



# Recording with the NAO

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# Outline

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▶ Datasets Overview

▶ First Results

▶ Challenges



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## ▶ First Results

## ▶ Challenges

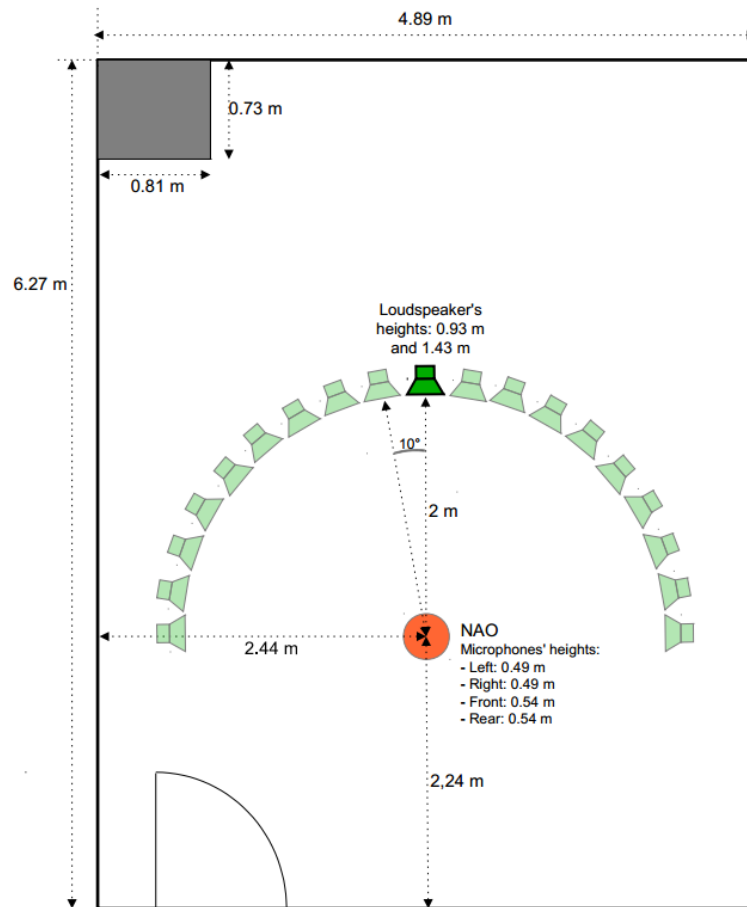
