

# Open community platform for hearing aid algorithm research

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## What?

- Open-source software for hearing aid algorithm development and evaluation
- Low-delay (< 10 ms), real-time signal processing framework



open  
Master  
Hearing  
Aid

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## Why?

- Proprietary systems that are not accessible to the research community and underlie commercial constraints
- Facilitation of collaborative efforts and reproducibility in hearing aid research
- Lower barriers for accelerated studies with novel algorithms
- Smooth transfer of research results into application



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## When?

- First major release available since **June 21, 2017** on GitHub



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### Who?



University of Oldenburg



HörTech gGmbH (Oldenburg)



Bat&Cat SoundLabs (Palo Alto)

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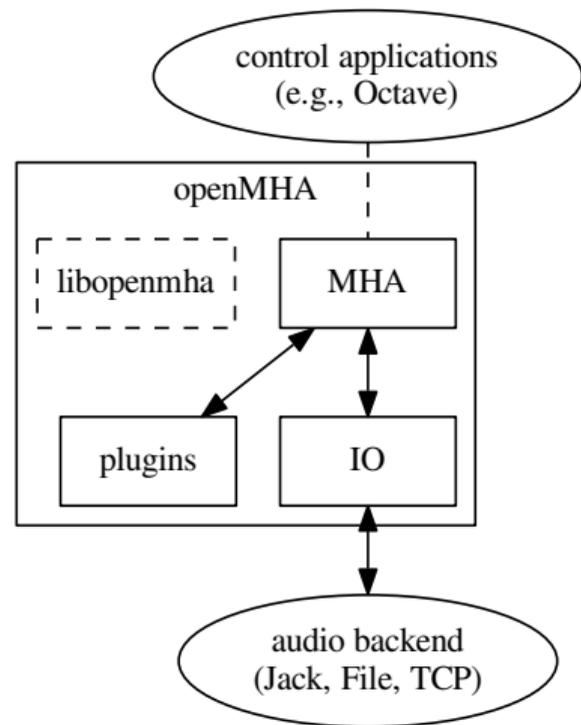
### ... pays?

## Funding

National Institutes of Health initiative to develop real-time portable signal processing tools for advancing research on hearing loss compensation (NIH Grant 1R01DC015429-01)

## Basic framework for implementation of algorithms

- MHA host application
- libopenmha toolbox
- communication interfaces to control applications and for audio I/O
- runtime configuration changes

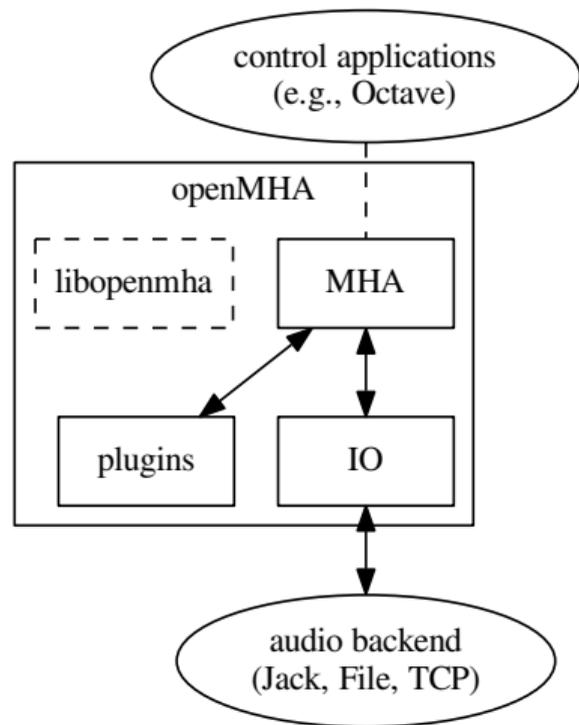


## Basic framework for implementation of algorithms

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## Tools and documentation

- Octave/Matlab GUI for hearing aid fitting
- manuals for different usage scenarios
- example configuration files for algorithms included

