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GSoC project: Incomplete factorization

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Introduction

Extend GNU/Octave with

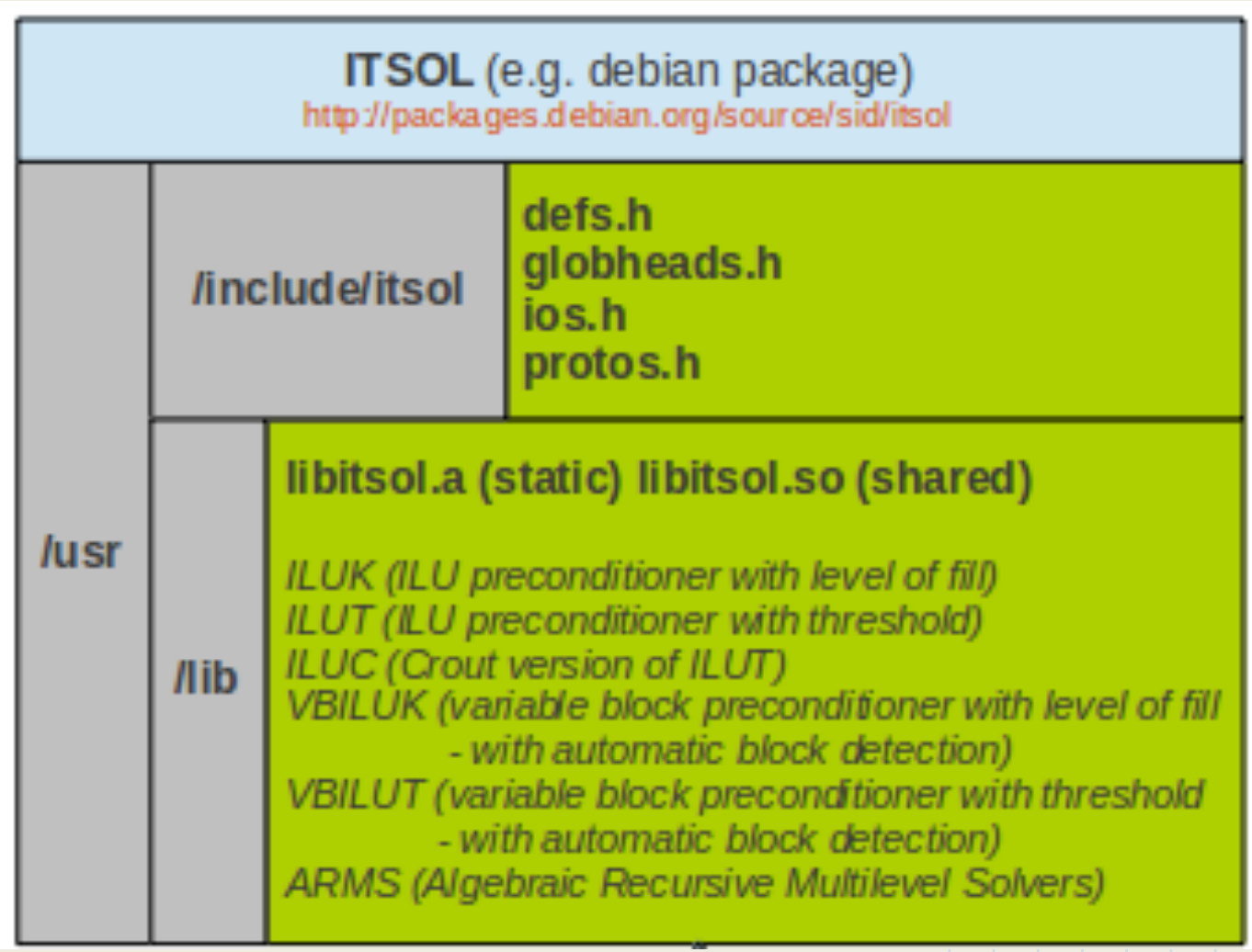
- Incomplete LU-factorization (ilu)
  - Interfacing ITSOL
- Incomplete Cholesky-factorization (ichol)

Useful as preconditioners for solving big sparse linear systems.

