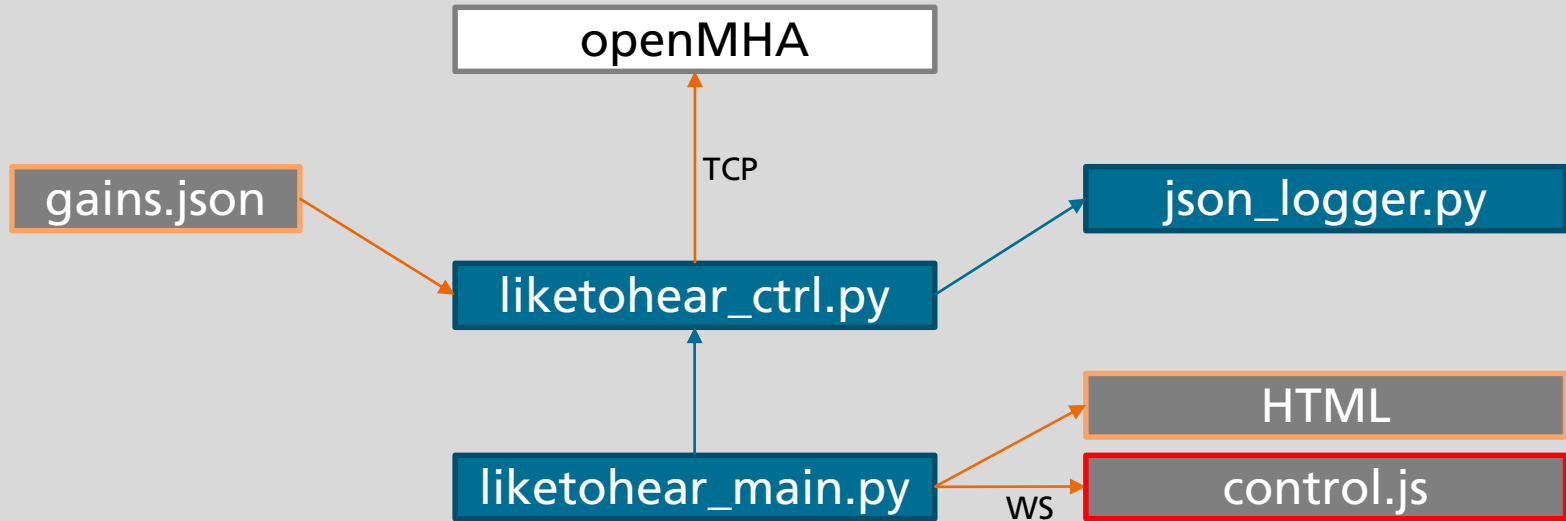
Components



Like2Hear Class diagram



Components



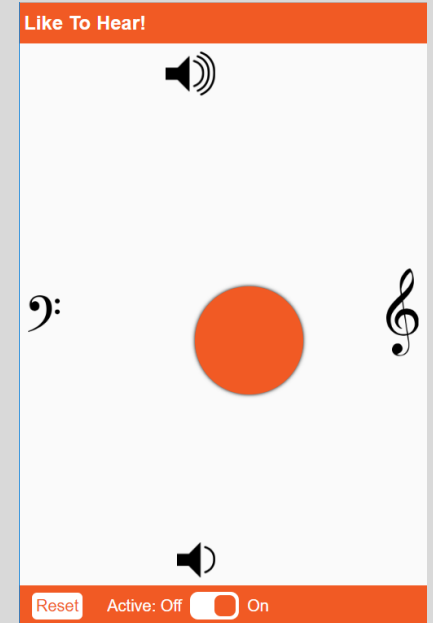
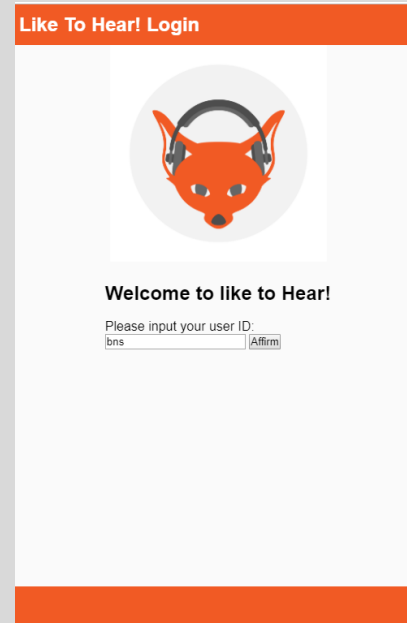
Website control script

- Control.js Classes:
 - Socket() for web socket interaction
 - Soundformer() for controlling 2D interface element
 - Menu() for handling on off switch and reset