# Datasets Overview

## ► The NAO\_LOC dataset

### Single source experiment

LMS Audiolab  
Cauerstr. 7, 91058, Erlangen, Germany  
Room G 0.25

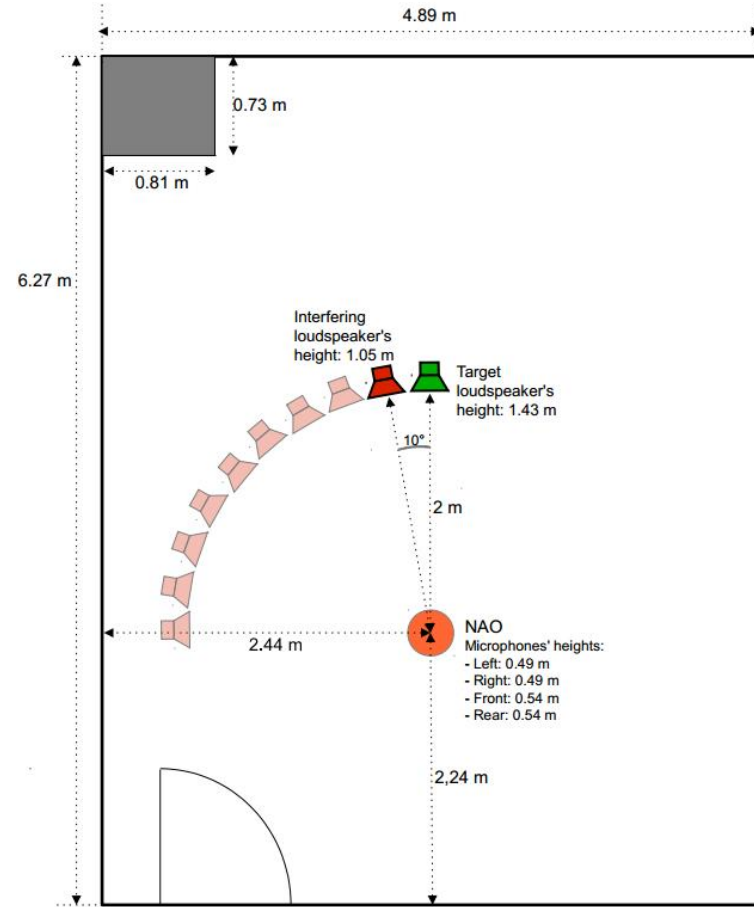
Room height: 2.59 m



### Two sources experiment

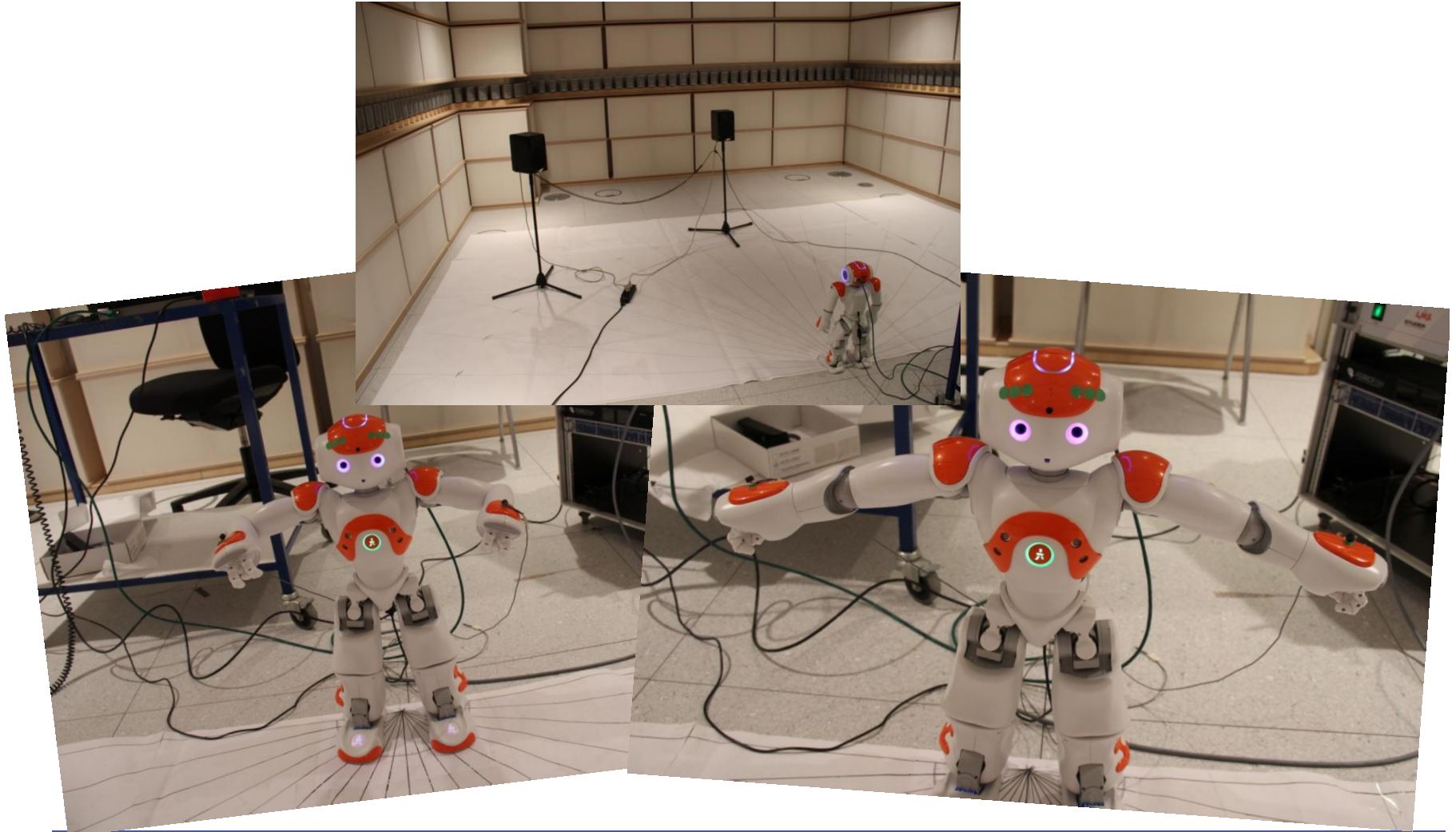
LMS Audiolab  
Cauerstr. 7, 91058, Erlangen, Germany  
Room G 0.25

