SVD using CUDA and MPI

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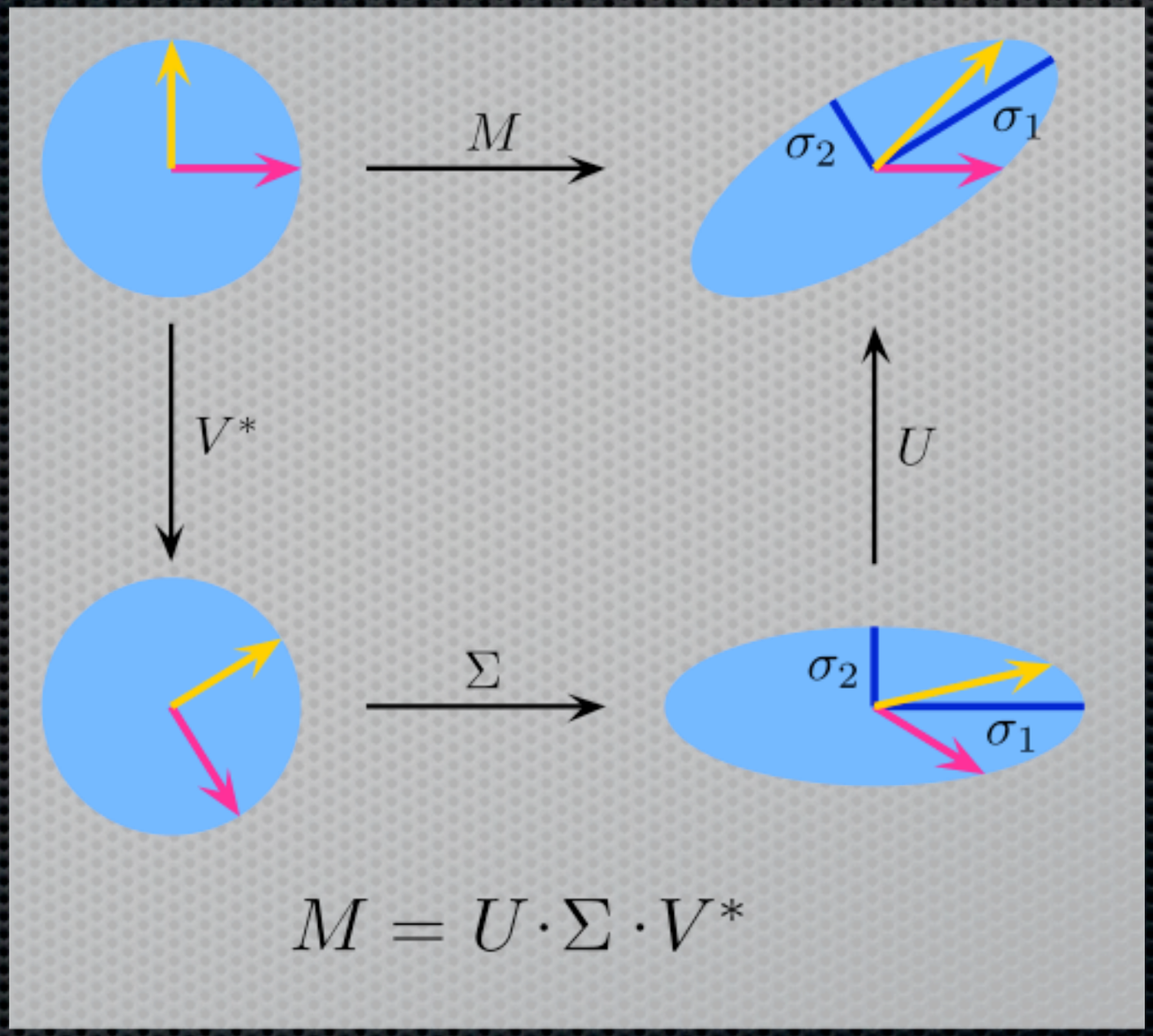
SVD(Singular Value Decomposition)

- In linear algebra, the singular value decomposition (SVD) is a factorization of a real or complex matrix, with many useful applications in signal processing and statistics.

