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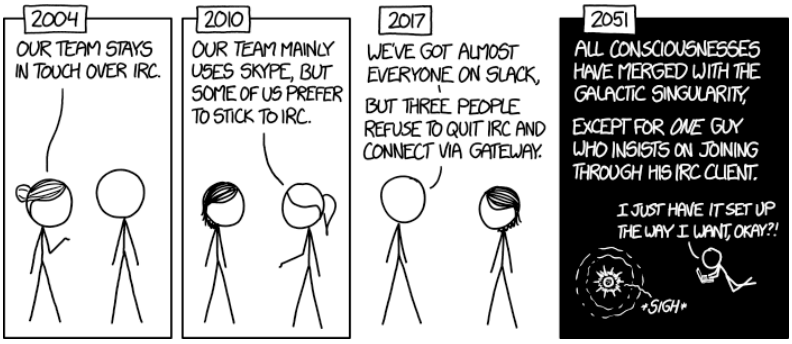
Course 22051: Signals and Linear Systems in Discrete Time

22051

Project assignment - A basic DSP pipeline



source: xkcd.com

Your entrance ticket to the "friendly discussion"

In order to join the exam, I will ask you to work during this semester on the implementation of a basic DSP pipeline. This could be an example of you working in a start-up where you need a tool that analyses data from a measurement device. And you need to crunch quite some data - and want to be able to back-track everything to the very beginning.

The basic idea is that you won't be able to do much in the beginning of the course (How should you? You just started on DSP!). But as we progress, you will be able to start implementing certain elements - and continuously think about how to make the individual elements play together. It will be essential that you work together as a team - and that you work on this in a continuous manner. There might occur the need for ongoing changes and modifications - so don't consider your code to be finished before it's done!

A key element in this project will be that you share knowledge. And you are not only encouraged to share knowledge within your own group, but I also highly encourage you to share knowledge **across groups**! Learn from each other how these problems can be tackled - and then find your own way to implement them! **Share knowledge, not code!**[1]. You need to submit your own code and a detailed description of all the elements in your system as a group at the beginning of week 12. Copying code or text is plagiarism and can not be accepted. But please go ahead and chat!

[1] With one exception - that is that you are more than welcome to share the routine that reads in the specifications (see below).

Bastian Epp: 45 25 39 53 (office), e-mail: bepp@dtu.dk

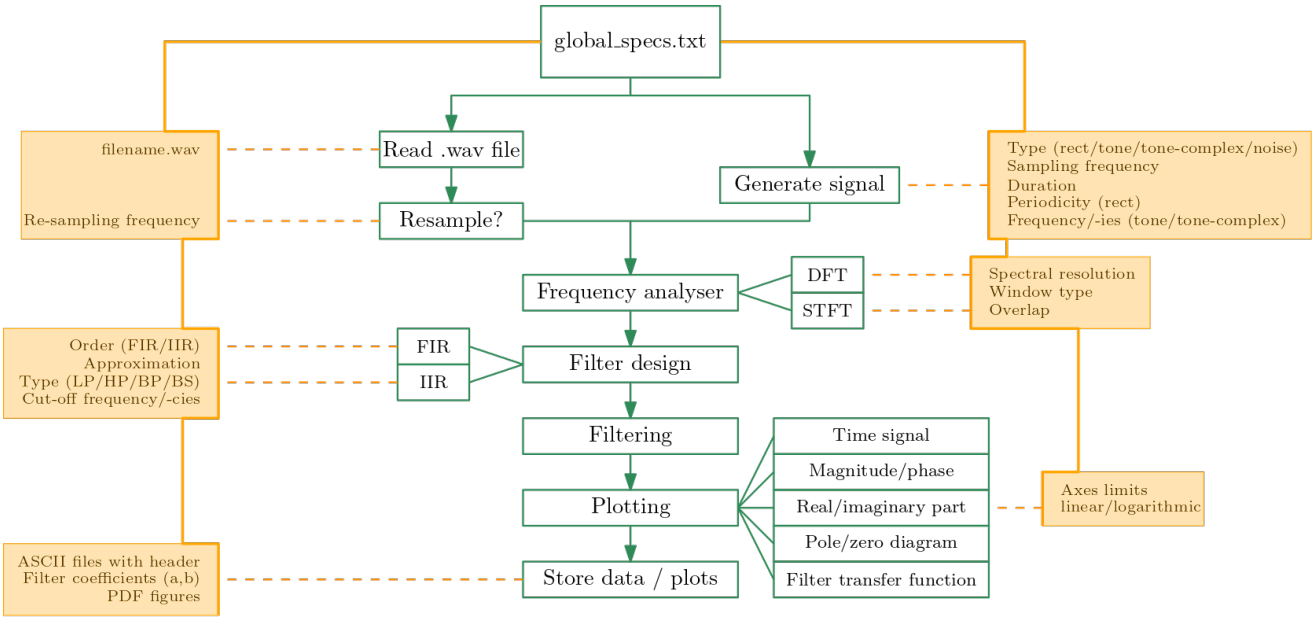


Figure 1: Basic structure of the system. All relevant info is provided in the file `global_specs.txt`. The orange boxes indicate the relevant variables. The green boxes show the relevant processing stages.

