Towards a unified USCT data and code interface

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3D Ultrasound Computer Tomography

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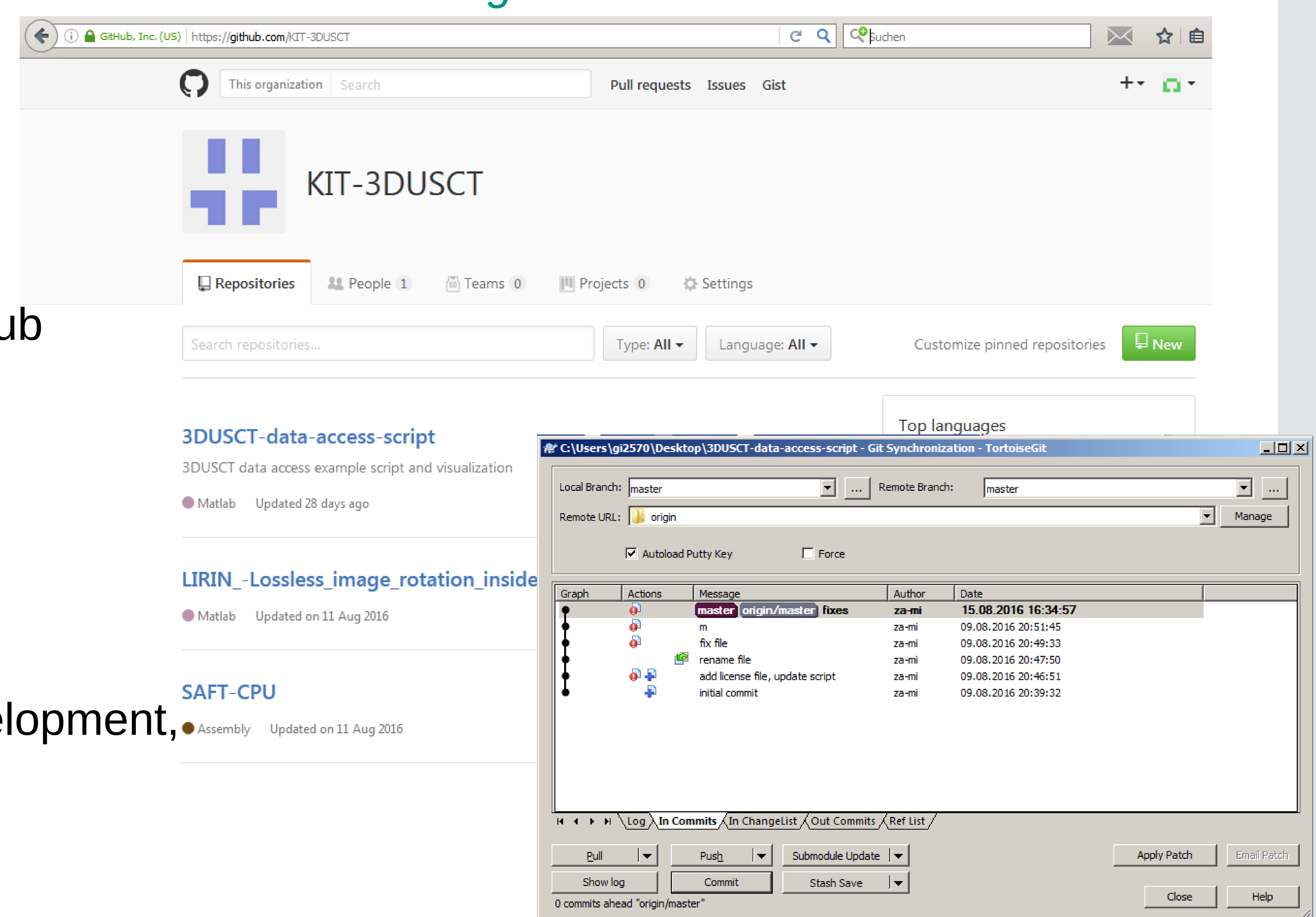
Abstract

The academic USCT research community is hampered in collaboration and progress by missing defaults in data formats, meta data specifications and comparable code bases.
We present some initial contributions and starting points to address these shortcomings.

