

Good Ingredients Make a Good Dish: Open-Source Sequence Programming

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Synopsis

In this presentation, I will introduce the open-source pulse sequence programming tool Pulseq. I will start by describing how it interacts with the scanner and how to install it. I will then go through simple sequence examples (gradient and spin echo sequences), describing how to add RF pulses, gradients and acquisition objects to the sequence. Finally, I will provide examples of a few more advanced applications focusing on quantitative MRI, namely diffusion, T1 and T2 mapping

Description

The goal of this presentation is to provide basic notions of pulse sequence programming and to introduce the open-source pulse sequence programming tool Pulseq [1].

I will start by describing how Pulseq interacts with the scanner, namely explaining how ".seq" files describe the pulse sequences and what is required to use this tool.

I will then go through simple pulse sequence examples (gradient and spin echo sequences), describing how to add basic objects to a pulse sequence, namely: RF pulses, gradients and acquisition objects. I will show both the original Matlab implementation and the Python equivalent, made possible through the use of PyPulseq [2].

Finally, to showcase more advanced uses of these tools, I will provide examples of a few more advanced applications focusing on quantitative MRI, namely brain diffusion [3] and myocardial T1 mapping [4,5].

Objectives

At the end of this presentation, the audience should:

- Understand how the open-source tool Pulseq interacts with the vendor environment;
- Understand how to add basic blocks to a simple pulse sequence using Matlab/Python;
- Understand the potentialities and limitations of this tool.

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References

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[3] Nunes RG, Ravi KS, Geethanath S, Vaughan Jr JT (2020) Implementation of a Diffusion-Weighted Echo Planar Imaging sequence using the Open Source Hardware-Independent PyPulseq Tool, *ISMRM*

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