Room height: 2.59 m



# Datasets Overview

## ▶ The EGO\_NOISE dataset



## ▶ Datasets Overview

## ▶ First Results

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▶ Datasets Overview

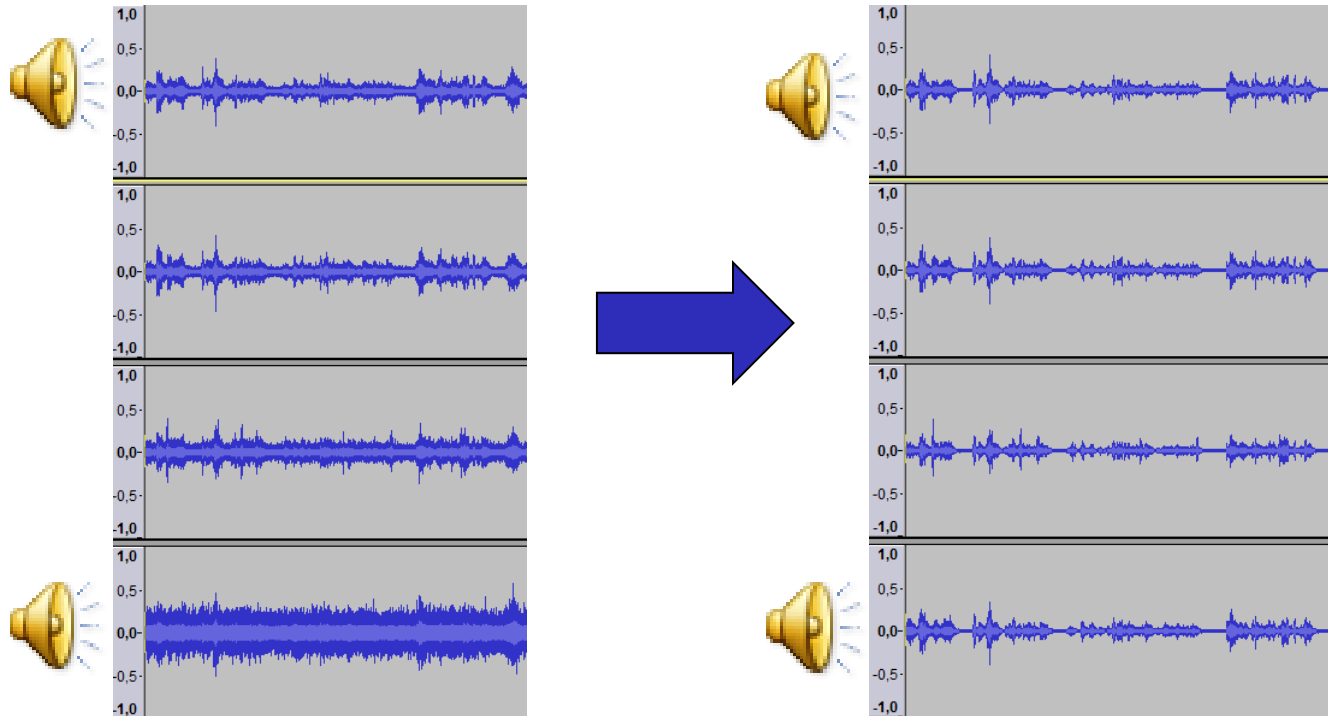
▶ **First Results**

▶ Challenges

# First Results

## ▶ Fan noise reduction

- 4-channels Wiener filtering
- Noise covariance pre-learned
- Signal covariance estimated using recursive averaging

