



EQ2401 Adaptive Signal Processing

Project Assignment II, Spring 2024

Background

In this assignment your task is to reduce a periodic noise disturbance (tones) that perturbs a speech signal by using adaptive filtering techniques.

Task

The data can be found on the course homepage under Assignment 2. There you will find a zip-file `EQ2401Project2_2024.zip` that contains the sound file `EQ2401Project2data2024.wav`. The data can be loaded into MATLAB by

```
[y,fs]=audioread('EQ2401Project2data2024.wav');
```

The variable `y` contains the noisy sound data, and `fs` the sampling frequency.

Your task is to try to reduce the tonal noise as much as possible and in that way enhance the speech.

You should at least try to apply the LMS, NLMS and RLS adaptive filters taught in the course.

For all filters you should discuss and motivate the design of the filters and the choice of user parameters.

There are probably several different strategies to solve the problem. One idea is to look at the so called Adaptive Line Enhancer/Canceller technique. You can easily find information about it on the web.

Extra task For the interested students, there is also another data file `EQ2401Project2_bonus_task2024.wav` included. This contains a speech signal and a police siren sound as a disturbance. The task is to eliminate the siren sound. This is a bonus task, outside the requirements of the course, and it will not influence the grading.

About the Project

This is a project assignment that is part of the examination in the course and, hence, examination rules apply.

You can work on the project individually or in groups of **two** students, but **not** in larger groups.

Your solution should be presented orally in a short seminar. You will be given 5 minutes for a slide style presentation and then we will have about 10 minutes for running your matlab script and discussions.

That is, your solution strategy and results should be documented in the form of a few presentation slides and a well designed matlab demo script.

The project is graded by **Pass** or **Fail**. A passing grade is required to complete the course. To give credit to good solutions and presentations, we will further award up to **2 bonus points**. The students can then add these bonus points to their exam score. The bonus points will be valid on the exams in March or June this year.

The following is required for a passing grade:

- A solution to the project tasks, documented in a clear and concise manner.
- Of course, the solutions should be unique and accomplished only by members of the individual groups.
- The solutions should be presented according to deadlines.

When you have finished the task please upload the following (at the course homepage under assignment Project 2, it is sufficient that one of the group members submit):

- A zip-file containing:
 - Presentation slides in ppt or pdf format. The front page should state your names, personal numbers and email-addresses.
 - Your solution in the form of a matlab script named as `main.m`.
 - All related m-files needed to run the script (except for standard matlab functions)

Make sure that we can run your script as is. That is, that all files are submitted and all paths are set in the script if needed.

In the presentation, make sure you are describing what the problem really is about, what the solution is, what assumptions you have made, and that you have motivated choices or approximations made.

If the solution does not pass, there will be a chance to turn in a revised version before a new deadline. The revised version will be graded with pass or fail; that is, it will not be possible to get bonus points with a revised project. Note that if the solution fails the second time, a new project must be completed next year.

Good Luck!