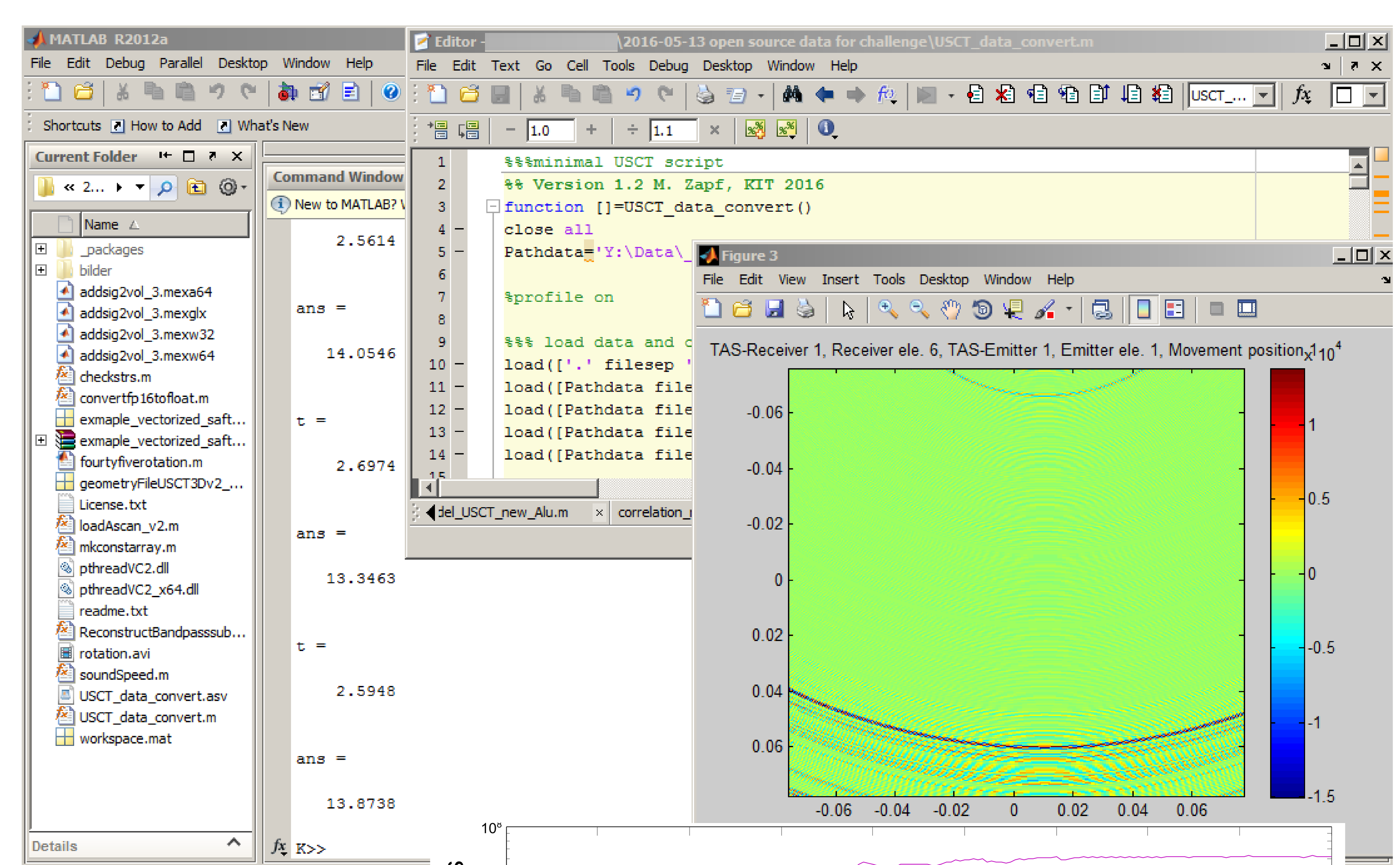
Ideas and general favorable properties



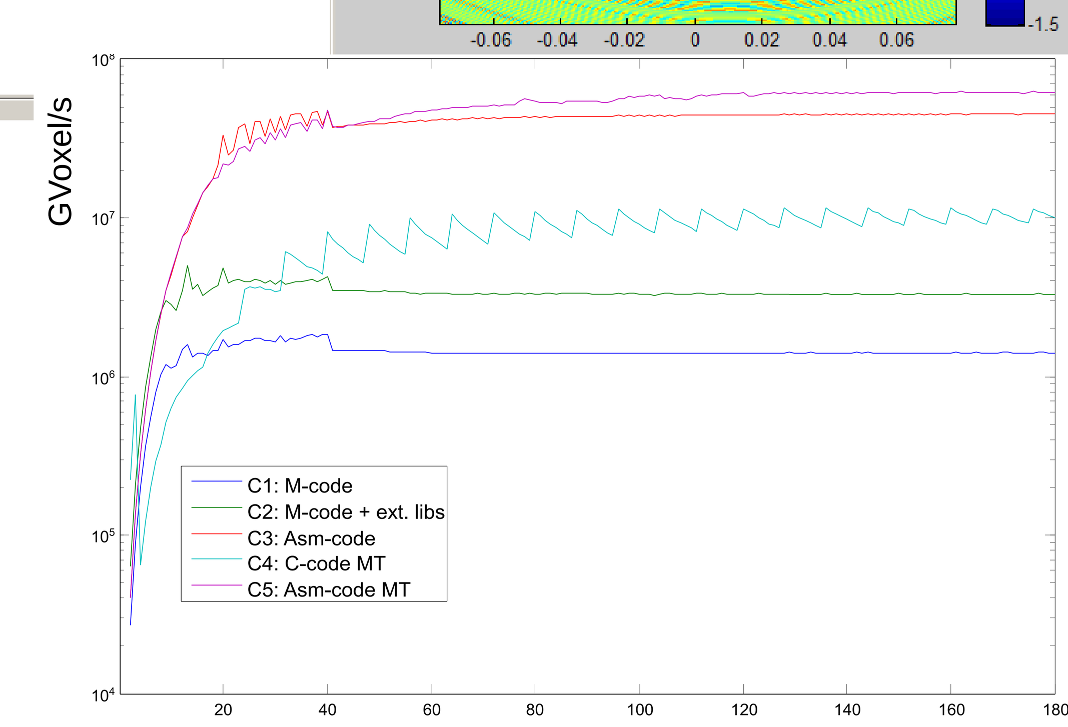
- **Freely available**, by an established open source licenses
- Concurrent **collaboration** with versioning: GIT
- Creation of "**single point of source**" code repository at GitHub
- MATLAB as **common denominator** for scientific code

Initial Contribution

- Github repository https://github.com/KIT-3DUSCT
  - Central point of source, code versioning, concurrent development, branching and forking, Issue and bug tracker