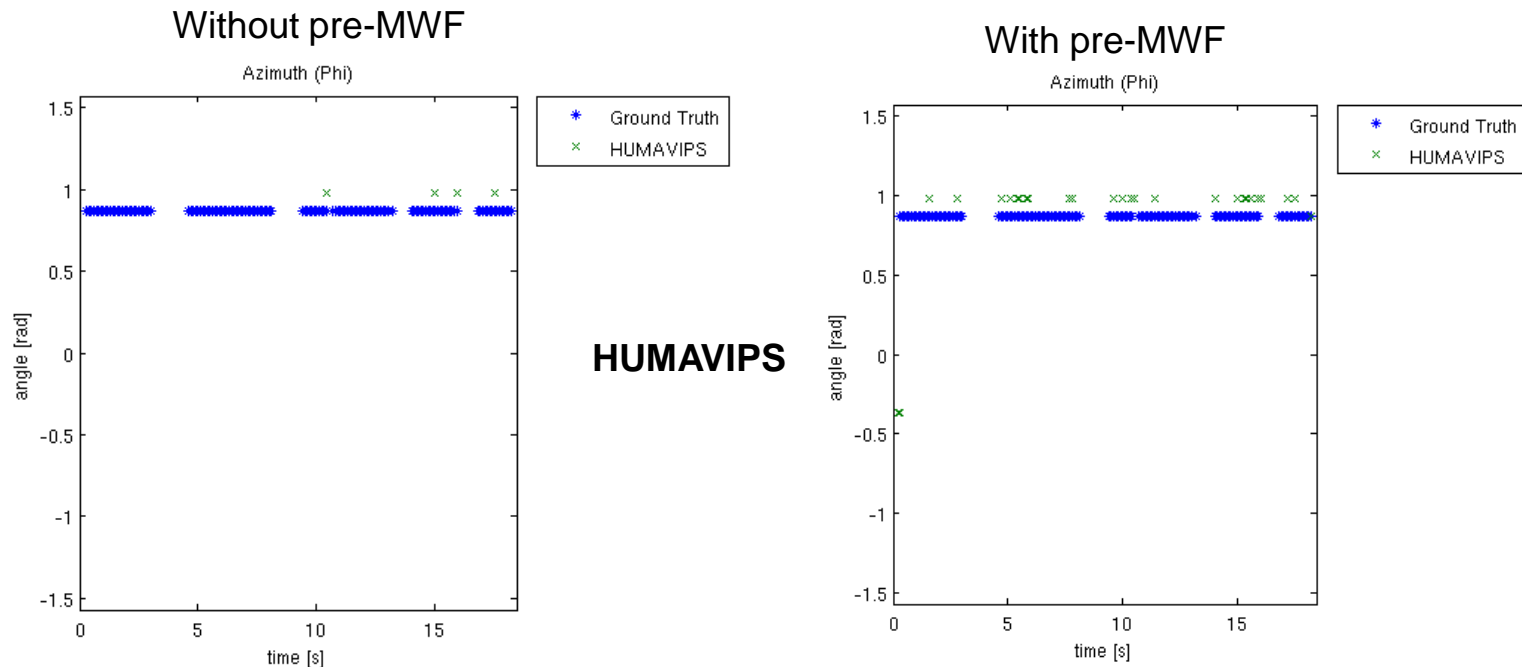




# First Results

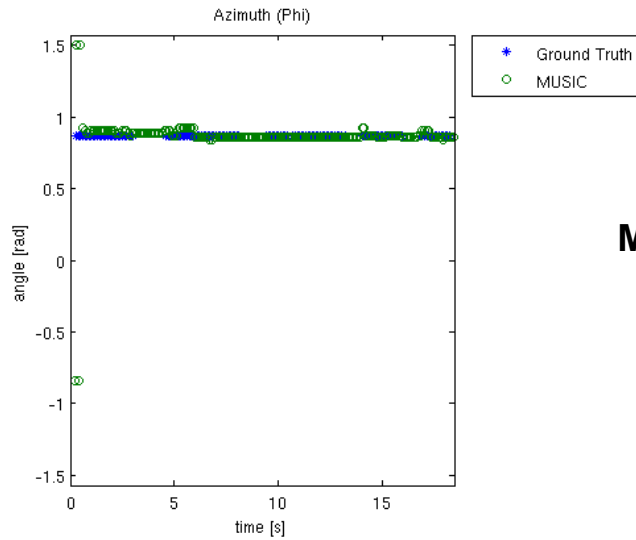
## ▶ Sound source localization

- HUMAVIPS (Normalized cross-correlation)
- MUSIC + Generalized eigenvalue decomposition + rec. avg.
