A framework for programming a modern magnetic resonance system

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Introduction: Magnetic resonance system leads the tools of analysis and diagnosis because its non-invasive and non-destructive characteristics over the study object. Recent advances in the magnetic resonance field introduced such technology in more accessible and portable design which requires flexibility for being used to new applications that researchers could create by their own. This flexibility and liberty is not found in commercial system. The aim of this project is the definition of a framework that assists the equipment programming and management, including since the creation of the interface to data processing.

Methods: The entire framework is supported by up-to-date programming techniques that generates an API that can be integrated with others external tools such as simulators and scientific libraries. The main language is Python because of its simplicity and availability of many scientific libraries such as NumPy, SciPy, etc.

Results: Within this framework, the PyMR [1] framework offers a generalized application programming interface (API) for programming and setting magnetic resonance systems, while another derived API constitutes the backend, which communicates in a lower level with the hardware. Preliminary versions are already in use in local magnetic resonance system at University of São Paulo, São Carlos Institute of Physics, Center of Magnetic Resonance Imaging and Spectroscopy. Figure 1 shows the interface of object manager which has the object creator, object inspector and object editor. The first one shows all the classes that can be instantiate. The second one shows the system structure and the last one shows the properties that can be changed for each part of the system. Plugins were also produced to help users to manage to create, in any level, new applications or systems. These plugins should be integrated with the Eclipse Integrated Development Environment (IDE) or other ones. The whole framework and plugins have an integrated documentation which could be exported in HTML or PDF formats.
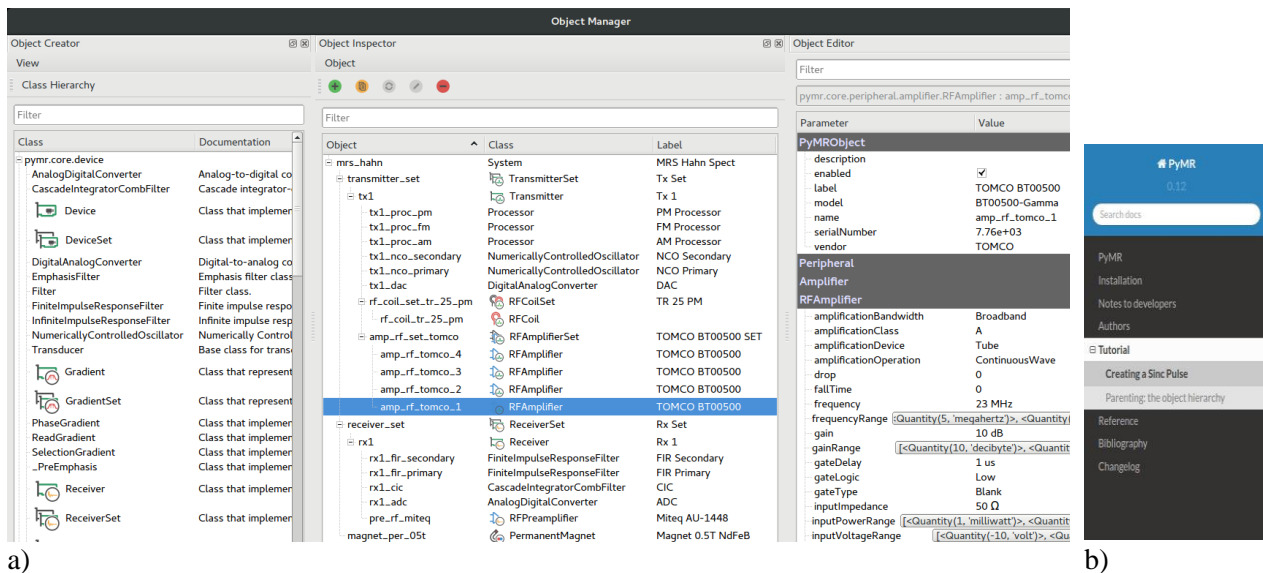
Figure 1. Some characteristics of PyMR framework. **a)** Object manager formed by object creator, object manager, object editor. **b)** Integrated documentation generated in HTML.

Conclusion: The set of frameworks and plug-ins is extremely versatile and flexible, reflecting the high power of modern technologies or new applications for existing ones.

Referências: [1] PIZETTA, D. C. Biblioteca, API e IDE para o desenvolvimento de projetos de metodologias de Ressonância Magnética. 2014. Dissertação (Mestrado em Física Aplicada) - Instituto de Física de São Carlos, Universidade de São Paulo, São Carlos, 2014. Disponível em: <http://www.teses.usp.br/teses/disponiveis/76/76132/tde-28042014-160738/>