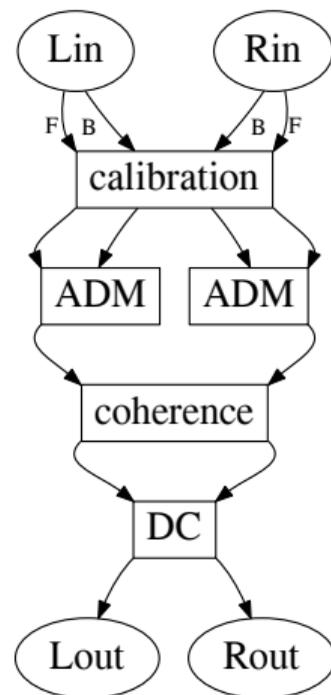


## Hearing aid processing plugins

- calibration
- multi-band dynamic compressor (DC)
- feedback reduction

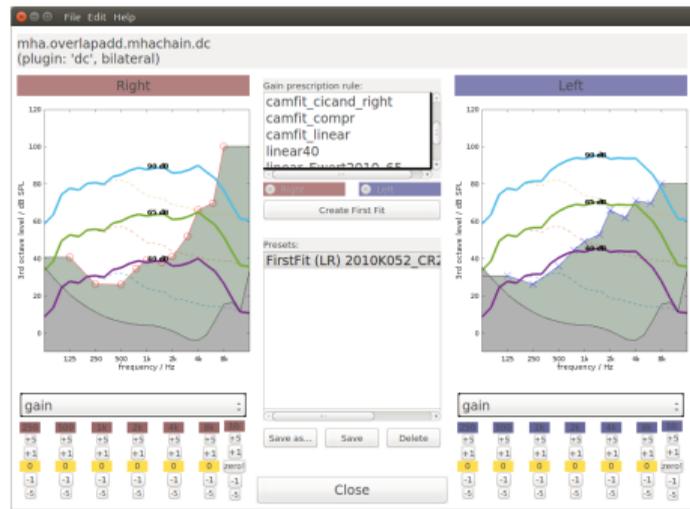
## Hearing aid processing plugins

- calibration
- multi-band dynamic compressor (DC)
- feedback reduction
- binaural coherence filter
- bilateral adaptive differential microphones (ADM)
- beamforming algorithms (delay-and-sum, MVDR)
- single-channel noise suppression



## I Audiological researchers

- Measurements out-of-the-box on PC hardware
- Change parameters on application level



## I Audiological researchers

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## II Application engineers

- Set up measurement tools and customize algorithms
- Access configuration interface at an advanced level

```

emacs@fg-desktop2
File Edit Options Buffers Tools Conf Help
nchannels_in = 2
srate = 48000
fragsize = 64

nhalib = nhachain
nha.algos = [ffftfilterbank dc combnchannels]
nha.ffftfilterbank.f = [50 312 1620 7060]
nha.ffftfilterbank.ftype = edge
nha.ffftfilterbank.ovltype = hanning

nha.ffftfilterbank.fscale = log
nha.ffftfilterbank.phasemodel = mintnal
nha.ffftfilterbank.fftilen = 192

nha.dc.chname = fffftfilterbank_nchannels
nha.dc.gtstep = [1]
nha.dc.gtmIn = [0]
nha.dc.tau_rmslev = [0.003]
nha.dc.tau_attack = [0.000]
nha.dc.tau_decay = [0.005]
nha.combnchannels.outchannels = 2

lolib = MHAIOJack
lo.con_in = [system:capture_1 system:capture_2]
lo.con_out = [system:playback_7 system:playback_8]

# lo.in = Alice_english.wav
# lo.out = output.wav

nha.dc.gtdata = [...
[0 1 2 3 4 5 6.3 6.7 7.0 7.3 7.7 8.0 8.3 8.7 9.0 9.3 9.7 10.0 10.3 10.7 11.0 11.
53 11.7 12.0 12.3 12.7 13.0 13.3 13.1 12.8 12.6 12.3 12.0 11.8 11.5 11.3 11.0 10.9
58 10.5 10.2 10.0 9.7 9.5 9.2 8.9 8.7 8.4 8.2 7.9 7.7 7.4 7.1 6.9 6.6 6.4 6.1 5.9]
-:--- nha-compressor-2016-11.cfg Top L2 (Conf[UnlX])
Beginning of buffer
    
```

## I Audiological researchers

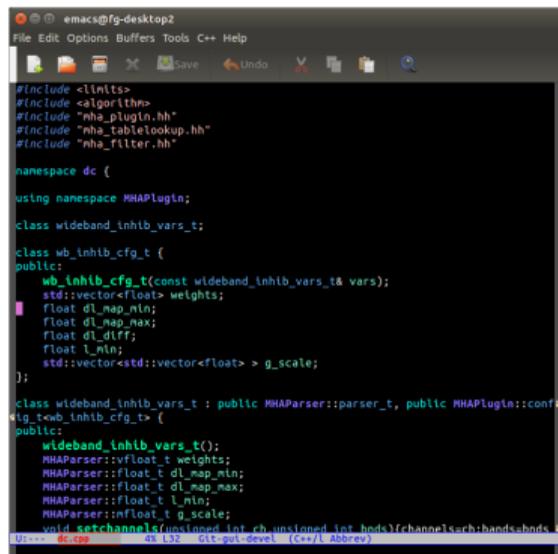
- Measurements out-of-the-box on PC hardware
- Change parameters on application level