Webpage concept

■ Control.js

- Simple java class for control & web socket communication



WebSocket Commands

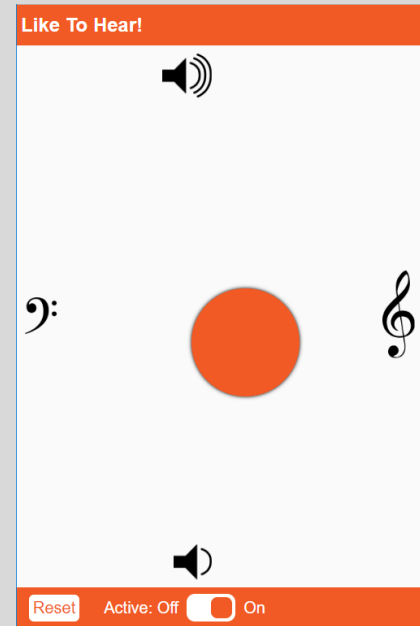
■ JSON formatted strings

```
{cmd: "REG" ,  
data: date.now()}
```

```
{cmd: "RESET" ,  
data: 1}
```

```
{cmd: "ONOFF" ,  
data: 1}
```

```
{cmd: "SET", receiver: "",pre: 5,vol: 5,algo: "1"}
```



Configurations: gains.json

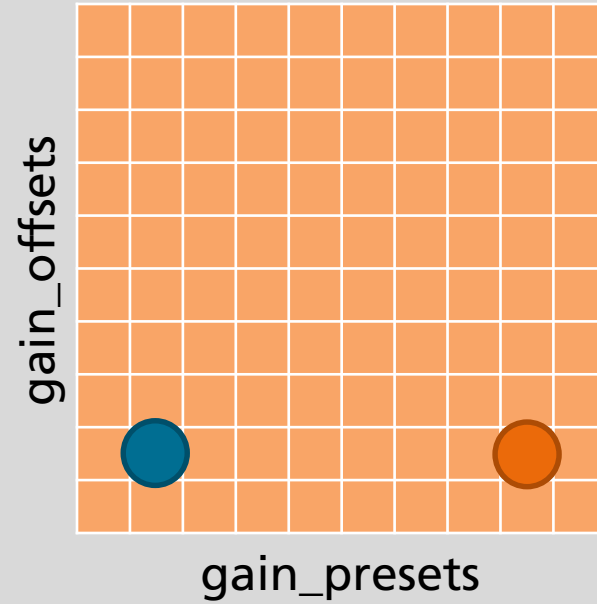
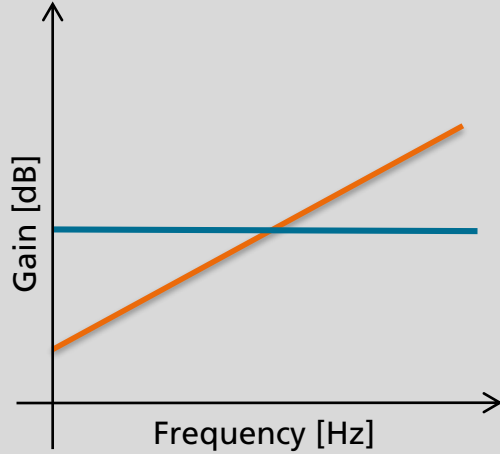
■ Fields

- gain_presets : 10 Presets consisting of 2 Channels * 9 Bands * 65 Gains
- mostly linear gains compressive above high threshold
- Step size 2 from minimum input gain of 0

Processing settings

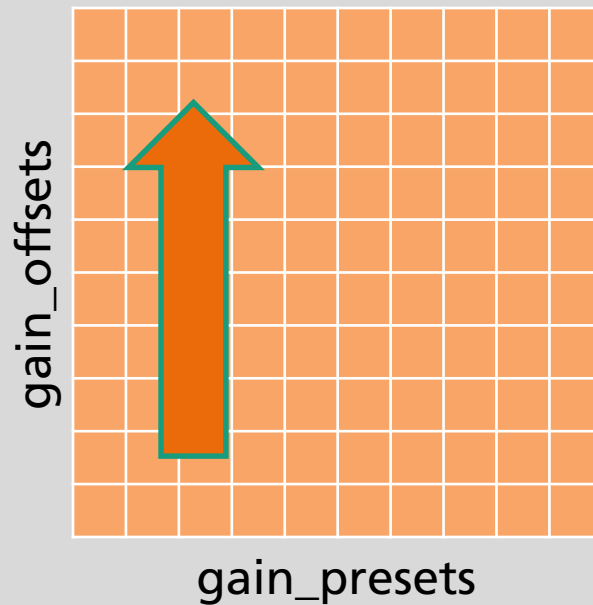
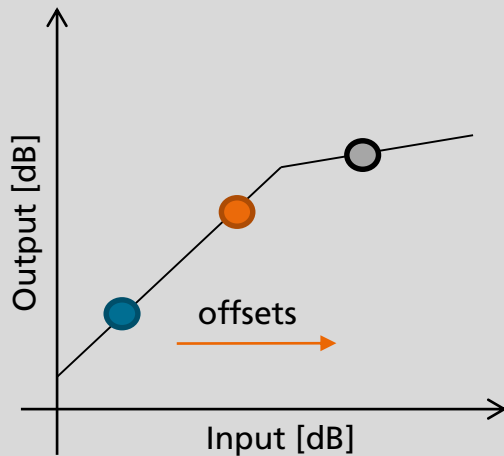
- Filter bank frequencies:
 - Processing [Hz]: 177, 297, 500, 841, 1414, 2378, 4000, 6727, 11314
 - Audio logging [Hz]: 250, 500, 1000, 2000, 4000, 8000
- Gain settings
 - 10 x 10 presets
 - Grid: x-axis frequency emphasis, y-axis overall gain [3dB steps]
 - Compression for high input level

