Technical Paper Writing

Ronald F. DeMara
Department of Electrical and Computer Engineering
University of Central Florida
Orlando, FL 32816-2450
demara@mail.ucf.edu

Abstract

This document provides guidance for graduate students writing thesis, dissertation, or technical reports for publication. It highlights many useful techniques for generating the needed scholarly level of results. It also lists suggested mechanisms for maximizing efficiency during this phase of the research process.

This document is organized into sections which flow roughly in the order from file creation to submission back to me for editing, feedback, and further advice. Also, see my Ph.D. Overview [1], Ph.D. Plan [2], and Presentation Writing [3] documents for additional information.

I. File Naming Convention

To help with version control, please maintain yourself and exchange via email (to advisor and others) filenames only using the following naming convention:

<StudentFirstName>-<Conference/JournalAcronynm/purpose>-<2digitYear>-<TodaysDay Digit><TodaysMonthName><TodaysYear>-<24hourtime>"hrs"

like:

heng-ERSA05-08Feb2005-2100hrs.doc

II. Milestones for Conference vs. Journal papers.

- Most journals and conferences have their own style files at their website. If none indicated then for journals please use: http://netmoc.cpe.ucf.edu:8080/internal/conversion/2004/CONFIDANT_evaluation.pdf as your example. For conferences, please use IEEE 2-column format.

- For conferences:
  1. authors prepare 2-column version from the start
  2. 2-column version submitted to reviewers
  3. comments returned within a couple of months
  4. "Camera Ready" version of 2-column formatted prepared by AUTHORS for publication in proceedings

- For journals:
  1. authors prepare single column version (with 1.5 or double line spacing)
  2. single column version submitted for review
  3. comments returned after about 6 months to 1 year
  4. authors make required changes and resubmit single column version
  5. paper accepted for publication
  6. the PUBLISHER (not authors) prepare the 2-column version under direction of the editors (not authors)
  7. a "proof" version of the way it will appear in the journal is emailed to the authors for checking for errors and has (usually) to be returned within a few business days. Usually, some errors need fixed (depending on if publisher uses LaTeX vs. Word, etc).

III. LaTeX vs. MS Word

- LaTeX
  LaTeX usually turns out more efficient in long run for dissertation (when many figures, equations, and tables can cause headaches).

- MS Word
  I will allow Word to be used ONLY if you take the time to make all the formatting as professional looking as LaTeX would for every:
  -table,
  -equation symbols,
  -equation numbering,
  -theorem/definition formatting & numbering,
  -Figure numbering,
  -Reference numbering,
  -Section numbering,
  -list, and
  -font use.
- If using Word then must do 100% professional formatting yourself (without Advisor having to keep fixing the formatting and floating figure problems).
- All Figure numbers, Reference IDs, Section numbers, etc must NOT be hardcoded (so that they are re-numbered automatically --- please figure out if you choose to use Word).
- Figures in Word <--- MANDATORY (PLEASE FOLLOW BELOW)
  - Insert SECTION BREAK (CONTINUOUS) around every Figure.
  - Please see attached example of USING SECTION BREAKS and follow it closely.
  - Please never use SECTION BREAK (NEXT PAGE) [because it is buggy and cause much grief to your document if you try to delete it later!!!] but instead [INSERT PAGE BREAK followed by SECTION BREAK (CONTINUOUS) which seems less buggy].

- You will need to toggle between VIEW NORMAL and VIEW PRINT PREVIEW to edit around these section breaks appropriately (try it now if you haven't done so before).

IV. Organization

A. Author's Objective

- Your objective as author is to *teach* the reader something new in the minimum number of words.
- Concentrate on ***teaching the reader something new and useful*** rather than just ***explaining what happened to get done in your work***
- If an expert in the field reads this paper, he MUST learn something new --- which is the test if the paper is publishable or not. Otherwise, do not continue writing it – this means it should not be published nor known previously. This is referred to as being novel work.

B. Role of Diagrams, Tables, Graphs

- At least 90% of the substance of any technical paper is in its diagrams, tables, and graphs.
- Have one diagram/table/graph every one or two pages – do NOT proceed more than 2 pages without a one.
- Writing should be concise and follow along from the figures and tables naturally.
- Most all of the words explain or "walk the reader through" the diagrams, tables, graphs … so if there isn't a table or figure to explain at anytime then you probably need to stop writing text and make one.
- "Talk to" the figures or tables in the text.
- Table name/heading is always located on top of Table.
- Figure name or heading is always located below the Figure.
- In Graphs/Charts, each of :
  a) Title
  b) Axes
  c) Legends
  d) Plots, graphs

  Should tell something new and specific, so there should be no redundancy between these elements.