## II Application engineers

- Set up measurement tools and customize algorithms
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## III Plugin developers

- Develop and implement new plugins in the openMHA framework



```

#include <limits>
#include <algorithm>
#include "mha_plugin.hh"
#include "mha_tablelookup.hh"
#include "mha_filter.hh"

namespace dc {

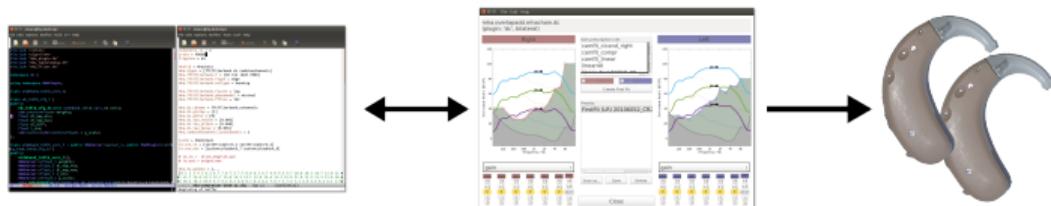
using namespace MHAPLugin;

class wideband_inhib_vars_t;

class wb_inhib_cfg_t {
public:
    wb_inhib_cfg_t(const wideband_inhib_vars_t& vars);
    std::vector<float> weights;
    float dl_map_min;
    float dl_map_max;
    float dl_diff;
    float l_min;
    std::vector<std::vector<float> > g_scale;
};

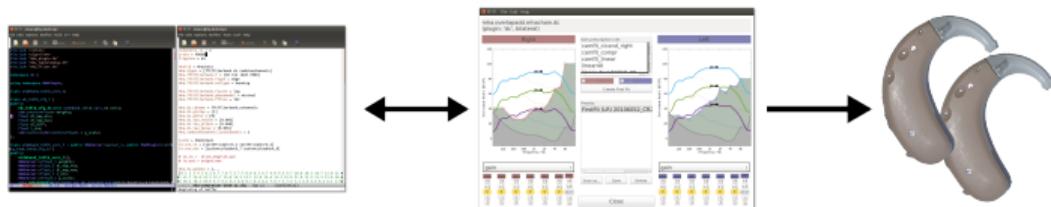
class wideband_inhib_vars_t : public MHAParser::parser_t, public MHAPLugin::confi
cfg_t wb_inhib_cfg_t {
public:
    wideband_inhib_vars_t();
    MHAParser::vfloat_t weights;
    MHAParser::float_t dl_map_min;
    MHAParser::float_t dl_map_max;
    MHAParser::float_t dl_min;
    MHAParser::float_t g_scale;
    void setChannels(unsigned int ch, unsigned int hds)(channels:ch;bands:hds
);
};
    
```





## The **openMHA**

- ... provides a real-time processing platform for hearing aid algorithm development.
- ... is designed to evaluate, compare and bring into application novel hearing aid algorithms for future hearing aid generations.
- ... runs on standard PC and sound hardware (Linux OS, more to come) as well as Beaglebone Black ARM and similar platforms.



## The **openMHA**

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- ... is designed to evaluate, compare and bring into application novel hearing aid algorithms for future hearing aid generations.
- ... runs on standard PC and sound hardware (Linux OS, more to come) as well as Beaglebone Black ARM and similar platforms.
- ... will be further extended based on latest research and contributions from the hearing aid research community.

openMHA is open source under AGPL-3.0 license

Latest news:



