This document explains what we expect from you during the evaluation of the DSAP lab sessions on 24/05/2017. We ask you to send your code, prepare a short presentation and give some demos. No additional report is needed.

# 1. Code

Send your code and audio files to hbrouckx@etrovub.be before 23:59 on Friday 19/05/2016.

# 2. Presentation

## Intro

On the first slide of your presentation, **introduce the group** and mention who did what (e.g. person1 implemented the PSD method, person2 the LMS method,…).

## Project 1: stereo to surround

### PSD method

Illustrate the **PSD method** by **plots of the 7 different output signals** (FL, FR, C, RL, RR, LFE; x-axis = time in seconds) with the following settings:

- Use as input L=[0 0 … 0] (silence), R=[1 0 … 0] (impulse). Use a sampling frequency of 16kHz.
- Set the order of all the lowpass filters equal to 256 (length=257). For the other parameters, use the values mentioned in the paper.
- Make sure the output signals are complete and clearly visible on the plots (long enough; use conv() to convolve and not filter() , add titles/axes).

### LMS method

Apply the LMS technique to the file **stereo2surround_testfile.wav** with the following settings:

- Use the left channel as the desired signal $d(n)$.
- Set μ equal to 1e-3.
- Use a length of 50ms for $\boldsymbol{w}(n)$ and intialise it to zero:

$$\boldsymbol{w}(0) = [0\ 0\ \ldots\ 0]^T$$

**Plot the $\boldsymbol{w}(n)$** you get after your code has finished running.

### PCA method

Apply the LMS technique to the file **stereo2surround_testfile.wav,** using a window length of 200 ms.

- Plot the analysis/synthesis window $\boldsymbol{w}(n)$
- Plot the values of $c_L, c_R, s_L, s_R$

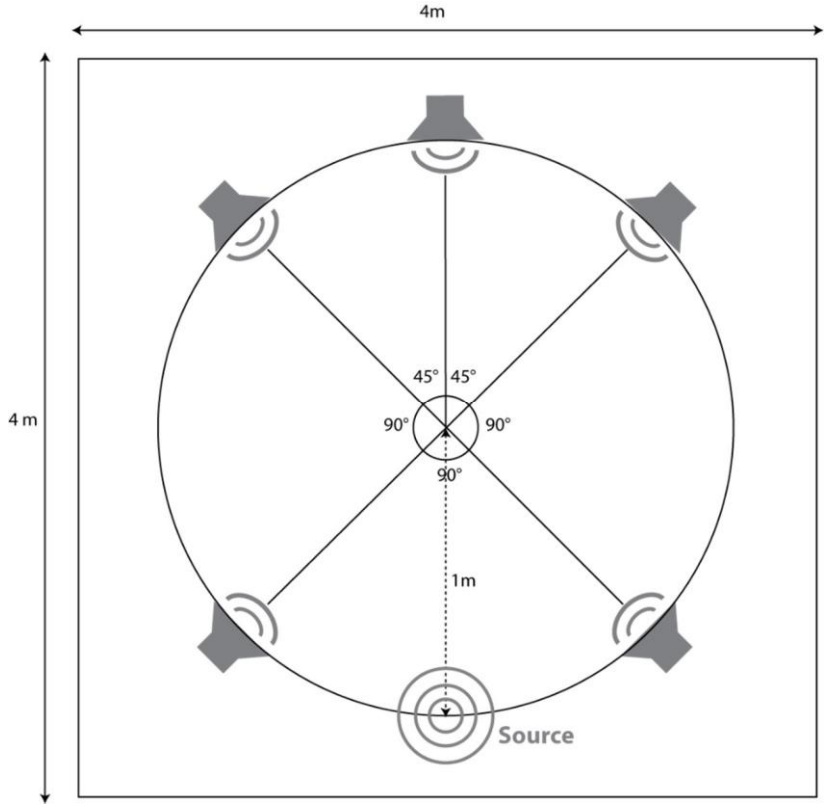
### ADP method

Apply the ADP technique to the file **stereo2surround_testfile_2.wav**.

- Plot $w_L(n), w_R(n)$

## Project 2: surround reconstruction

Use the following setup for reproducing a virtual sound source using your synthesis algorithm :




The virtual room dimensions are 4x4m. The loudspeakers are considered to be positioned at 1m from the listener. Assume the source is positioned in the back of the room at a distance of 1m from the listener (fixed position). Use an impulse as source signal (input=1;). If you are using windows, make sure this impulse is not lost by using a window of length 1 (meaning the window is just one sample with value 1). Use a sampling frequency of 48kHz and assume the speed of sound is 340m/s. Now **plot the output of all loudspeakers** (FL, FR, C, RL, RR) with the sample number on the x-axis (in samples, not seconds).

## Project 3: LPC vocoder

For **one representative** (active) **frame**, **plot for both the speech signal** (modulator) and the **instrument signal** (carrier):

- The amplitude spectrum of the signal frame
- The amplitude spectrum of the LPC source
- The amplitude spectrum of the LPC filter

Also **plot** the amplitude spectrum of the corresponding **output signal** frame.

# 3. Demos

## Project 1: stereo to surround

### PSD

Use the file **stereo2surround_testfile.wav** as input. **Bring the output files** on a USB flash drive. The output files are 3 stereo files:

- **Stereo file 1**: Left channel = Front Left, Right channel = Front Right
- **Stereo file 2:** Left channel = Center, Right channel = Low Frequency
- **Stereo file 3:** Left channel = Rear Left, Right channel = Rear Right

### LMS

Use the file **stereo2surround_testfile.wav** as input. Use the left channel as the desired signal ( ). Set equal to 1e-3. Use a length of 50ms for ( ) and set the initial equal to zero: $(0) = 0\ 0 \ldots 0$ .
**Bring the output files** on a USB flash drive.

### PCA

Use the file *stereo2surround_testfile.wav* as input. Use a window length of about 200ms. **Bring the output files** on a USB flash drive.

### ADP

Apply the ADP technique to the file **stereo2surround_testfile_2.wav**.

## Project 2: surround reconstruction

Use the same room and loudspeaker setup as previously described to calculate the outputs of the 5 loudspeakers (with late reverberation) when using your **own recordings**. **Bring the output files of the 4 first scenarios** (you don't need to use the one with the simultaneous speakers) on a USB flash drive (using the same file formatting as described for project 1; in this case the right channel of stereo file 2 will be zero since there is no LFE signal).

## Project 3: LPC vocoder

**Bring the carrier and modulator input files and the vocoded output file** (calculated in an offline fashion) that you used on a USB drive.