- TRINICON-BSS + Average directivity pattern
- TDOA converted to azimuth angle using the *extended Woodworth model* [Aaronson & Hartmann, JASA 2014]



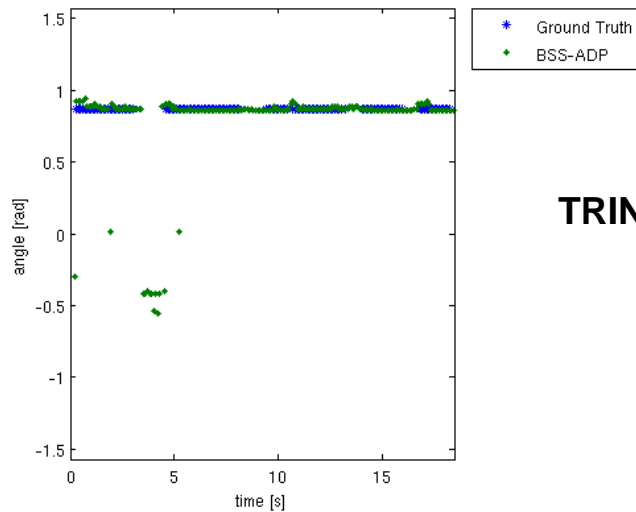
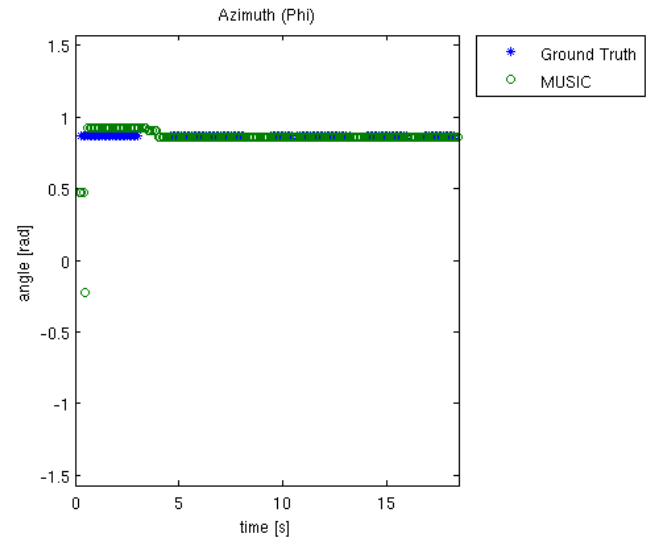
# First Results