C. Typical Proportions

- 20% of the paper should explain "what" … what the objective is, what the circuit will do, …
- 70% of the paper should explain "how"/"when"/"where" … how the circuit works, when this event occurs then …, where the needed function is implemented
- 10% should explain "why" … rationale for design tradeoffs, why it works, why the result is significant

V. Technique for Generating Scholarly Content

Writing a paper is a creative process that requires time for ideas to grow and develop. Here is one technique to help guide that process:

-posing a technical question to yourself (just what is it that I don't understand?)
-brainstorming answer (what does that question really mean?)
-making a diagram or table (this collects up the brainstorm results into coherent groupings)
-formalizing depiction of that answer (make bulletized lists of key points while drawing the figure)
-expand the bullets into full sentences.
- repeat until all possible questions answered ... or page limit reached :-)

Here is the process in detail:

1) Spend 5 mins identifying the research question to be learned:
which in this case after just a little pondering became
"How does CRR process relate to a search of the repair space?"

2) Spend 0.5 hr thinking about that question to be learned:

That means just 1 thing: Brainstorm that question. If you are not sure what to brainstorm on exactly then try repeating the list below to yourself until you are:

- What does that question mean?
- How many ways could someone answer that question?
- What is the range of reasonable responses to that question?
- What variables interact to form each response to that question? How might someone formalize that interaction of the responses to that question?

During brainstorming start sketching out some possible solutions (no matter how incomplete or only partially-correct they may be --- there are no "bad" ideas when brainstorming) by hand on scratch paper or open scratch window on PC. I recommend sketching out ideas in Microsoft Power Point for this … because then the slide is pre-made (or at least drafted) for the paper presentation or defense later.

Until ... suddenly the lightbulb comes on in your brain. This is the happiest moment research inspiration. You have actually created new information that was not previously known and is very rewarding to obtain that intellectual inspiration.

3) Spend 1 hr making the Figure (or table) that depicts the concept. Throughout that time keep refining the scholarly answer:

When drawing it, make bulletized notes to yourself in a text box.

Rather than trying to actively brainstorm these in step 3 (step 2 brainstorming is over for now ... yes, let me repeat that - stop brainstorming before step 3 or you will never get the days work completed :-) just write down what you are thinking about the diagram to explain it.

Instead of brainstorming, just write down whatever comes to mind like a tape recorder of your thoughts as you draw things out on the PC. Capture what your mind is THINKING while your hand keeps DRAWING.
("Zen and the Art of Motorcycle Maintenance" book - if you happen to know about it.)

Do spend time right then to make the diagram pretty ... besides improving image quality, THIS IS THE TIME when you will find that you will capture the most useful scholarly information as you:

-adjust font sizes for headings of whats really important (Why?)
-make lines different thickness for whats the primary dataflow / control flow (Why?)
-provide precise vertical spacing / placement that corresponds to the relative grouping of ideas (Why?)
-use of shapes/arrows that capture the relative same and different meanings (Why?)

(Hint: answer to Why?'s above is that making those items pretty with your hand gives your mind the chance to really understand the RELATIONSHIP between them: bigger font for more important items, thicker lines for main dataflows, grouping of related items being closer together, etc. Otherwise if you just scribble or jot down the idea too quickly/messily/slopply without refinement then you don't have enough of a chance to understand it to really make it scholarly.
That is why "drawing refinement" and "text wordsmithing" are important to the scholarly process and why I emphasize them. Later, those bullets you captured in the text box become the text in the paper.

Also,
1) Use some labeling legend (write numbers 1, 2, 3, etc.) on the components on every diagram to highlight the flow of operations or components. For example, in a Figure label as API #1, API #2 etc to show the resources managed by the APIs ... or similar strategy to give some "action" to the diagram. This is always a good strategy for diagrams - every diagram should have some "action" that is talked about in the text. Also components on diagrams should can be grouped be dashed lines.
2) Do not mix 3-dimensional and 2-dimensional drawing. A figure should be consistent in using either all 2-D figures (blocks) or all 3-D elements.

VI. Sentence Construction

A. Simple Structure

- Write simply using subject/verb/object construction much of the time.

- Avoid extra words: if a word or sentence doesn't need to be there (the reader learns the same thing without out it) then it must be removed.
- Avoid subjunctive clauses
- Eliminate deadwood sentences
    - example:
      "Y can be one way that is used in a method to show how X is achieved."
      which becomes just
      "Y achieves X."
      and stop at that.
- Eliminate sentences that exhaust the reader's mental energy
    - example:
      "CGT methods will be useful in increasing the efficiency of the process of hardware repair using evolutionary methods in general."
      becomes just
      "CGT methods increase the efficiency of repair."
- If the sentence has more than 10 words then ask yourself:
    - What is the REAL subject of this sentence? ... then write it down at the start of the sentence.
    - Next, remember that verbs are really the MOST powerful word categories in the English language: make effort to always choose the most PRECISE, ILLUSTRATIVE, ACTION-ORIENTED verb possible.
    - Finally, look the whole sentence over to remove any wishy-washy words.

