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pHARDI, implementación paralela de un framework de deconvolución esférica de datos de resonancia magnética por difusión

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ARCOS

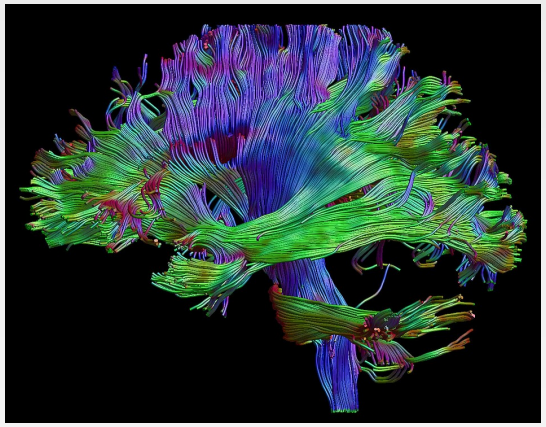
REPHRASE

Magnetic resonance imaging (MRI)

- Non-intrusive method for getting internal anatomy and the physiological processes of the body.
- Mostly used for diagnosis of patients.
- Huge amount of data gathered by scanners.
- Applied to Neuro-sciencies
  - Bipolar issues
  - Paranoia
  - Schizophrenia

Objectives of fiber-tracking

- Identification of fibers for studding the connectivity ratio between different areas of the brain.
- Two different approaches
  - Statistical-based studies (i.e., 4TB of medical data)
  - Fiber tracking applied to guided surgery
- Totally implemented in Matlab
- Target: non computer-science users (i.e., medical doctors)
- Detected problems:
  - Portability
  - Performance: specially on data management
  - Flexibility



Erick J. Canales-Rodríguez, Lester Melie-García, Yasser Iturria-Medina, Yasser Alemán-Gómez

http://neuroimagen.es/webs/hardi_tools/

Objectives of this work

- To introduce the implementation of RUMBA-SD.
- To describe the steps taken and the tools used for the migration of the Matlab-based application to the C++ language
- To present the parallel C++ version of RUMBA-SD that relies on the Armadillo library and takes advantage of current multi-core architectures
- To perform an exhaustive evaluation that demonstrates the benefits of the migration and analyze best combinations of parallel heterogeneous platforms

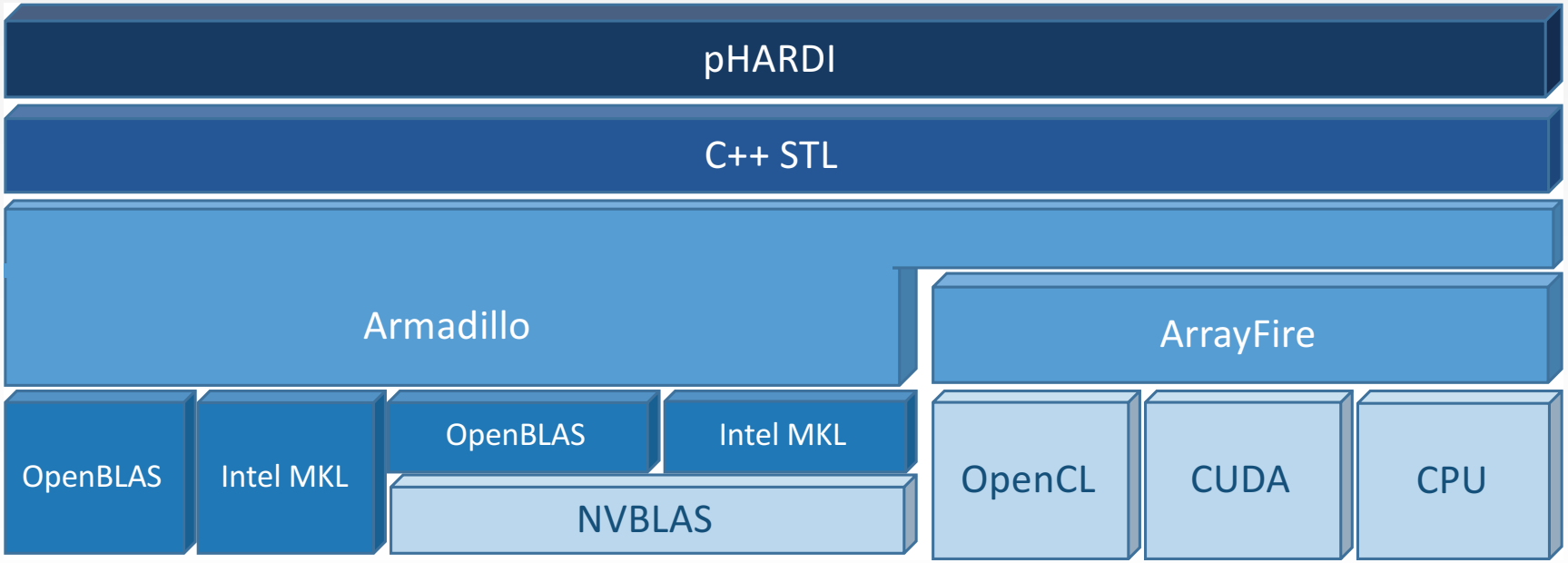
pHARDI (Parallel High Angular Resolution Diffusion Imaging (HARDI) Tools)

