A **Free** and **Open-Source Web Application** for **Pulse Sequence Development** and **Simulation**

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ISMRM | Iberian CHAPTER

Design, visualize, and simulate pulse sequences **directly from your browser**

SUMMARY

Motivation
- MRI sequence development has traditionally relied on **vendor-specific, proprietary tools**
- Limited accessibility, flexibility and reproducibility

Recent Open-Source Initiatives
Several tools have contributed to a more open ecosystem:
- **Pulseq**: standardized `.seq` format + Python/Matlab libraries
- **JEMRIS**: simulator with graphical sequence editor
- **CMRseq**: Python framework for programmatic sequence design
- **mtrk**: newly-released, interactive and Pulseq-compatible sequence editor

Our Contribution
MRSeqStudio: A Web-based, free and open-source application for:
- **Designing sequences interactively** – via drag and drop blocks
- **Visualizing sequence waveforms** – with a sequence diagram plot
- **Displaying the selected slice within the 3D volume** – through a lightweight spatial planner
- **Simulating** the created **sequences in real time** – using KomaMRI simulator backend

- ✓ Combines **sequence editor + simulator in a single tool**
- ✓ Runs **entirely in the browser**, with backend-powered simulations
- ✓ **No local installations** needed

METHODS

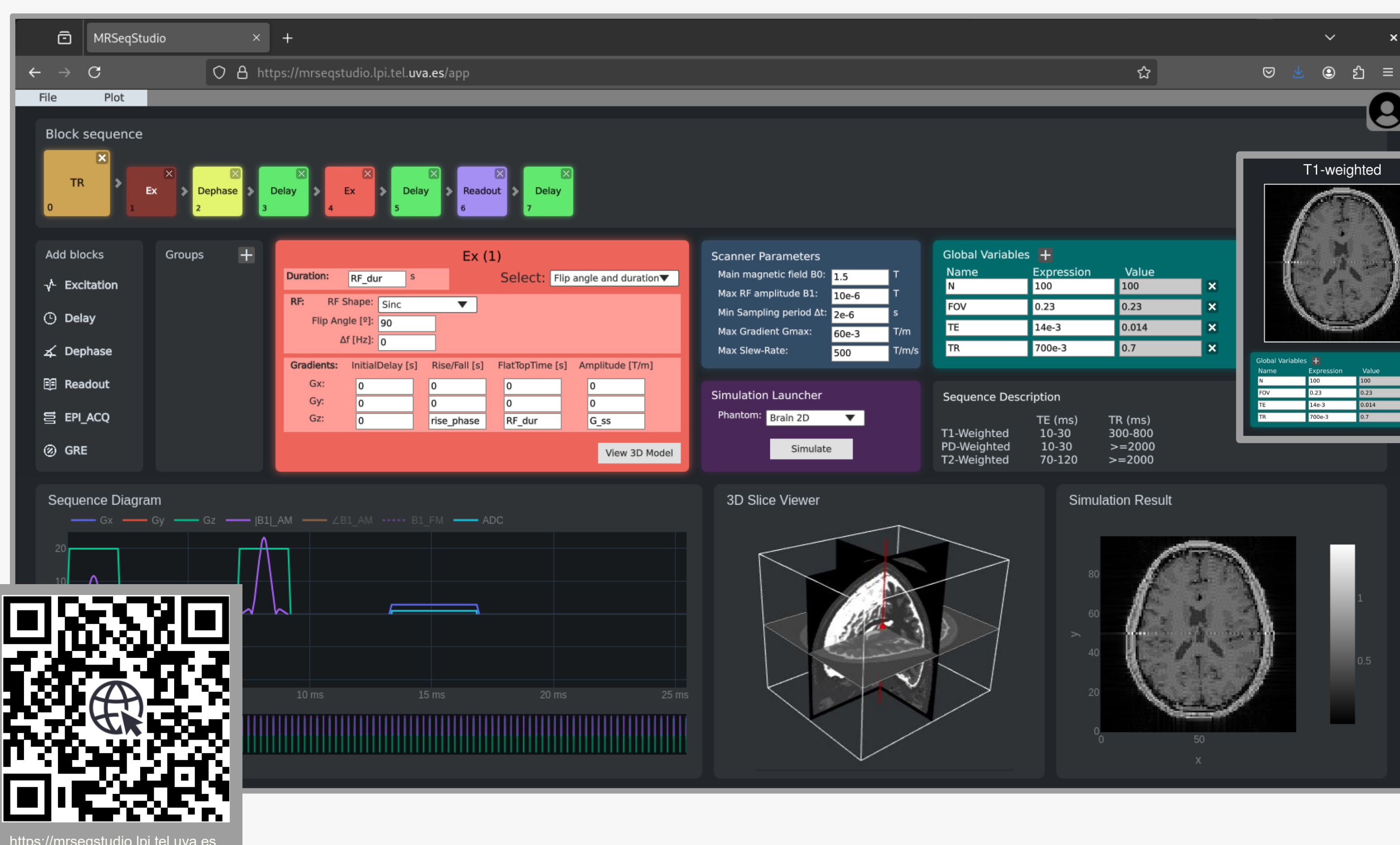The application follows a client-server architecture based on the **REST** paradigm.