B. Reserved Words and Formatting

- Figures/Tables
    - Table 1 "lists" …
    - Figure 1 "shows" or "illustrates" or "depicts" …
    - But don't write that Table 1 "shows."
- Third person only
    - Avoid first person (use of "I") and second person (use of "we")
- use of "and"
    - such that there is a comma before 3 or more items in a list like: "bread, peanut butter, and jelly" not "bread, peanut butter and jelly"
- define ALL acronyms the first time you use them ... with italics including the acronymn, e.g. *Competitive Runtime Reconfiguration (CRR)* is a novel …
- avoid use of parenthetical expressions and footnotes in formal papers … if it is important enough to be a footnote then it should be important enough to be in the main text else it isn't important so should be left out.

VII. Microsoft Word Items

- retype the quotation marks so that they properly "curl in" towards text (properly typeset quotes), not straight up and down quote marks (this is due

to cut and paste into MS Word. If using MS Word then you MUST check everytime manually yourself.)

- references numbers should not be hardcoded
- figure and table numbers should not be hardcoded
- use two spaces after every period at the end of a sentence, like "It is an FPGA. It is fast ..." not "It is an FPGA. It is fast ..." <notice 2 spaces looks better and is the way to typeset a document. LaTeX does this automatically with no effort, but in word, you must remember to type 2 spaces manually after every sentence.

VIII. References

- order references alphabetically by surname (last name) of first author
- use proper modern citation format for all references, i.e. A. Smith, B. Jones, ... not Smith, A. and Jones, B.
- do not indent references in reference list
- see reference examples at the end of this document for Sample Citations Formats:
    - Item [4] below is a sample citation for books.
    - Items [5], [6], [7], [8], [9], [10], and [11] below are sample citations for *journal* articles.
    - Items [12], [13], [14], [15], [16], [17], and [18] below are sample citations for *conference* articles.
    - Items [10] and [17] below are samples for *submitted* but not yet accepted documents.
    - Items [11] and [18] below are samples for *accepted* but not yet published documents.
    - Item [19] is a sample *book chapter*.

IX. Finishing Checklist

It is only your best effort when the paper:

- has a provocative yet well-formed title,
- is sufficiently justified/motivated in terms of previous work yet doesn't slam others,
- Conveys new information to an expert in the field
- doesnt use "we" or "I,"
- extensive use of tables,
- use of at least 1 figure/table per page,
- professional-grade figures (cleanly drawn, good use of fonts, line size),
- content-dense-yet-not-incomprehensible text,
- polished proper word use and impeccable formatting,
- acceptable scholarly level of equations and terminology,
- every sentence is phrased in the authoritative ("I am the expert") tone,
- distribution of space devoted to each topic is balanced and symmetric,
- re-floating of any moved figures nicely on the page,

- final spellchecking done, and
- final proofreading done.

Read this often especially whenever you write; CHALLENGE yourself on EVERY point; I guarantee it will help.

X. Submission instructions

1) check the conference or journal website instructions
2) compose a cover letter like:

“

Dear Dr. Smith:

Attached is the manuscript "A Device-Controlled Dynamic Configuration Framework Supporting Heterogeneous Resource Management" by H. Tan and R. F. DeMara which we are submitting to ERSA'05 focus session #7 on Runtime Resource Management. The file is attached as tanh.pdf and its keywords are:
-Self-contained On-chip Reconfiguration,
-FPGA Resource Management Infrastructures,
-FPGA Applications and Prototypes,
-Fast Reconfiguration Techniques
-Layered Reconfigurable Device Models

The contact author information is:

Heng Tan
Research Associate
Department of Electrical and Computer Engineering
University of Central Florida
Box 162450
Orlando, FL 32816-2450
tel: 407-823-4861
fax: 407-823-5835
e-mail: theng@mail.ucf.edu

We would like to have it considered as a Regular (7 page) paper first, or secondarily as a Short (4 page) paper otherwise.

Please let me know if any questions arise.

Sincerely,
Heng Tan

Heng Tan
Research Associate
Department of Electrical and Computer Engineering
University of Central Florida
Box 162450

Orlando, FL 32816-2450
tel: 407-823-4861
fax: 407-823-5835
e-mail: theng@mail.ucf.edu
”

3) submit 1 or 2 days before deadline to make sure it gets there in time in case there is some problem or mix up.

References

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