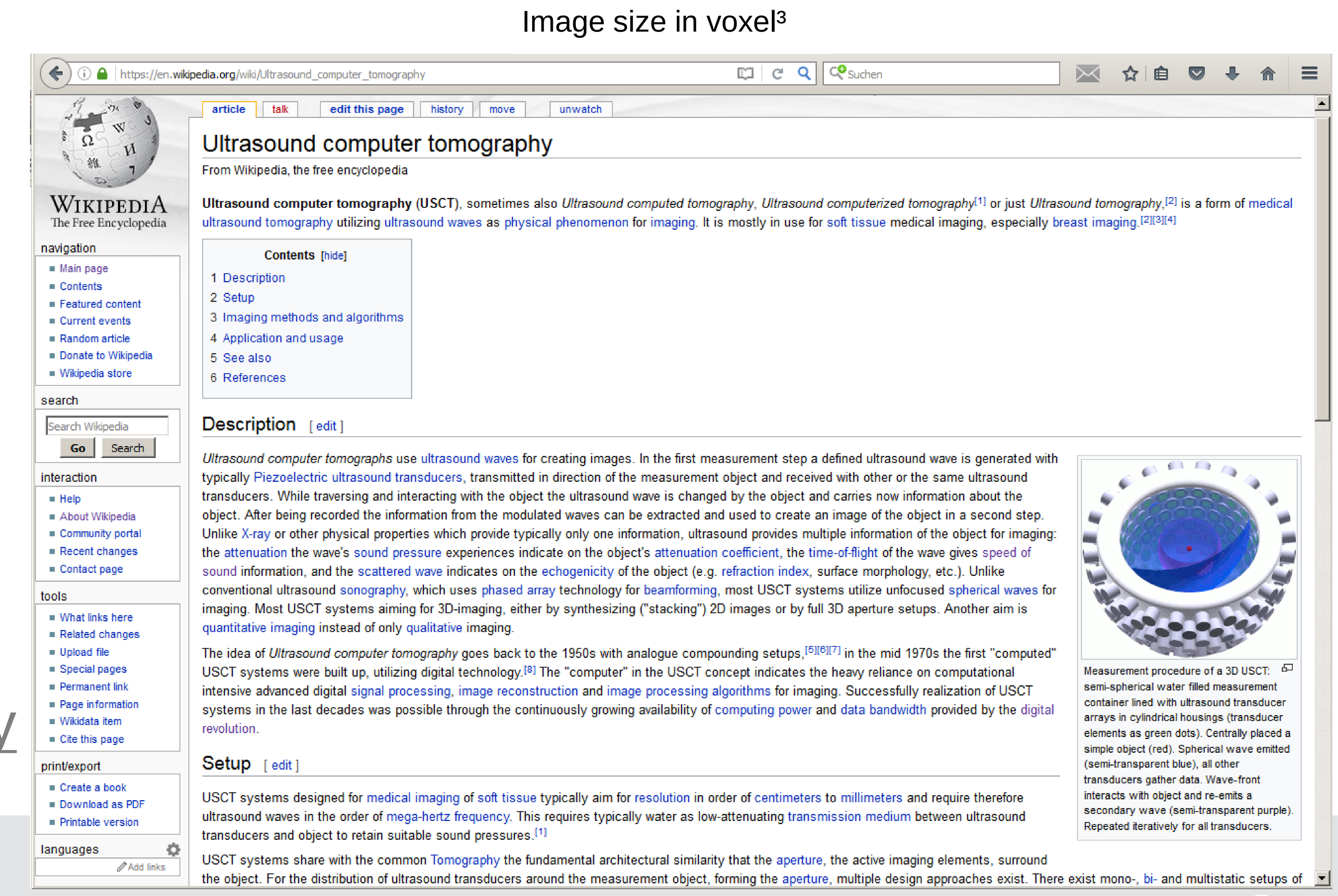


- **KIT 3D USCT data import and imaging script**
  - Repository: https://github.com/KIT-3DUSCT/3DUSCT-data-access-script
  - Import and usage of KIT 3D data & metadata
  - Advanced signal processing chain
  - Iterative reflectivity imaging with synthetic aperture focusing technique (SAFT)
  - Under open source BSD license https://opensource.org/licenses/BSD-3-Clause



- **Parallelized CPU SAFT implementation "SAFT CPU"**
  - Repository: https://github.com/KIT-3DUSCT/SAFT-CPU
  - CPU parallelized, up to 1GV/s, ~40 x faster than MATLAB code
  - Hardware agnostic C implementation
  - Highly optimized x86 assembly
  - Auto-partitioning and run-time optimization
  - Portable, works for Windows and Linux calling conventions
  - Wrapped as MATLAB MEX
  - Under open source LGPL https://opensource.org/licenses/lgpl-license

Further community synchronization



- Data challenge webpage http://ipeusctdb1.ipe.kit.edu/~usct/challenge
- Wikipedia page https://en.wikipedia.org/wiki/Ultrasound_computer_tomography