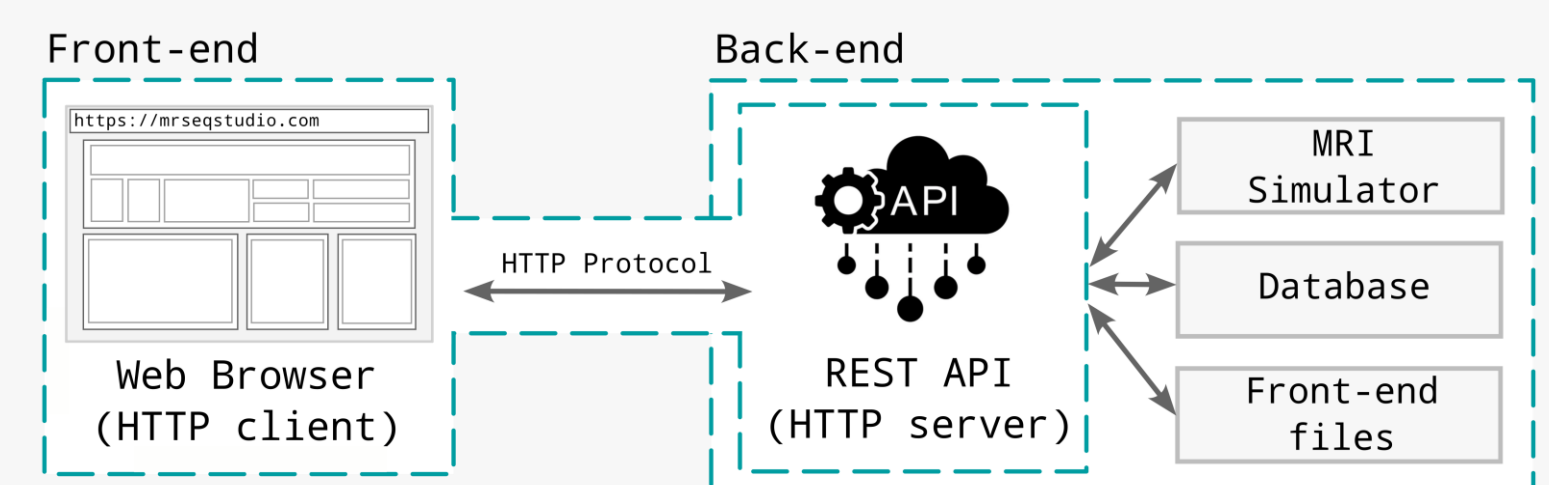
- **Front-end**: built with Qt (QML) + WebAssembly, and VTK.JS
- **Back-end**: built with julia
  - **REST API** (HTTP server): Oxygen.jl
  - **MRI Simulation**: KomaMRI.jl
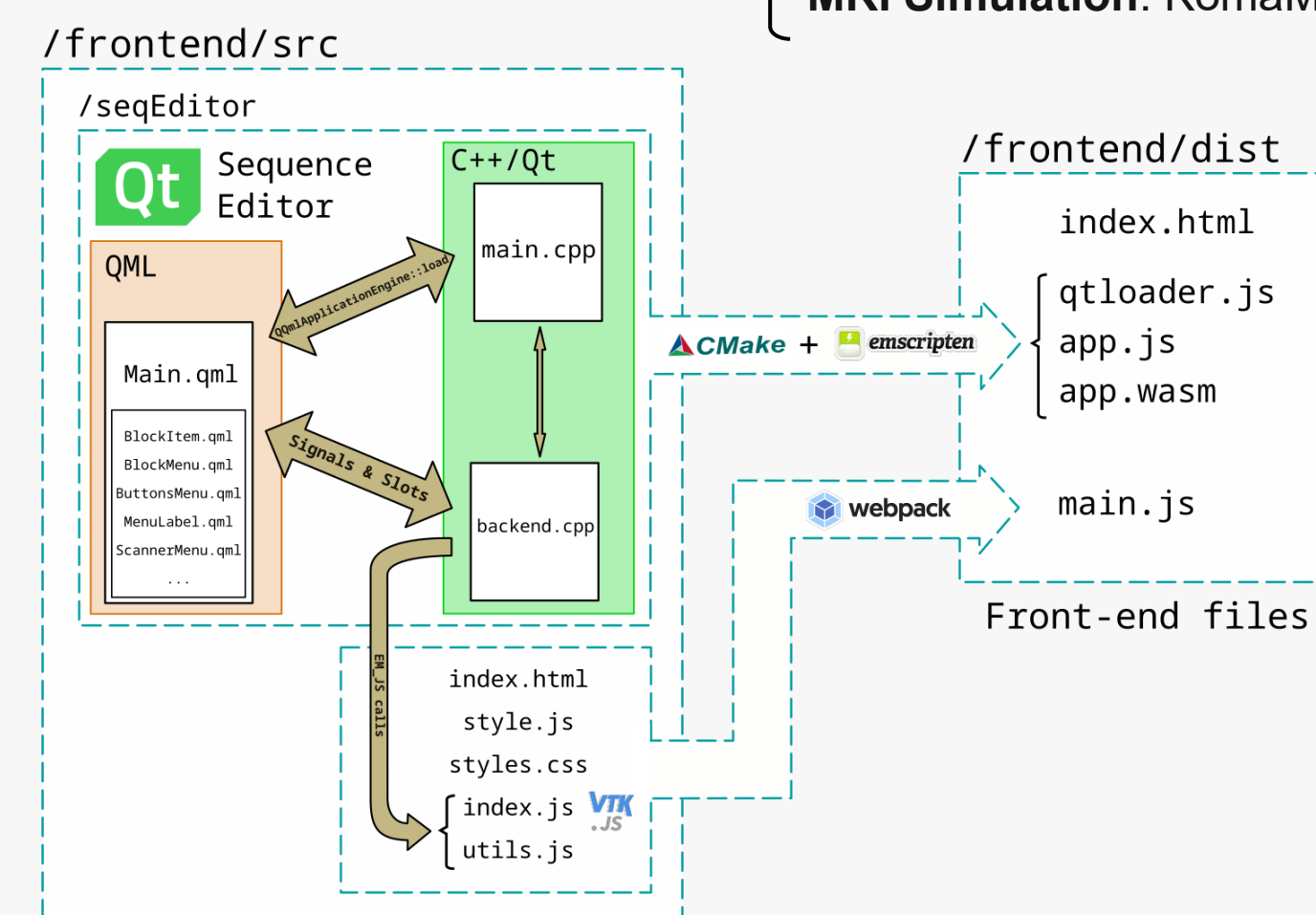
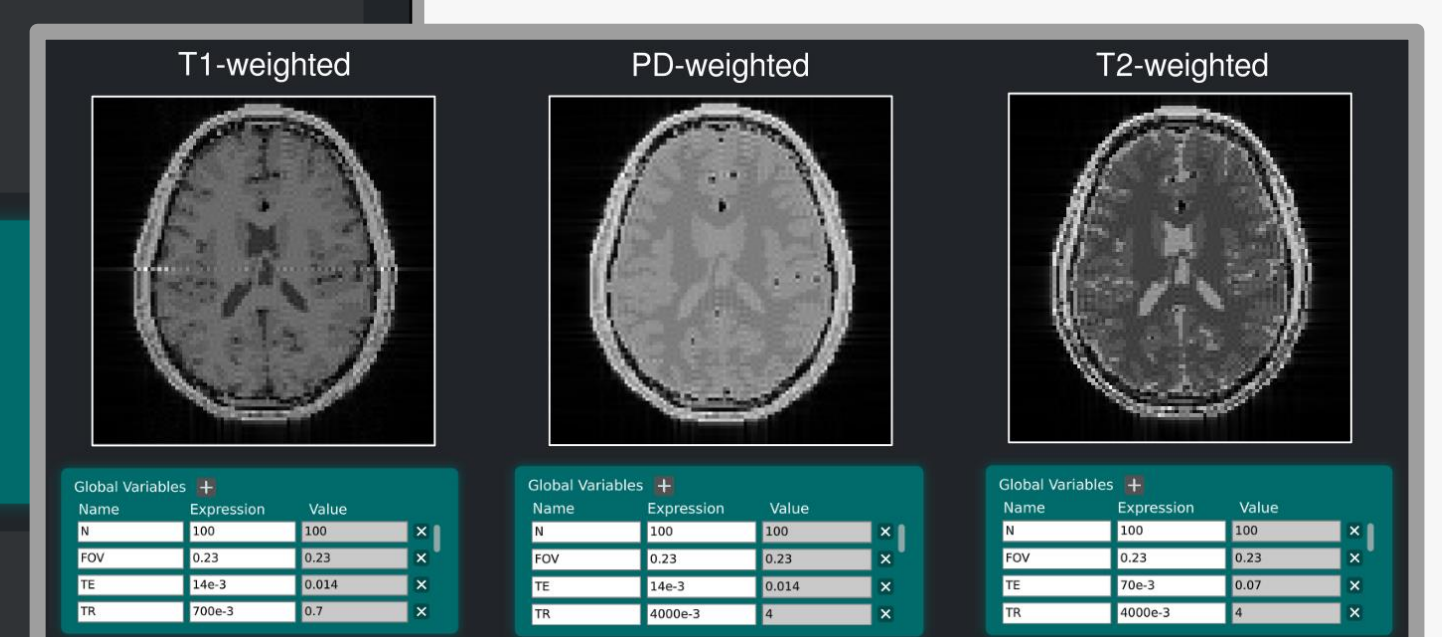github.com/pvillacorta/MRSeqStudio

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RESULTS

Usage example: Adjusting TE and TR in a SE sequence to generate T1, T2, and PD-weighted images

Key functionalities:
- Sequence Creation, Editing and Simulation
- File Import and Export (.json, .qml)
- Plotting tools:
  - Sequence diagram viewer
  - 3D slice viewer

https://mrseqstudio.lpi.tel.uva.es