- RUMBA: Initial implementation based-on Matlab.
  - Parallelism does not applied to all computation levels (e.g. vectors).
  - High dependence on linear algebra operations.
  - Around 500 lines of source code.
- RUMBA ported to C++ with a similar Matlab representation.
- **pHARDI** aims to include multiple reconstruction methods (RUMBA, QBI, DSI, etc).
- Employed libraries:
  - Armadillo
  - ITK
  - FFTW3

pHARDI

http://bitbucket.org/fjblas/phardi/

- Portable implementation for heteregenous systems
  - Totally migrated to C++
  - High performance solution
  - Multi-device support
  - 100x faster than other develpments in the field (Bedpostx)



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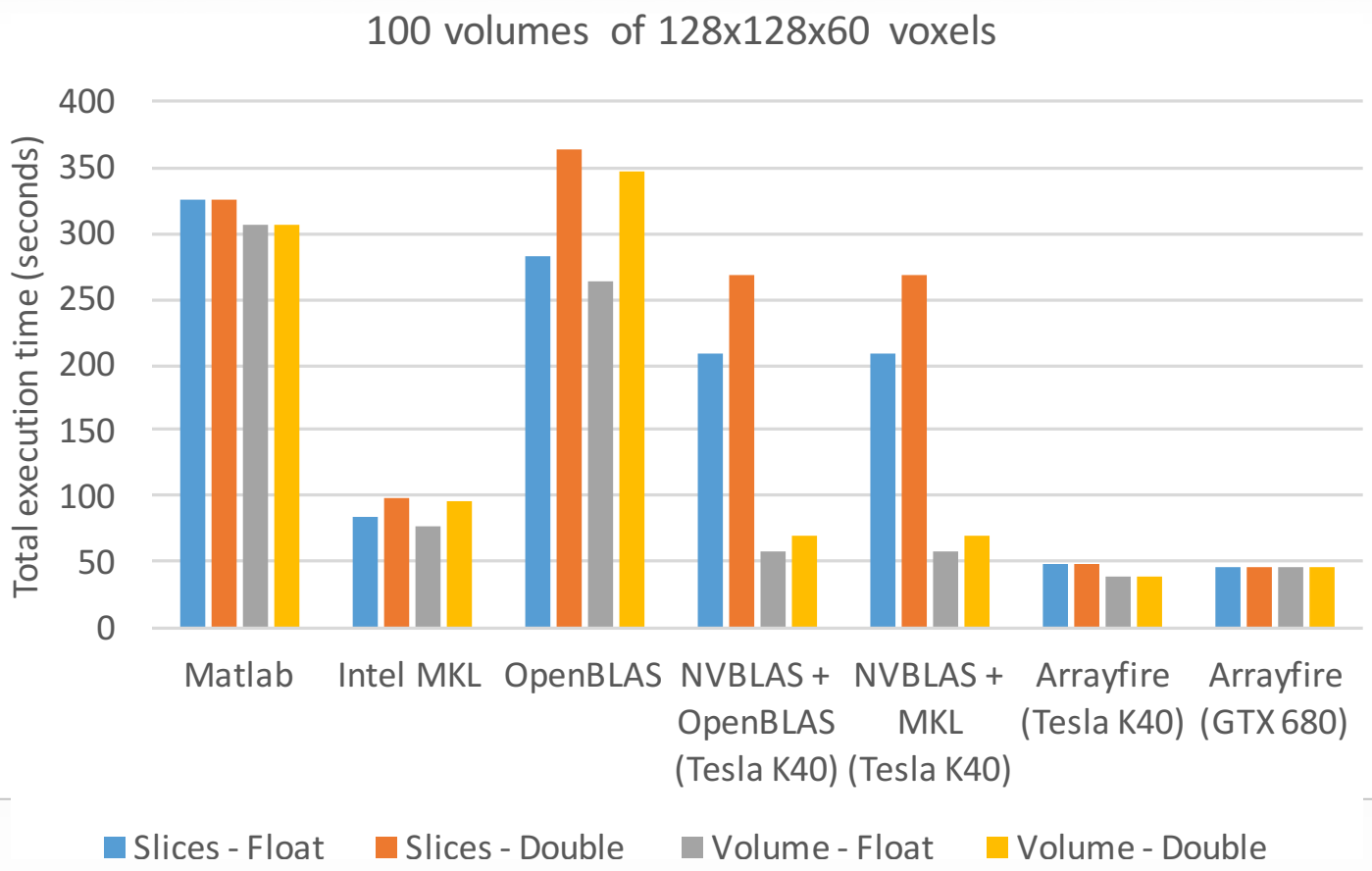
Evaluation (II)



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