1 The project

It happened! We started our first company. Yes - it is in a garage. But we have pizza (vegetarian), beer and are full of enthusiasm and knowledge! It is incredible how expensive these software licences are for that piece of analysis software that we need to evaluate the output of our acoustic deep-space hyperfractal communicator! Luckily enough we just got YOU and we know that you can implement that software for us. We defined a basic workflow in figure 1. You are free to use the software that you want (we will be happy with MATLAB, Python, Julia or C). All we need in the end is:

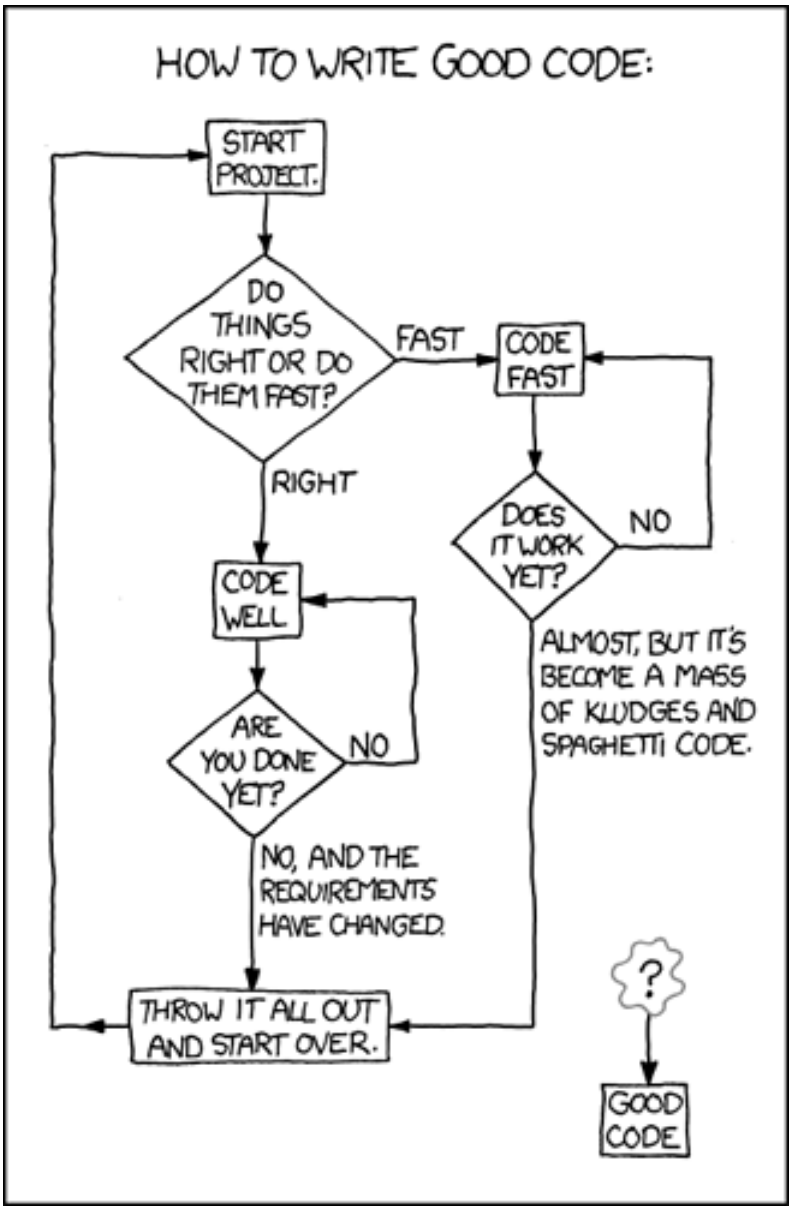
- a commented code,
- split into separate files containing the individual functions,
- hosted in a GIT repository (use `gitlab.gbar.dtu.dk`) named `22051_project_grpXX` (XX = group number) where we can follow the commits,
- where we specify the parameters in the file `global_specs.txt` and then just run the code!

We want to be able to run the code from a folder that contains all required files and outputs the raw data, the processed data, the filter coefficients used as well as the figures in format 10x15 cm in PDF format (in a quality that allows us to use it directly for publications). Then we also want you to provide a technical report of max 6 pages in paper manuscript format (you will get a template) where you outline the code and your considerations behind the implementation. We know that there are issues like “aliasing” and “normalized frequencies” that need to be considered. But you know all about that! so we trust you!

How to get it done

If you need support, then please reach out to your network (the other groups) and post questions etc. on the communication channel. Feel free to post code on DTU LEARN - and see how others solve the problem. You will find your own way of implementing it - and this is what we will be discussing during the next weeks. You are also welcome to bring up some specifics during the weekely small-group discussions where we can tackle things specifically.

Good luck!



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Acknowledgements

This project assignment is the result of teamwork - with essential contributions from enthusiastic students that are interested in improving teaching for the generations to come. Thanks to MBR, XH, IÞ for the key ideas!