Example



$$M = U \cdot \Sigma \cdot V^*$$

Jacobi Rotation

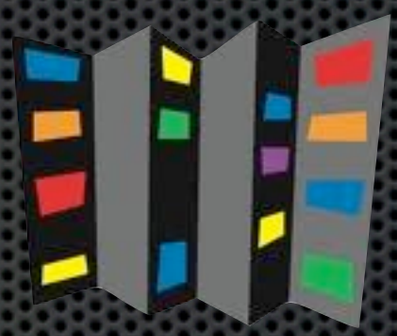
- In numerical linear algebra, a Jacobi rotation is a rotation, Qk_{ℓ}, of a 2-dimensional linear subspace of an n-dimensional inner product space, chosen to zero a symmetric pair of off-diagonal entries of an n×n real symmetric matrix
- It is the core operation in the Jacobi eigenvalue algorithm, which is numerically stable and well-suited to implementation on parallel processors.

Optimization

- MPI overhead preventing speed up
- CUDA data causing us issues with optimiation

Platforms

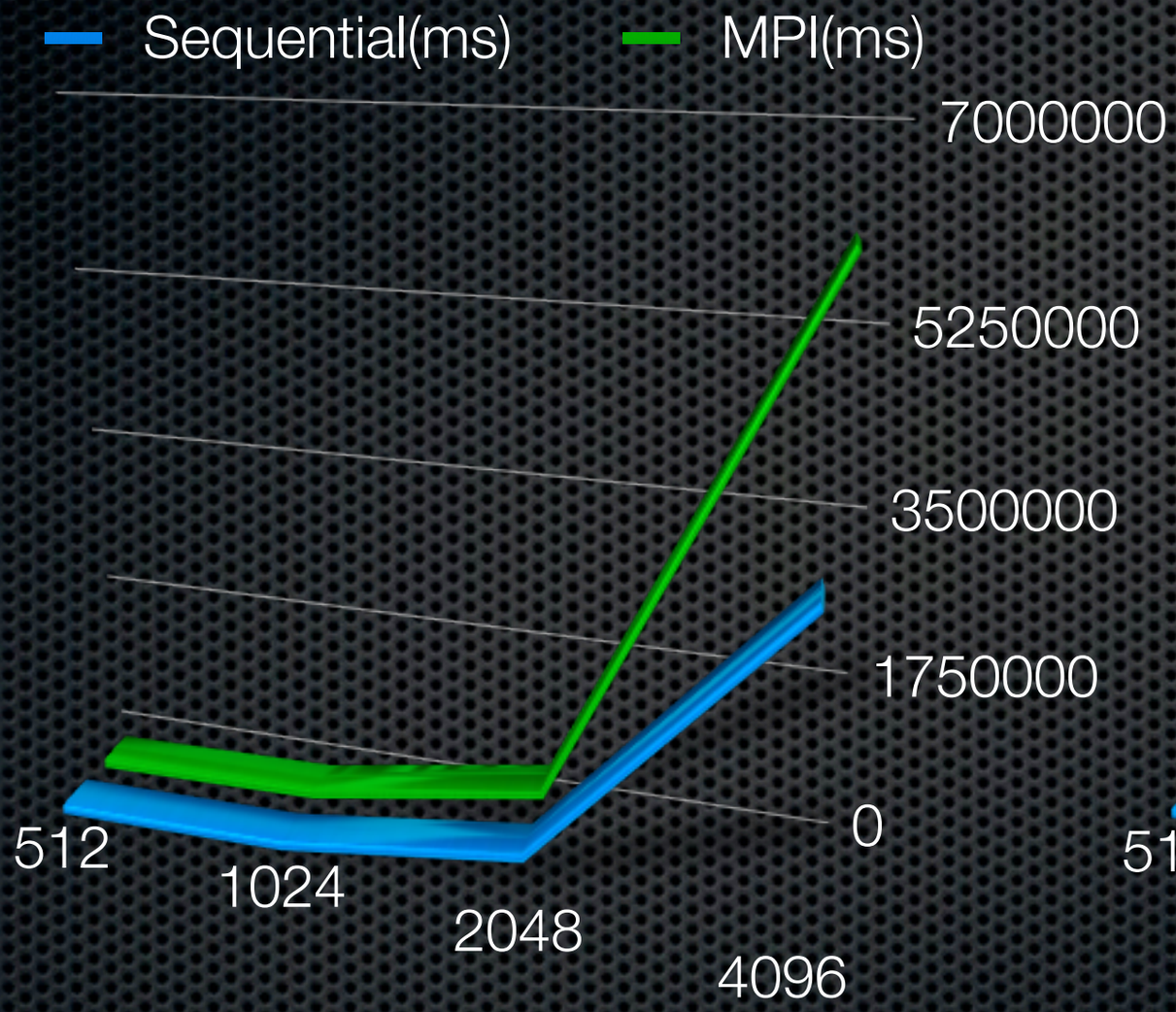
- CHPC for MPI implementation

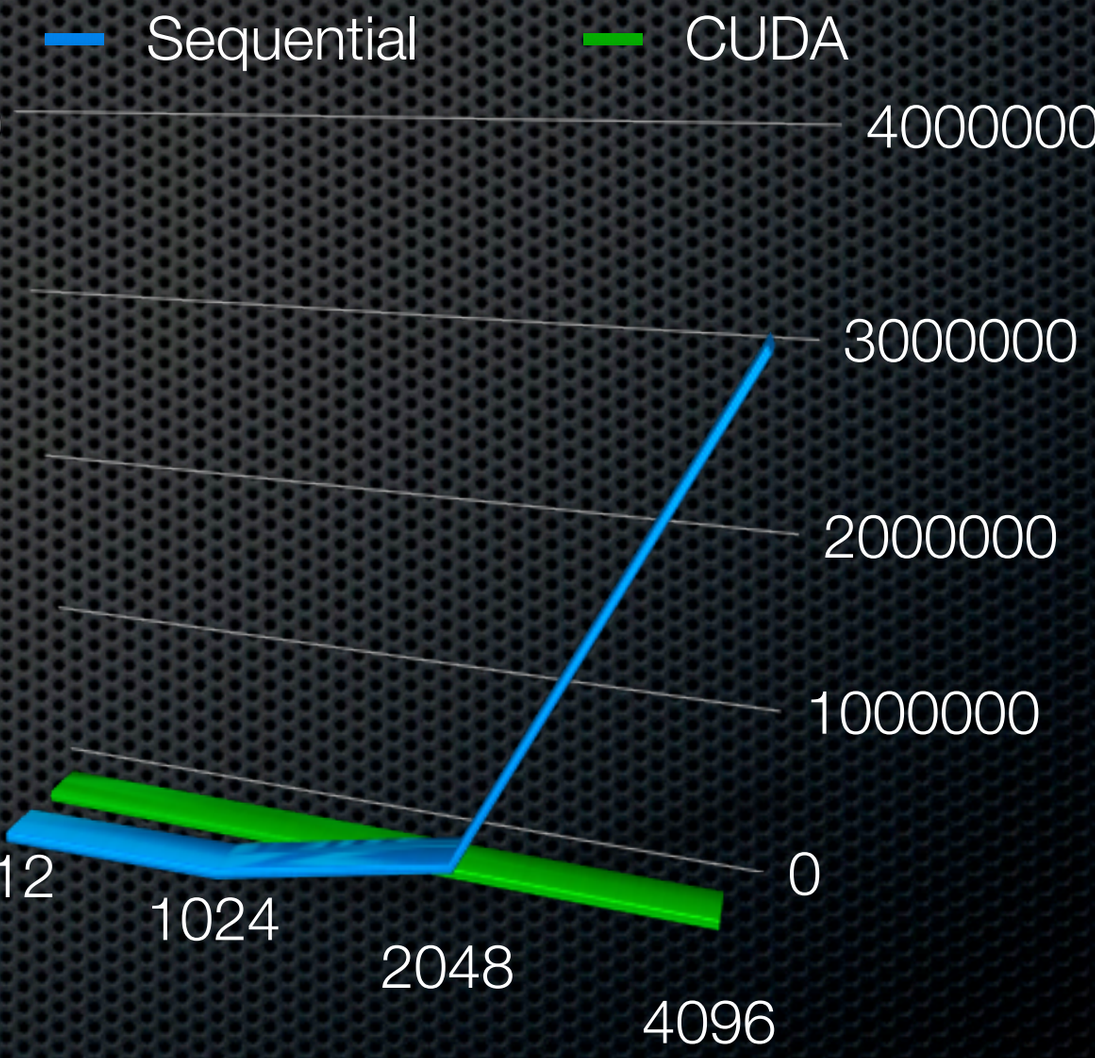


- CADE for CUDA implementation

Cade Lab
University of Utah

Execution Time





Discussion

- Extremely difficult to run both on same platform
- CHPC doesn’t have the GPUs needed for CUDA
- CADE lacks processors for MPI

References

- http://en.wikipedia.org/wiki/Singular_value_decomposition
- http://en.wikipedia.org/wiki/Jacobi_rotation