COLUMBIA UNIVERSITY
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imr-framework for rapid design and deployment of non-Cartesian sequences

Keerthi Sravan Ravi [1,2], Sairam Geethanath [2*], John Thomas Vaughan [2]

[1] Department of Electrical Engineering, Tandon School of Engineering, New York University, New York
[2] Columbia Magnetic Resonance Research Centre, Columbia University, New York

imr-framework

What is `imr-framework`?

`imr-framework` is a software framework that transforms a standard MR system into an *MR value driven autonomously functioning* scanner, which can be deemed as an *Intelligent Physical System* (IPS). Check the Github repository here.

Library structure

`imr-framework`:

- `amri`: MR value driven autonomous scanner
- `pulseq`: Python translation of the Pulseq framework [1].
- `pulseq-gpi`: GPI integration of Pulseq [2]
- `ImRiD`: Image reconstruction database

References

[1] Layton, Kelvin J., et al. "Pulseq: A rapid and hardware-independent pulse sequence prototyping framework." Magnetic resonance in medicine 77.4 (2017): 1544-1552.

[2] Ravi, Keerthi Sravan, et al. "Pulseq-Graphical Programming Interface: Open source visual environment for prototyping pulse sequences and integrated magnetic resonance imaging algorithm development." Magnetic resonance imaging 52 (2018): 9-15.
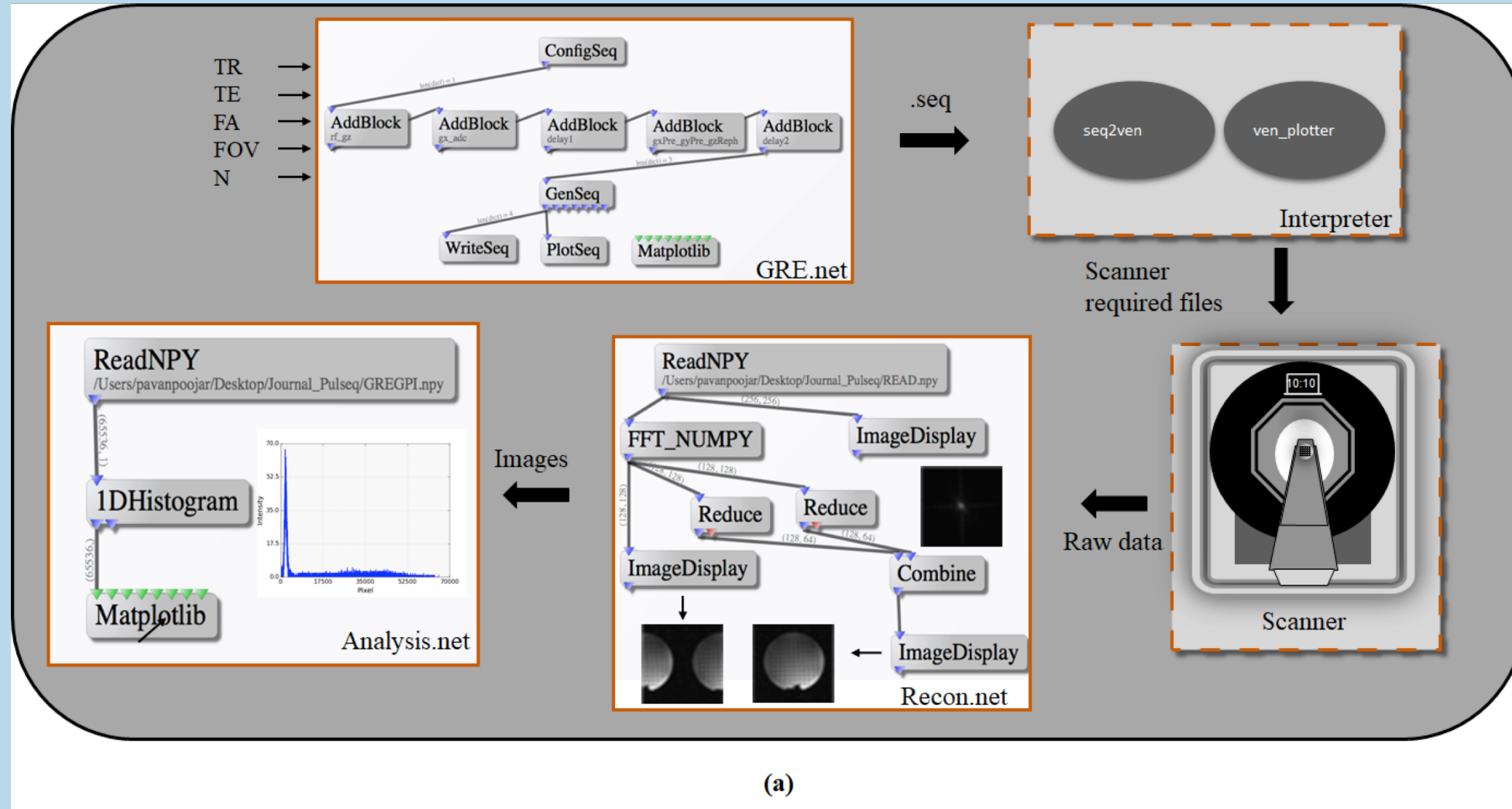
Figure 1: A comprehensive, unified, open source platform for MR method development
Sravan et. al., MRI 2018

- Demonstrate deployment of spiral and radial non-Cartesian sequences to acquire ADNI phantom data.
- Sequences programmed on Python-Pulseq.
- Acquisitions performed on a Siemens 3T Prisma.