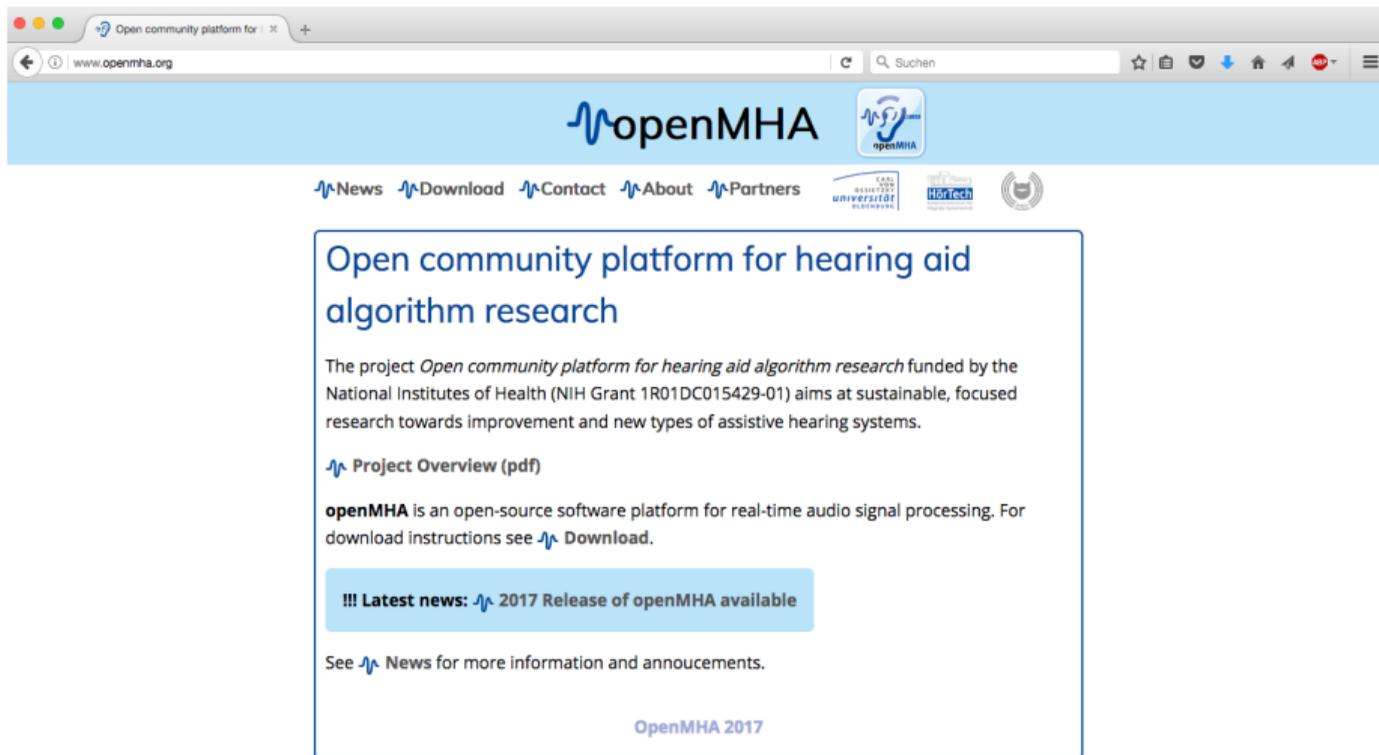
[www.openMHA.org](http://www.openMHA.org)

Open source code available here:



<https://github.com/HoerTech-gmbH/openMHA>





The screenshot shows a web browser window with the address bar displaying "www.openmha.org". The website header features the "openMHA" logo and navigation links: News, Download, Contact, About, and Partners. Below the navigation are logos for Carl von Ossietzky Universität Oldenburg, HörTech, and a circular logo. The main content area is titled "Open community platform for hearing aid algorithm research". The text describes the project as being funded by the National Institutes of Health (NIH Grant 1R01DC015429-01) and aims at sustainable, focused research towards improvement and new types of assistive hearing systems. A link for "Project Overview (pdf)" is provided. A paragraph states that openMHA is an open-source software platform for real-time audio signal processing and directs users to download instructions. A light blue callout box contains the text "!!! Latest news: 2017 Release of openMHA available". At the bottom, there is a link for "News" and a footer for "OpenMHA 2017".

## Open community platform for hearing aid algorithm research

The project *Open community platform for hearing aid algorithm research* funded by the National Institutes of Health (NIH Grant 1R01DC015429-01) aims at sustainable, focused research towards improvement and new types of assistive hearing systems.