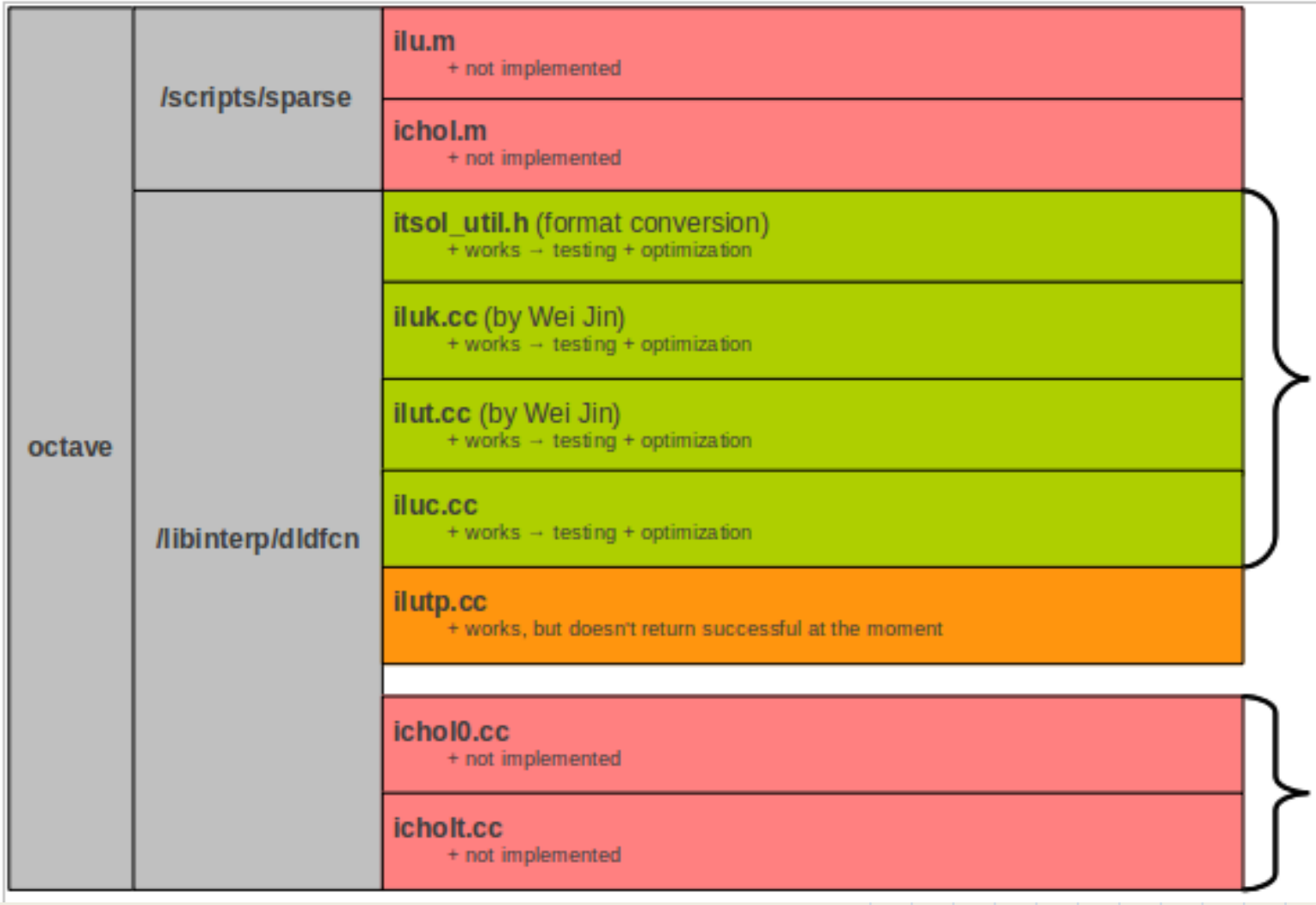
The ITSOL library

- A GPLv2 mathematical library containing many factorizers by Yousef Saad, that MATLAB also offers
  - ILUK (with level of fill)
  - ILUT (with threshold)
  - ILUTP (with threshold and pivoting)
  - ILUC (Crout version of ILUT)
- http://www-users.cs.umn.edu/~saad/software/ITSOL/

The ITSOL library (2)



What has been done...



"Short" Demo

1. Small test case from my blog:
   - ILU(0)
   - ILUT
2. Big symmetric model problem by Andreas Stahel

Goals for the Miderterm

- Intefacing ITSOL (iluk.cc, ilut.cc, ilutp.cc, iluc.cc), callable from Octave (almost finished)
  - Performance issue: Format conversion CRS - CCS
  - Problem: ITSOL-library dependency
- Wrapper file for MATLAB compatibility (ilu.m)
- Test cases
- Documentation

- (optional) Complex ILU versions (ZITSOL)
- (optional) New player Michele Martone RSB-format

Goals for the Final Evaluation

- Implementations for IC(0) and ICT completed
- Wrapper file for MATLAB compatibility (ichol.m) finished
- Test cases
- Documentation

- (optional) Complex version for the incomplete-factorizations

Follow my work

Blog:
http://siko1056-gsoc.blogspot.com/

Public repository:
http://inversethought.com/hg/octave-kai/

References

1. Templates for the Solution of Linear Systems: Building Blocks for Iterative Methods. Second Edition: http://netlib.org/linalg/html_templates/report.html

2. Saad, Yousef: Iterative Methods for Sparse Linear Systems. Second Edition. Minneapolis, Minnesota: Siam 2003. http://www-users.cs.umn.edu/~saad/IterMethBook_2ndEd.pdf

3. http://www.mathworks.com/help/matlab/ref/ilu.html

4. http://www.mathworks.com/help/matlab/ref/ichol.html