Comments on Writing

AMSC/CMSC 663
Fall 2013

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1. The writing process

Step 0: Staring at a blank page
Step 1: Start with something

It is a truth universally acknowledged that a single man in possession of a good fortune, must be in want of a dog.

Happy families are all alike; unhappy families are exceedingly rare.

When he was nearly thirteen my brother Jem got his arm badly broken at the elbow.
1. Writing

Step 1: Start with something

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Happy families are all alike; unhappy families are exceedingly every unhappy family is unhappy in its own way.

When he was nearly thirteen my brother Jem got his arm badly broken at the elbow.

The point: it’s hard to get it right the first time but easier to get it right when you have something other than a blank page.
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wife. (Jane Austen, *Pride and Prejudice*)

every unhappy family is unhappy in its own way. (Leo Tolstoy, *Anna Karenina*)

Harper Lee, *To Kill a Mockingbird*
1. Writing

Step 2: Always think of the reader

Does this reader know what you know?

Can the reader fill in the missing steps?

Is the notation clear and simple?

Can readers understand what I’m saying?
1. Writing

20th draft:

bounded by the much less stringent relative tolerance $\frac{\|u(x^{(1)}_{n,1})\|_{\infty}}{\|x^{(1)}_{n,1}\|_{\infty}} \ll 1$, where $\delta$.

This larger relative tolerance implies that the inner iterations required for solving the correction equation can be considerably smaller than those needed to solve the original equation directly.

3.3. Linear solvers with subspace recycling for the correction equation.

Step 2 of Algorithm 2 can be further refined by the use of linear solvers with subspace recycling to further reduce the number of inner iterations. This methodology has proved efficient for solving a long sequence of slowly-changing linear systems. When the iterative solution of one linear system is done, a small set of vectors from the current subspace for the candidate solutions is selected and "recycled," i.e., used for the solution of the next system in the sequence. Subspace recycling usually reduces the cost of solving subsequent linear systems, because the iterative solver does not have to build the candidate solution subspace from scratch. A popular solver of this type is the Generalized Conjugate Residual with implicit inner Orthogonalization and Deflated Restarting (GCR-DR) [27] developed using ideas of special truncation [7] and restarting [23] for solving a single linear system.

Reference [27] makes a general assumption that the preconditioned system matrix changes from one linear system to the next, and thus the recycled subspace taken from the previous system must be transformed by matrix-vector products involving the current system matrix to fit into the solution of the current system. In the setting of solving the sequence of correction equations in Algorithm 2, fortunately, this transformation can be avoided, because the preconditioned system matrix without tuning is the same for the correction equation in all Arnoldi steps.

It is suggested in [27] that the harmonic Ritz vectors corresponding to smallest harmonic Ritz values can be chosen to span the recycled subspaces. These vectors are approximate eigenvectors of the preconditioned system matrix corresponding to smallest eigenvalues. If the harmonic Ritz vectors are good approximate eigenvectors, this strategy tends to reduce the duration of the initial latency of GMRES convergence typically observed when the system matrix has some eigenvalues of very small magnitude; see [11]. Our subspace recycling also includes dominant Ritz vectors, as suggested in [27]. In Section 5, our numerical experiments show that the set of dominant Ritz vectors is an effective choice for subspace recycling if the use of harmonic Ritz vectors fails to reduce the inner iteration counts.


is one of the earliest papers on inexact Krylov subspace eigenvalue algorithms, where a large number of numerical tests were carried out for the ordinary Arnoldi method (without restarting). It was observed empirically that the matrix-vector product involving $A$ must be computed with high accuracy, whereas the accuracy for $A^{-1}$ can be relaxed, as the Arnoldi method is a black-box procedure. A similar phenomenon is also observed in [18] for an inexact Lanczos method. An analysis based on matrix perturbation theory given in [30] shows that the allowable errors in the matrix-vector product can be relaxed to a quantity inversely proportional to the eigenvalue residual norm of the current desired approximate invariant subspace, which is a measure of the quality of the approximate invariant subspace and is under control (and expected to improve) after these inexact Arnoldi steps. This relaxation strategy is extended in [11] to the inexact IRA method, where a practical estimate of the allowable tolerance, $\tau$, is proposed for the linear systems in Arnoldi steps. Ideally, accurately estimated allowable tolerance $\tau$ can help reduce the inner iteration counts to the largest extent possible without compromising the accuracy and the convergence behavior of the deflated method to the desired invariant subspace. In this section, we give a refined analysis of allowable errors in Arnoldi steps and an alternative estimate of allowable tolerances for the linear systems.

Suppose the matrix-vector product involving $A = A^{-1}B$ is applied inexact for
1. Writing: Conventions of scholarly publication

• An *abstract* gives a brief summary of accomplishments

• An *introduction* summarizes the state of the art of the topic and states what was accomplished in the project described

• The royal “we” is used to state who did the work (“In this paper, *we* prove that $P=NP$.”)

• Typically there are page limitations for journals

• The bibliography should accurately reflect other work that is relevant
2. The publication process

Once you are satisfied with your results and your document

• Decide on a publication venue
  Journal? Conference?
  Which one? Some self-evaluation is required.

• Submit the document for consideration
  Look at the journal (conference) page for how to do it
  Write a cover letter
  Perhaps: suggest editor to handle it
  names of possible reviewers

• Wait for reviews
  For journals: this rarely takes less than three months
  it may take as long as a year
  three-six months is typical today
2. The publication process

Outcome of the submission

• Reviewers like it, suggest no or minimal revision
  Virtually impossible

• Reviews say results are interesting but significant revision is required
  Very common outcome. Need to deal with it.
  Typically, many of the points are correct, some are debatable.
  Your response: some combination of make requested corrections and explain why what you did is good.

• Reviews are negative, paper is rejected.
  It happens. Your response:
  Best: Figure out what went wrong, fix it, submit elsewhere
  Possibly: Throw work away. (Not the preferred response)
This process is repeated throughout an academic / research life
I. Plagiarism
   a. Unacknowledged use of other work
   b. Unacknowledged use of one’s own work

Every paper submitted to SIAM journals is checked for plagiarism with a program called *Crosscheck*

$\approx 5\% \ (171 \text{ in a recent year})$ of submissions are flagged

Of these:

$\approx 50\%$ are flagged for *self-plagiarism*

$\approx 50\%$ are flagged for other reasons

$\frac{118}{171} = 62\%$ are rejected outright

In some (other) cases: papers about to be accepted were later rejected after duplication was discovered
II. Reproducibility of experimental results

a. Serious problems have arising in medical research
   Statements about safety of experimental results have been shown to be invalid and not reproducible, led to very bad outcomes
   One example: Patients suffered collapsed lungs due to errors in MATLAB codes

b. At least one journal, *Biostatistics*, has criteria “reproducibility” to which papers are subjected. Papers meeting the criteria are marked R

c. Can’t use only “good” outcomes of experiments