## Without pre-MWF

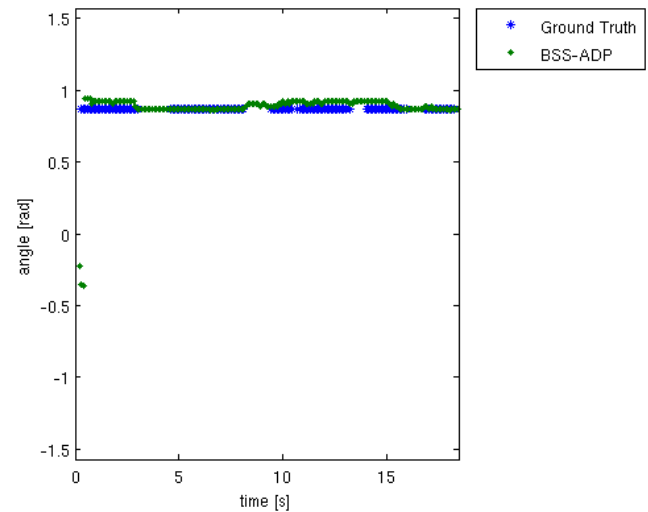


MUSIC

## With pre-MWF



TRINICON-BSS



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▶ **First Results**

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▶ First Results

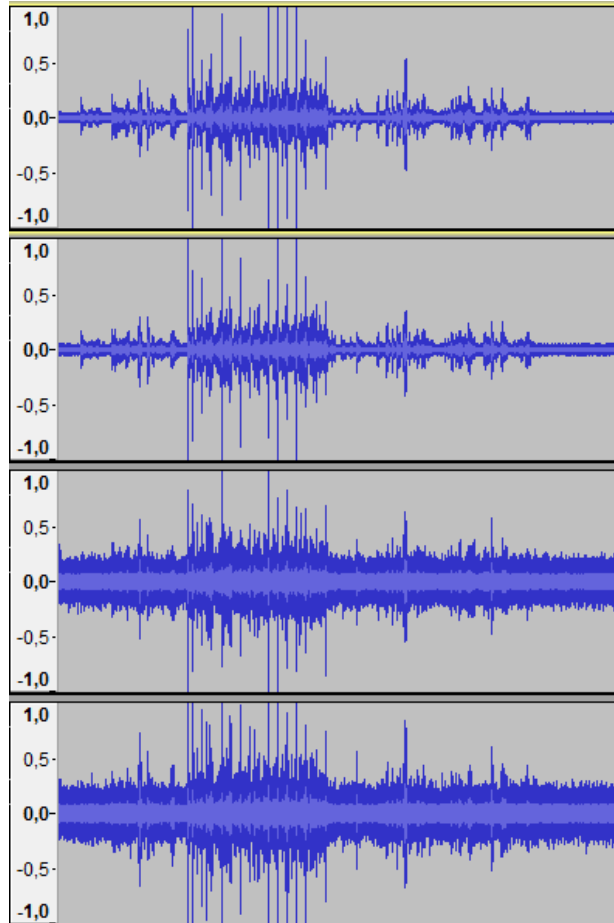
▶ Challenges




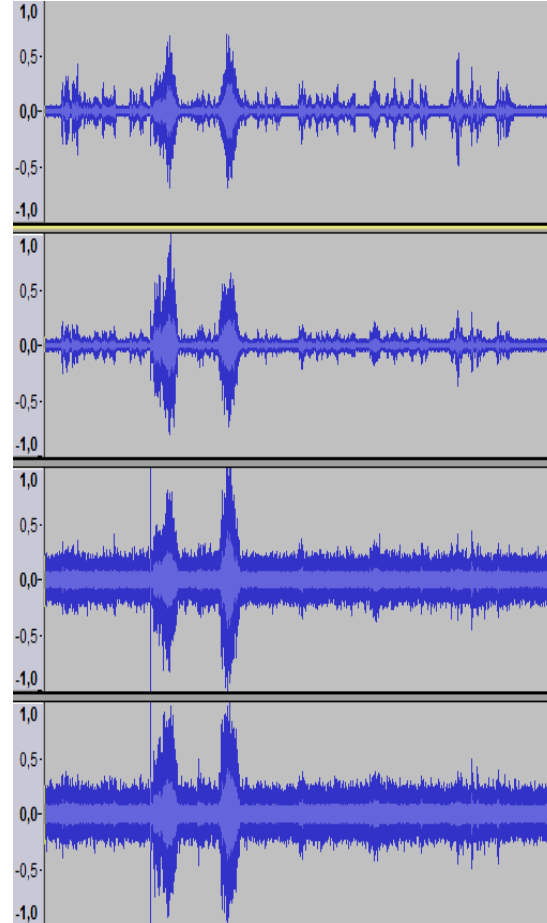