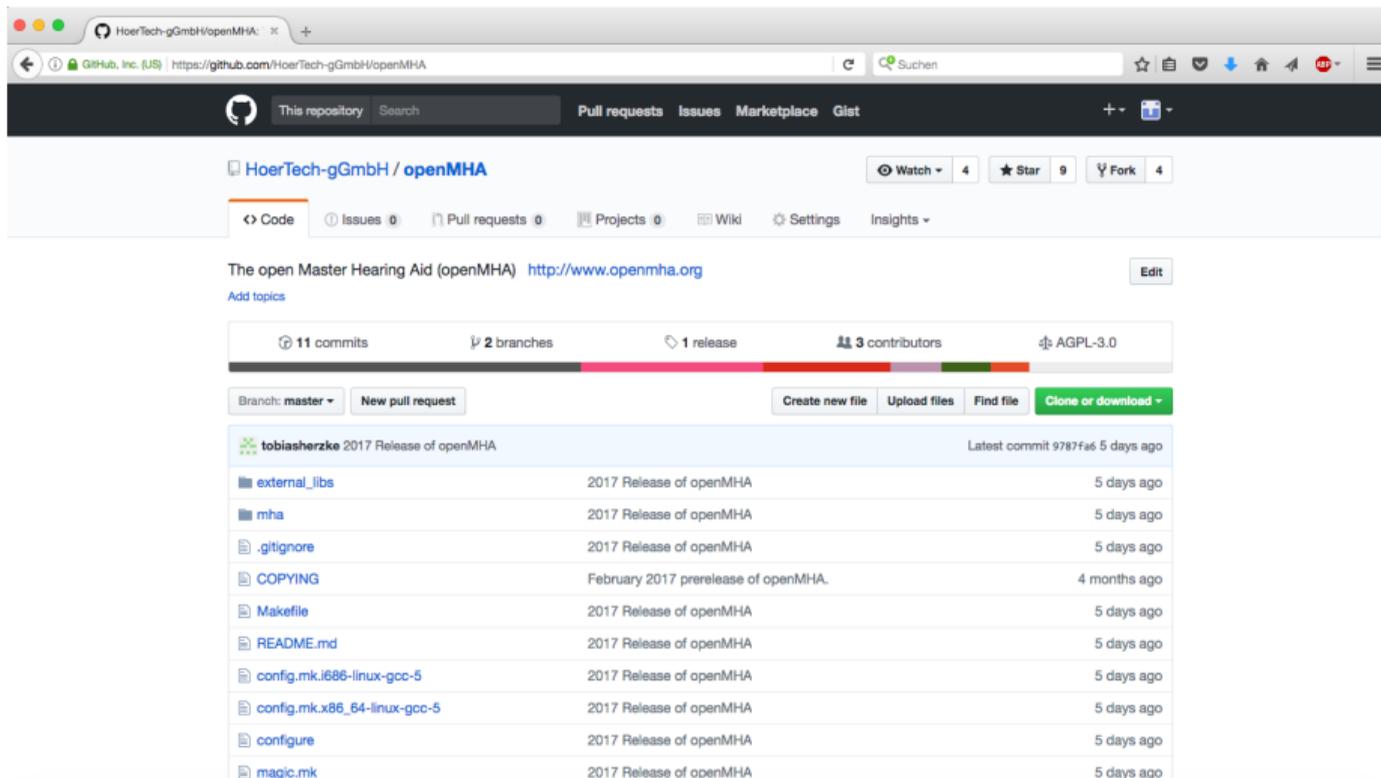
[Project Overview \(pdf\)](#)

**openMHA** is an open-source software platform for real-time audio signal processing. For download instructions see [Download](#).

**!!! Latest news:** [2017 Release of openMHA available](#)

See [News](#) for more information and announcements.

OpenMHA 2017



<https://github.com/HoerTech-gmbH/openMHA>

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The open Master Hearing Aid (openMHA) <http://www.openmha.org> Edit

Add topics

11 commits 2 branches 1 release 3 contributors AGPL-3.0

Branch: master New pull request Create new file Upload files Find file Clone or download

File	Commit	Time
external_libs	2017 Release of openMHA	5 days ago
mha	2017 Release of openMHA	5 days ago
.gitignore	2017 Release of openMHA	5 days ago
COPYING	February 2017 prerelease of openMHA.	4 months ago
Makefile	2017 Release of openMHA	5 days ago
README.md	2017 Release of openMHA	5 days ago
config.mk.i686-linux-gcc-5	2017 Release of openMHA	5 days ago
config.mk.x86_64-linux-gcc-5	2017 Release of openMHA	5 days ago
configure	2017 Release of openMHA	5 days ago
magic.mk	2017 Release of openMHA	5 days ago

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Latest news:



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