Gain Presets

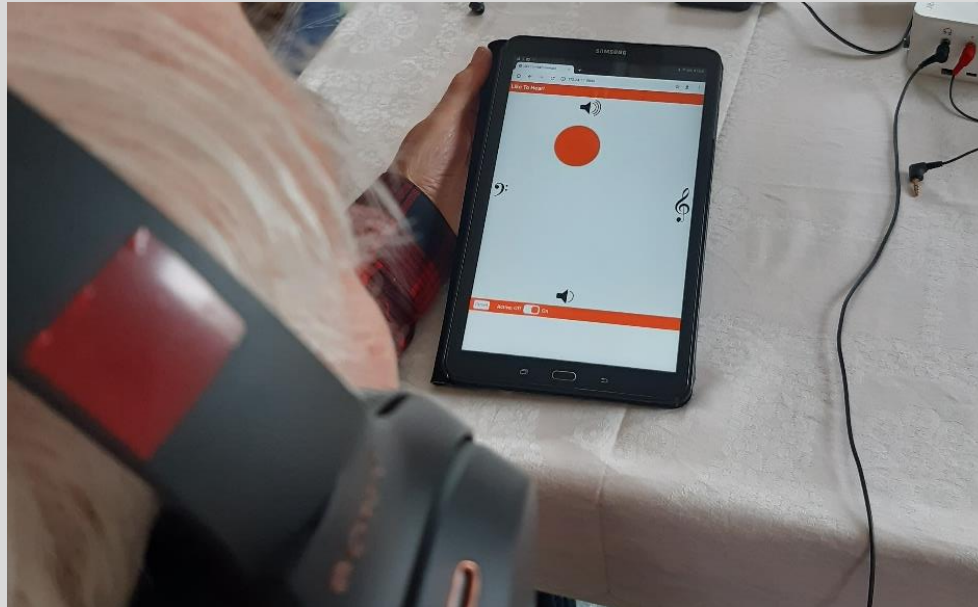


Gain Offsets

Gain Offsets for a Single Band



Self-Adjusting for Daily Use

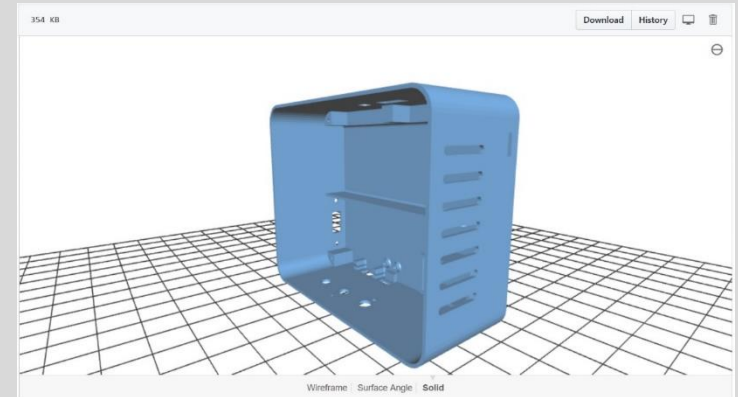


Liketohear on Github

Open Source and DIY

<https://github.com/liketohear/>

- Tutorial Hardware Setup and Installation
- Known Issues
- 3d case
- Prediction Modelling
 - jupyter notebook: liketohear-AI
- Data Visualization
- ... your ideas are welcome





Screenshot: https://github.com/liketohear/liketohear-3dcase/blob/master/MHA_case_2.0_main.STL



Thanks for Listening!

<https://github.com/liketohear/>

 Like_to_hear  Liketohear

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Contact: syp@idmt.fraunhofer.de