# Challenges


## ▶ Ego-noise

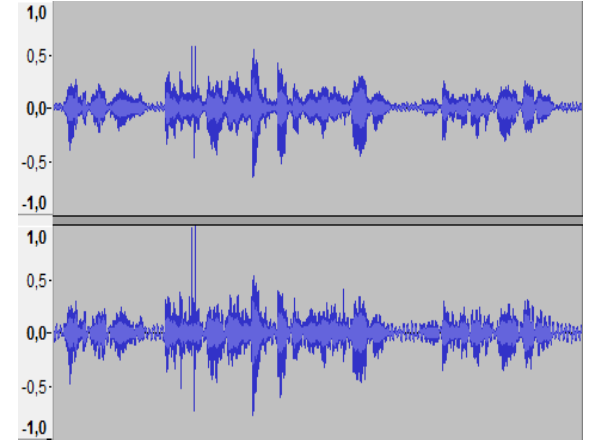
Walking (63-66 dB\*) 



Waving (62-68 dB\*) 



HeadYaw (59 dB\*) 



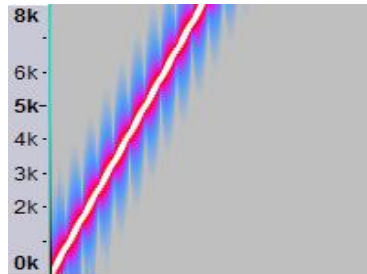
\* Sound pressure at front mic, no source, fan on.  
With fan only: **42.3 dB**

# Challenges

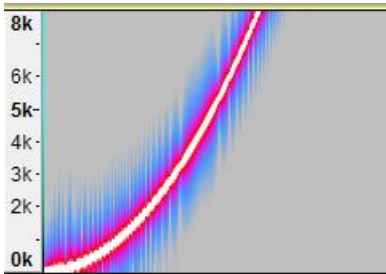
- ▶ Acoustic Echo-Cancellation
  - Loudspeakers' non linearities