System specs:
- Gmax – 32mT/m
- SRmax – 130mT/m/s
- FOV (both) - 256mm, Flip Angle 15^0, TR/TE = 20/5ms

- Spiral – 16 shot, 128 x 256
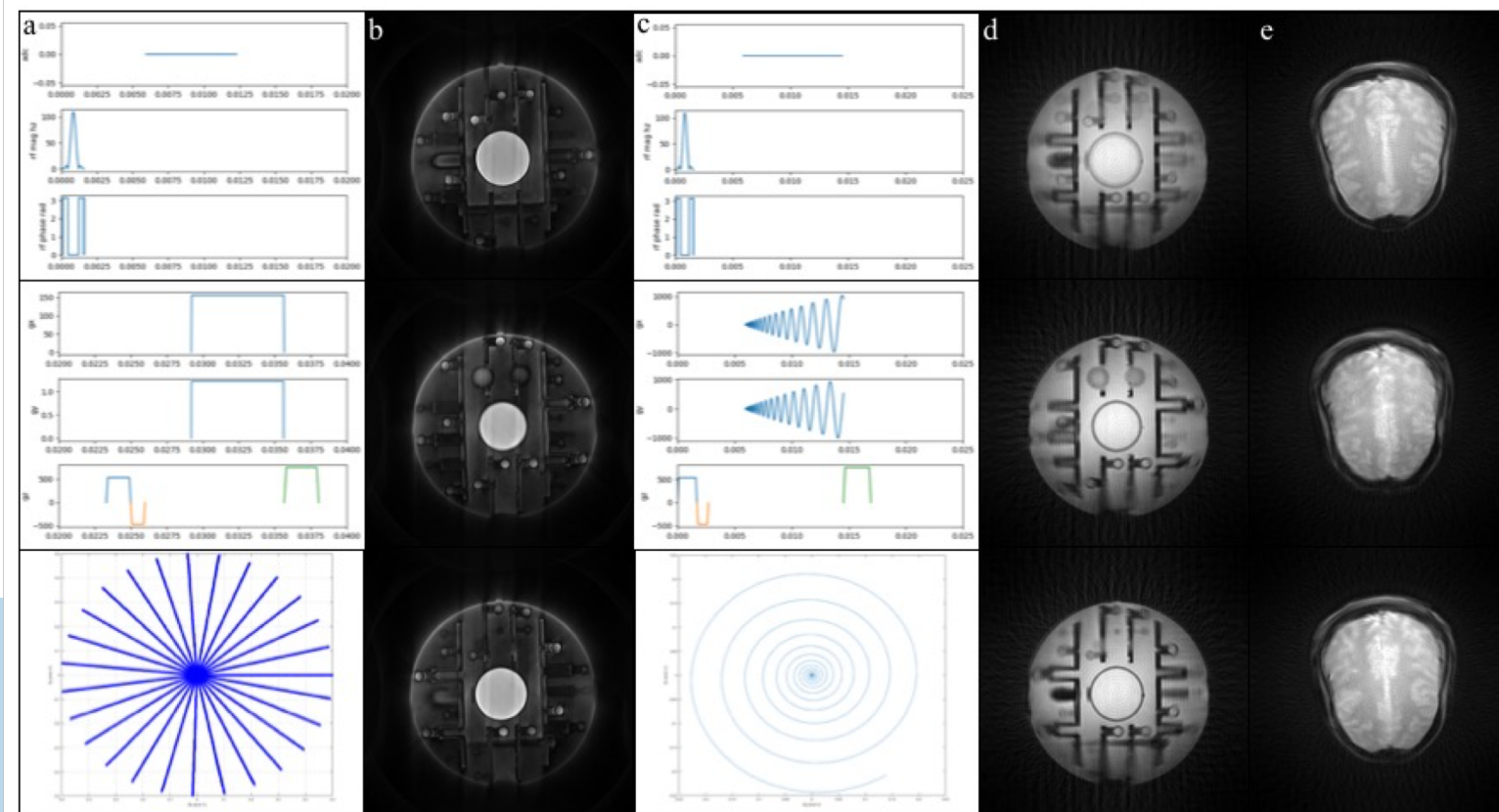- Radial – 805 spokes FID, 256 x 256

Figure 1. (a) and (c) show the pulse timing diagrams and the k-space trajectories for the 2D radial and spiral sequences respectively; (b) shows the phantom acquisitions for the 2D radial sequence; (d) and (e) show the phantom and in vivo acquisitions for the 2D spiral sequence

18/10/2018