**Sent to NAO's loudspeakers**

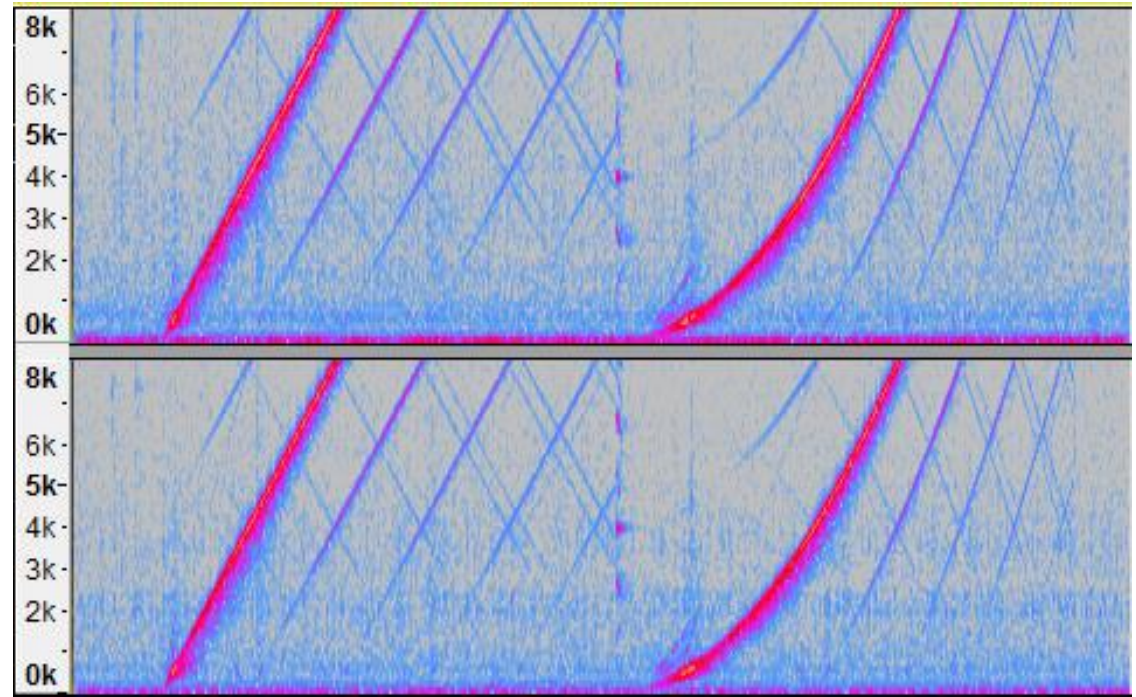
Linear Chirp



Quadratic Chirp

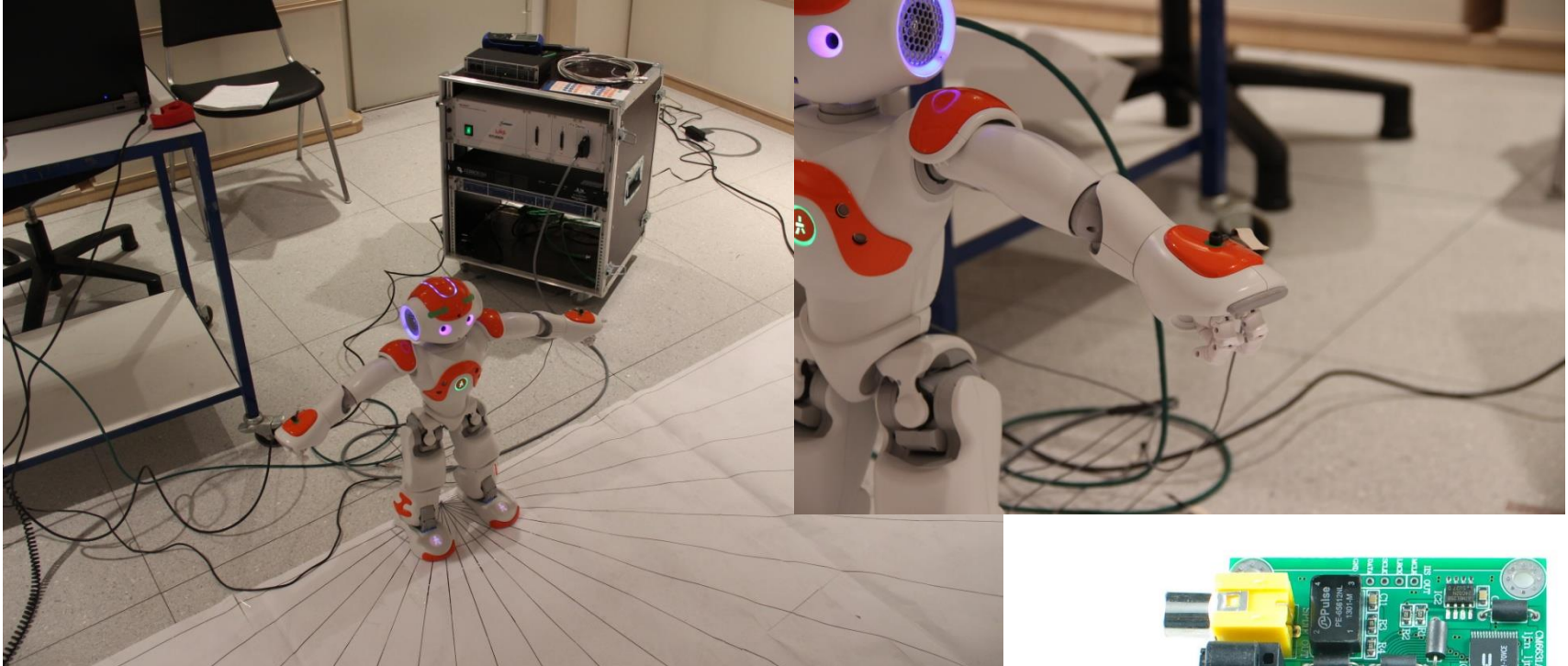


**Recorded with external microphones**



# Challenges

## ▶ Internal/External Mics/Loudspeakers synchronization



Use a USB to SP-DIF converter

